



**United States Military Academy  
West Point, New York 10996**

**ANNUAL FACULTY RESEARCH REPORT**  
OF THE  
**DEPARTMENT OF SYSTEMS ENGINEERING**  
AND THE  
**OPERATIONS RESEARCH CENTER**  
FOR THE  
**ACADEMIC YEAR 2006**

**DTIC No. ADA455050**

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**October 2006**

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## EXECUTIVE SUMMARY

The purpose of this document is to formally summarize and conclude the research program of the *U.S. Military Academy Department of Systems Engineering (DSE) and the Operations Research Center for Excellence (ORCEN)* for the Academic Year 2006. The annual research report includes a statement of purpose for research which supports DSE and the ORCEN, a description of the two organizations, a list of the key personnel responsible for executing the plan, and an overview of the annual research cycle.

After this introduction, we present research summaries for applied research or problem-solving project. Each summary includes a problem statement and description, the methodology employed for project execution, a summary of results, a list of presentations and publications and a current status. Additional information is provided on the senior investigator, principal analyst the client organization, and points of contact.



## **PART I – THE DEPARTMENT OF SYSTEMS ENGINEERING RESEARCH PROGRAM**

***The purpose of the research program within the Department of Systems Engineering is to support cadet education and faculty development through the development, execution and presentation of relevant Army and Department of Defense research opportunities for significant clients.***

The Department of Systems Engineering research projects provide the faculty and cadets with the opportunity to investigate a wide spectrum of interdisciplinary, systemic issues and to apply many of the systems engineering, engineering management, and operations research concepts studied in the classroom to real-world problems of interest to the Army and the Department of Defense (DoD). These projects demonstrate for both cadets and faculty the relevance and importance of systems engineering in today's high-technology military.

The research program in the Department of Systems Engineering (DSE) directly addresses four specific Academy needs:

**1. Research enriches cadet education.** Cadets learn best when they are challenged and when they are interested. The introduction of current issues facing the military into their curriculum achieves both. Early in their education, cadets are taught by their instructors the application of techniques to real issues and problems – issues and problems they will face upon graduation. Through this, they gain an appreciation of the robustness of the discipline and a greater understanding of their profession. As they progress in their education, they begin to apply these techniques to heretofore unsolved issues and problems. This codifies their education on the techniques and instills an adaptive, problem-solving mentality in the cadets.

**2. Research enhances professional development opportunities for Army faculty.** It is important to develop and grow as a professional officer in each assignment. On the DSE faculty, officers conduct research on relevant projects to remain current in their operational branch or in the Functional Areas 49, 51, 53 and 57. The research they conduct keeps them abreast of Army and DoD issues, at the forefront of their academic discipline and is returned to the classroom. They become better officers and leaders through the knowledge they gain and impart.

**3. Research maintains strong ties between the Academy and Army/DoD agencies.** The US Military Academy and DSE is a tremendous source of highly qualified analysts for the Army and DoD. Each faculty member holds an advanced degree in a technical discipline and has a deep understanding of the military and its issues. Research ensures that the Academy remains a significant part of the Army and DoD and not just another source of commissioning for junior officers.

**4. Research provides for the integration of new technologies into the academic program.** As the pace of technological advances increases, the Academy's education program must not only keep pace but must lead to ensure our graduates and junior officers are prepared for their continued service to the Army. Research which

applies the most advanced technology and techniques is critical to achieving this objective.

By being fully engaged in current Army and DoD issues, the Department of Systems Engineering and the Operations Research Center assures that systems engineering education at USMA and our faculty remain current and relevant. The military's return on its investment is meaningful career development experiences for officers, especially those in Functional Areas 49/51/53/57, an enhanced education program for the USMA cadets, and important investigation of vital Army and DoD problems at far less cost than would be required through civilian contracts.

The Department of Systems Engineering conducts research through its faculty and the Operations Research Center of Excellence (ORCEN). The ORCEN is the primary entry point for all research with the Department. The ORCEN Director is also the DSE Research Coordinator and oversees all aspects of the Department's research as well as personally directing research within the ORCEN.

## PART II – THE OPERATIONS RESEARCH CENTER OF EXCELLENCE

The purpose of the Operations Research Center of Excellence (ORCEN) is to provide a small, full-time analytical capability to both the Academy and the United States Army and the Department of Defense. The ORCEN was established in 1990 through a Memorandum of Agreement between the Department of Systems Engineering, the Department of Mathematics (DMath) and the Office of the Assistant Secretary of the Army (Financial Management and Comptroller). Its establishment was born of the burgeoning need for developing research opportunities to enrich DSE and DMath education.

Personnel authorizations in the ORCEN are established by a Table of Distribution and Allowances (TDA). Funding support for the Operations Research Center is established by a Memorandum of Agreement with the Office of the Assistant Secretary of the Army (Financial Management). The Operations Research Center is organized under the Office of the Dean as an Academy Center of Excellence. A permanent military Academy Professor provides oversight and supervision to the Center. In addition, the TDA authorizes one O5 analyst, three O4 analysts, and a GS5 secretary. By agreement between DSE and DMath, DSE provides three analysts, an Academy Professor as the Director and one permanent staff member to serve as Executive Administrator and assistant to the Director and DMath provides one analyst.

The Operations Research Center was originally sponsored by the Assistant Secretary of the Army (Financial Management & Comptroller). Fully staffed since Academic Year 1990-1991, the Operations Research Center has made significant contributions to cadet education, faculty development, and the Army at large. The following is a list of key personnel from the Operations Research Center for the Academic Year 2006.

Table 1: Key ORCEN Personnel

| TITLE & ORGANIZATION                                      | NAME                           | PHONE (DSN) | EMAIL                     |
|-----------------------------------------------------------|--------------------------------|-------------|---------------------------|
| Professor and Head,<br>Department of Systems Engineering  | COL Timothy E. Trainor, Ph.D.  | 688-5534    | Tim.Trainor@usma.edu      |
| Professor and Head<br>Department of Mathematical Sciences | COL Michael D. Phillips, Ph.D. | 688-5285    | Michael.Phillips@usma.edu |
| Director, ORCEN & Assistant Professor                     | LTC Simon R. Goerger, Ph.D.    | 688-5529    | Simon.Goerger@usma.edu    |
| Executive Officer &<br>Research Coordinator               | Ms. Linda Albronda             | 688-5897    | Linda.Albronda@usma.edu   |
| Deputy Director, ORCEN &<br>Associate Professor           | MAJ Gregory Boylan, MS         | 688-4792    | Gregory.Boylan@usma.edu   |
| D/MS Analyst & Instructor                                 | LTC John Halstead, PhD         | 688-4752    | John.Halstead@usma.edu    |
| D/SE Analyst & Instructor                                 | MAJ Howard McInvale, MS        | 688-1568    | Howard.McInvale@usma.edu  |
| D/SE Analyst & Instructor                                 | MAJ Ernie Wong, MS             | 688-4756    | Ernest.Wong@usma.edu      |

### **PART III – FACULTY RESEARCH**

The Department of Systems Engineering encourages its faculty to conduct research of value for the Army and the Department of Defense during their tenure at the United States Military Academy. This specifically includes the rotating junior faculty to support their professional development.

During Academic Year 2006, the Department of Systems Engineering had 18 faculty members holding a Ph.D. and 16 individuals on the faculty holding a Masters Degree. Each holds their advanced degrees in disciplines which support research in systems engineering, engineering management and/or operations research. This is a tremendous research potential for significant clients within the Army and DoD.

All research in the Department of Systems Engineering is overseen by a Senior Investigator (SI) to ensure quality and completeness for the client. These Senior Investigators all hold a Ph.D. in a qualified discipline for the research project presented. Most research projects have an associated junior analyst assigned to them. This contributes to the development of the junior analyst as a researcher, the Senior Investigator as a research lead and provides the client with the best research available by the Department.

Table 2: DSE Senior Investigator

| NAME                        | EDUCATION & DEGREE                                                                                                                                                                 | PHONE (DSN) | EMAIL                     |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------|
| LTC William Bland           | PhD – University of Virginia – 2003<br>MS – Florida Institute of Technology – 1995<br>BS – USMA – 1983                                                                             | 688-5181    | William.Bland@usma.edu    |
| Dr. Roger C. Burk           | PhD – University of North Carolina – 1993<br>MS – Air Force Institute of Technology – 1985<br>BA – St. John's College – 1974                                                       | 688-4754    | Roger.Burk@usma.edu       |
| Dr Patrick J. Driscoll      | PhD – Virginia Tech – 1995<br>MS – Stanford University – 1989<br>BS – USMA – 1979                                                                                                  | 688-6587    | Patrick.Driscoll@usma.edu |
| Dr. Bobbie Foote            | PhD – University of Oklahoma – 1967<br>MS – University of Oklahoma – 1963<br>BS – University of Oklahoma - 1961                                                                    | 688-4893    | Bobbie.Foote@usma.edu     |
| Dr. Niki C. Goerger         | PhD – Texas A&M University – 1992<br>MS – Mississippi State University – 1988<br>BS – Mississippi State University – 1986                                                          | 688-3180    | Niki.Goerger@usma.edu     |
| LTC Simon Goerger           | PhD – Naval Postgraduate School – 2004<br>MS – Naval Postgraduate School – 1998<br>BS – USMA – 1988                                                                                | 688-5529    | Simon.Goerger@usma.edu    |
| LTC John Halstead           | PhD – University of Virginia - 2005<br>MS – Kansas State University - 1997<br>BS – USMA - 1986                                                                                     | 688-4752    | John.Halstead@usma.edu    |
| LTC Dale Henderson          | PhD – University of Arizona - 2005<br>MS – Naval Postgraduate School - 1999<br>BS – USMA - 1989                                                                                    | 688-5539    | Dale.Henderson@usma.edu   |
| LTC Robert Kewley           | PhD – Rensselaer Polytechnic Institute - 2001<br>ME – Rensselaer Polytechnic Institute - 1998<br>BS – USMA – 1988                                                                  | 688-5206    | Robert.Kewley@usma.edu    |
| Dr. John Kobza              | PhD – Virginia Tech – 1993<br>MS – Clemson University – 1984<br>BS – Washington State University – 1982                                                                            | 688-2788    | John.Kobza@usma.edu       |
| LTC Michael J. Kwinn, Jr.   | PhD – University of Texas (Austin) – 2000<br>MS – University of Arizona – 1994<br>BS – USMA – 1984                                                                                 | 688-5941    | Michael.Kwinn@usma.edu    |
| LTC Willie J. McFadden, III | PhD – Old Dominion University – 2000<br>MS – Naval Postgraduate School – 1993<br>BS – USMA – 1983                                                                                  | 688-5941    | Willie.McFadden@usma.edu  |
| COL Michael L. McGinnis     | PhD – University of Arizona – 1995<br>MS – Rensselaer Polytechnic Institute – 1986<br>BS – USMA - 1977                                                                             | 688-2701    | Mike.McGinnis@usma.edu    |
| Dr. Gregory Parnell         | PhD – Stanford University – 1985<br>MS – University of Southern California – 1980<br>ME – University of Florida – 1974<br>BS – State University of NY (Buffalo) - 1970             | 688-4374    | Gregory.Parnell@usma.edu  |
| LTC(P) Robert Powell        | PhD – Stevens Institute of Technology – 2002<br>MMAS – US Army CGSC – 1999<br>MS – George Mason University – 1995<br>BS – Texas A&M University - 1984                              | 688-4311    | Robert.Powell@usma.edu    |
| LTC Brian Sperling          | PhD – Georgia Institute of Technology – 2005<br>MS – Air Force Institute of Technology – 1999<br>BS – USMA - 1989                                                                  | 688-4399    | Brian.Sperling@usma.edu   |
| COL Timothy L. Trainor      | PhD – North Carolina State University – 2001<br>MBA – Duke University – 1992<br>BS – USMA – 1983                                                                                   | 688-5534    | Timothy.Trainor@usma.edu  |
| Dr. Paul West               | PhD – Stevens Institute of Technology – 2003<br>MTM – Stevens Institute of Technology – 2000<br>MBA – Long Island University – 1993<br>BS – State University of NY (Albany) – 1983 | 688-5871    | Paul.West@usma.edu        |

Table 3: DSE Analysts

| NAME                     | EDUCATION & DEGREE                                                                                                                 | PHONE (DSN) | EMAIL                     |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------|
| MAJ Gregory Boylan       | MS – Georgia Institute of Technology – 2003<br>BS – USMA – 1994                                                                    | 688-4792    | Gregory.Boylan@usma.edu   |
| Ms. Robin Burk           | MBA – University of North Carolina – 1992<br>MDIV – Church Divinity School of the Pacific – 1983<br>BA – St. John’s College – 1973 | 688-4764    | Robin.Burk@usma.edu       |
| MAJ Paul Evangelista     | MS – Rensselaer Polytechnic Institute – 2005<br>BS – USMA - 1996                                                                   | 688-5661    | Paul.Evangelista@usma.edu |
| MAJ Gregory Griffin      | MS – University of Virginia – 2005<br>BS – USMA – 1994                                                                             | 688-3573    | Gregory.Griffin@usma.edu  |
| MAJ Robert Keeter        | MS – University of Virginia – 2003<br>BS – USMA - 1993                                                                             | 688-4857    | Robb.Keeter@usma.edu      |
| LTC Brigitte Kwinn       | MS – University of Arizona – 1994<br>BS – USMA – 1984                                                                              | 688-6493    | Brigitte.Kwinn@usma.edu   |
| MAJ Robert Lenz          | MS – Ohio State University – 2003<br>BS – USMA – 1993                                                                              | 688-4756    | Robert.Lenze@usma.edu     |
| MAJ Travis (TJ) Lindberg | MS – University of Arizona – 2004<br>BS – USMA – 1995                                                                              | 688-4311    | Travis.Lindberg@usma.edu  |
| MAJ Howard McInvale      | MS – Virginia Tech – 2002<br>BS – USMA – 1993                                                                                      | 688-5168    | Howard.McInvale@usma.edu  |
| MAJ Grant Martin         | MS – Georgia Institute of Technology – 2003<br>BS – USMA – 1994                                                                    | 688-5663    | Grant.Martin@usma.edu     |
| LTC(P) Kent Miller       | MS – Georgia Tech – 1994<br>BS – USMA – 1984                                                                                       | 688-5578    | Kent.Miller@usma.edu      |
| MAJ Thomas Rippert       | MS – University of Texas (Austin) – 2003<br>BS – USMA – 1993                                                                       | 688-2510    | Thomas.Rippert@usma.edu   |
| LTC Rodney Roederer      | MS – Colorado School of Mines - 1996<br>BS – USMA – 1987                                                                           | 688-4753    | Rodney.Roederer@usma.edu  |
| MAJ Travis Thompson      | MS – Columbia University – 2004<br>BS – USMA – 1994                                                                                | 688-4792    | Travis.Thompson@usma.edu  |
| MAJ Jason Wolter         | MEM – Northwestern University – 2004<br>BS – USMA – 1994                                                                           | 688-4888    | Jason.Wolter@usma.edu     |
| MAJ Ernie Wong           | MS – Stanford University – 2004<br>MA – Stanford University – 2004<br>BS – USMA – 1994                                             | 688-4756    | Ernest.Wong@usma.edu      |

## PART IV – THE DEPARTMENT RESEARCH CYCLE

Regardless of the research thrust, the research source or the client, each research proposal must be approved through the DSE Research Council and the Department Head. The ORCEN Director, in the role of the Department Research Coordinator, collects potential project proposals from Senior Investigators and brings the research opportunity to the Department Research Council which is headed by the DSE Department Head. This development of research opportunities is normally conducted in the summer, when the academic workload wanes for the Department's senior investigators.

At the beginning of the academic year in August, the ORCEN the research council convenes to review each research proposal for support and for the identification of required resources. The ultimate authority for approving the allocation of resources (which includes funding, lab time and analyst time) is the Head, Department of Systems Engineering. Once approved, the researchers can execute the research plan.

The Research Cycle for an Academic Year for the Department of Systems Engineering is illustrated in Figure 1. This is a depiction of the objective annual research cycle, which involves several processes in executing the research plan. Among them is the development of research opportunities, the approval timelines and the completion times for each project. Research opportunities can be developed during the academic year, or off-cycle. These projects are tentatively approved through the Department Research Coordinator and the Department Head. They will ultimately be required to be approved by the Research Council in its January, mid-year meeting.

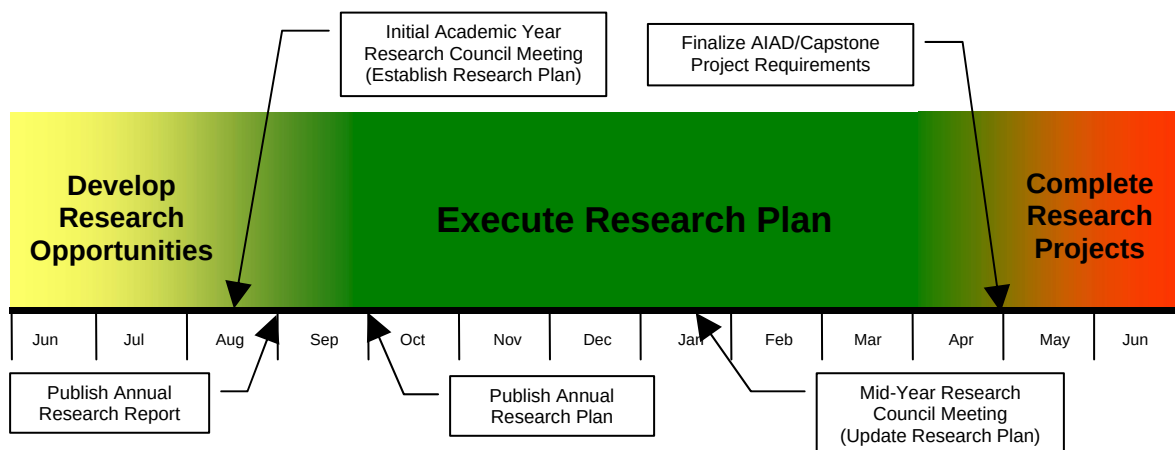


**Figure 1: DSE/ORCEN Annual Research Cycle**

As can be assumed based on the cycle above and the research approval process described above, the Department and the Operations Research Center does not solicit nor conduct many “short turnaround” research projects though there are some that they conduct. The reason for this goes back to the initial objectives of the Department's research program, which is to support the development of the junior analysts. In the ORCEN, the analysts rotate each year in the June timeframe. To ensure their time is used efficiently and they develop as a researcher, most projects are year-long works.

## PART V – Principal Faculty Research Activities – Academic Year 2006

### Effects Based Assessment Support System (EBASS)

**DSE Project No: DSE-R-0539**

**Client Organization:** Joint Forces Command (JFCOM)

**Principal Analyst(s):** MAJ Thomas O. Morel, M.S.  
**Contributing Analyst(s):** MAJ Ernest Y. Wong, M.S., M.A.

LTC Simon R. Goerger, Ph.D.

**Senior Investigator(s):** LTC Colonel Michael J. Kwinn, Jr., Ph.D.  
LTC Colonel Ronald C. Dodge, Jr., Ph.D.

#### Points of Contact:

| NAME            | ADDRESS                                                                                          | PHONE        | OTHER                    |
|-----------------|--------------------------------------------------------------------------------------------------|--------------|--------------------------|
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#### Problem Description:

Just as most businesses rely exclusively on metrics to assess their productivity and chart future actions to achieve their goals, we should require nothing less from our military and government. In application however, finding the right metrics and leveraging them to help make better decisions tend to be more easily said than done.

The difficulty arises from the consideration of multiple factors including the dispersion of forces, a more complete understanding of enemy intentions and capabilities, the complexities associated with military and political goals and objectives, and, we believe, a clear and robust methodology to support such an assessment to ensure the organization is obtaining the desired effects.

#### Proposed Work:

We submit a methodology based on sound operations research theory and an application to improve the military and government's capabilities to link metrics to the objectives they are trying to achieve. This methodology found its genesis in Afghanistan, was developed in laboratory environments and tested in Iraq and other Operational and Strategic headquarters throughout the world. Though this application and methodology is still maturing, it is doing so under fire and is becoming a force in the assessment community. Our application and methodology, now known as the Effects Based Assessment Support System (EBASS), has been jointly developed by the Operations Research Center of Excellence (ORCEN) and the Information and Technology Operations Center (ITOC), both at the United States Military Academy at West Point.

## **Results Summary:**

The Effects Based Assessment Support System (EBASS) is a distributed operational assessment tool based on the principles of Value Focused Thinking (VFT) developed jointly by the Operations Research Center of Excellence (ORCEN) and the Information Technology and Operations Center (ITOC) at the US Military Academy. Its genesis is work done in support of the military command in Afghanistan in 2002. Effects based assessment is utilized to determine the progress of organization to influence behaviors or the environment to achieve a specific end state. In order to facilitate this, decision makers need a data collection and information visualization tool flexible enough to utilize measures most appropriate for the domain, which 1) provides a qualitative value model which can account for the decision makers' most important evaluation considerations & measures, and 2) provides quantitative scoring functions and weights to evaluate alternatives.

## **Requirements and Milestones:**

- Onsite support for testing
- Attendance at working sessions and coordination sessions as coordinated.
- Quarterly Interim Progress Report(s) for all work conducted solely by ITOC and ORCEN researchers.
- Full source code tree (with all rights for reuse and modification) including documentation (with annual report or as requested).
- End of year report detailing work performed for FY 05 NLT 31 August 2005.

## **Project Deliverables and Due Date:**

- Final Briefing (May 2006) **Complete**
- Technical Report (June 2006) **Complete**

## **Presentations and Publications:**

### **In-Progress Reviews and Final Briefing**

Michael Kwinn, Simon R. Goerger, Greg Boylan, and Tom Morel (2005). "Effects Based Assessment Support System (EBASS) Implementation," Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Morel, Thomas O., Wong, Ernest Y., Kwinn, Jr., Michael J., Dodge, Jr., Ronald C., and Goerger, Simon R., "Effects Based Assessment Support System (EBASS)", Operations Research Center of Excellence, Technical Report DSE-TR-0539, DTIC # ADA448132, May 2006.

Simon R. Goerger. "Effects Based Assessment Support System (EBASS)," Presentation, 9<sup>th</sup> US/German Operations Research Symposium, Aberdeen Proving Grounds, MD, 05-07 October 2005.

Simon. R. Goerger. "EBASS: Effects Based Methodologies", Presentation to J5-IMPC-EM, Pentagon, Alexandria, VA, 03-05 August 2005.

**Personnel Briefed:**

- a. 03-04 August 2005:
  - i) OL Walker, J5-IPMC-ME
  - ii) Dr Linton Wells, Acting ASD (NII) and Networks and Information Integration (NII)
  - iii) Mr Callier, C2 Programs NII
  - iv) Capt Brian Fila (US Navy), Director of Contingency Support and Migration Planning for NII
- b. 06 August 2005:
  - i) LTG Sharp, J5
  - ii) Col Spacy (US Air Force), (J5 – Metrics Development Team)
  - iii) COL Spencer, Joint Staff
- c. 06 January 2006
  - i) Ambassador (Ret) Robert W. “Bill” Farrand and Dr David Davis (GMU)
  - ii) Mr Bradford R. Higgins, Assistant Secretary for Resource Management, Chief Financial Officer, State Department
  - iii) Dr Terry Kelly (DSE Board of Advisors)
- d. 07 April 2006:
  - i) Capt Myers (US Navy), JFCOM
  - ii) COL Campbell, J5-IPMC-ME
  - iii) COL Gass, J5 – Effects Cell
- e. 02 August 2006:

**Status: *Complete*** – 10 June 2006.

## Army Digital Terrain Catalog (ADTC) Phase II: Implementation and Host Location(s)

**DSE Project No: DSE-R-0602**

**Client Organization:** Battle Command and Simulation Experimentation Directorate

**Principal Analyst(s):** MAJ Ernest Y. Wong, M.S., M.A.  
MAJ Robert R. Keeter, M.S.

**Senior Investigator(s):** Niki C. Goerger, Ph.D.  
LTC Simon R. Goerger, Ph.D.

### Points of Contact:

| NAME                    | ADDRESS                                                                           | PHONE        | OTHER                             |
|-------------------------|-----------------------------------------------------------------------------------|--------------|-----------------------------------|
| LTC Scott Schutzmeister | Battle Command, Simulation & Experimentation Office (DAMO-SB)<br>Fort Belvoir, VA | 703-604-0227 | Scott.schutzmeister@hqda.army.mil |

### Problem Description:

Terrain database generation is cost and time prohibitive. This is exacerbated by the difficulty in identifying and accessing existing terrain databases with potential for reuse. For users to assess the availability and suitability of existing terrain databases for their intended use, it is imperative that sufficient information describing the content and quality be available for review. In FY05, a phase I study produced initial concepts for ADTL structure and management along with a starter set of terrain databases. The next steps toward solution to this problem involve revisiting the client's initial problem statement of amassing a comprehensive listing of major Army terrain databases, developing a virtual library interface prototype to help provide better access and exploitation of those databases, and recommending a database host-architecture that facilitates long-term reuse of available data.

### Objective:

The objectives of this study are to (a) identify major Army terrain databases that are not yet incorporated into ADTL and continuing populating ADTL with those databases, (b) designing a prototype for the virtual library interface that enhances access and exploitation of existing databases, and (c) recommending an easily maintainable host-architecture that gives users the resources to effortlessly exploit existing data. To do so effectively, we will conduct cross-walk with Army organizations to synchronize, integrate and avoid redundant efforts where possible with regards to populating and maintaining an ADTL. The scope of the work will include terrain databases based on a select group of platforms as identified with the client. Modeling and simulation systems will include but are not necessarily limited to OneSAF Testbed Baseline, OneSAF Objective System, and Joint Semi-Automated Forces.

### Proposed Work:

For this research, we will first revisit the client's initial problem statement and develop a comprehensive listing of available Army terrain databases that are readily available for reuse. Although it may be infeasible to acquire a completely exhaustive list of all existing databases, we intend to amass those primarily from the client's

recommendations. Not only will this effort help us identify where database resources lie, it will also help us determine where there may be redundancy and/or gaps in coverage.

We will employ the Systems Engineering Management Process (SEMP) to develop a working prototype for the web-based interface between the ADTL virtual library and database developers and users. The SEMP is a robust, deliberate problem solving methodology taught in the Department of Systems Engineering at the United States Military Academy. It has been used widely in a variety of applications, both on military and commercial problems. The SEMP has recently been employed in development of an operational assessment system for Operation Enduring Freedom, in support of the Base Realignment and Closure (BRAC) study group, and to analyze the regional structure of the Army Installation Management Agency. For synchronization and integration and avoiding redundancy, a cross-walk with ongoing/other efforts will be performed to determine mappings, subsets, and intersections among data models to maximize ADTL's ability to ingest data from these other repositories.

The first step to address objectives a, b, and c is assessing our current inventory and management of terrain databases. We will leverage our efforts in this area with other/ongoing related efforts such as RDECOM's Synthetic Virtual Database Repository (SVDR), ERDC's terrain cataloging efforts, the Master Environmental Library, etc. A concurrent step will be to collect information from key stakeholders for their needs. We plan to do this in a group setting. This step is followed by a functional analysis and value hierarchy design. These efforts, taken together will result in a better definition and more accurate scope of the problem. Capturing those insights will also be critical in linking this project to the initiatives spelled out by the Army Geospatial Data Integrated Master Plan (AGDIMP), as well as in anticipating future requirements. This step will be crucial in the design for the virtual library web-based interface prototype that truly does provide better access and permits exploitation of existing databases.

After collecting the information, the USMA ORCEN team will establish the procedure for the relative ranking of options for ADTL database host management—the procedures and data architecture that will be in place to account for security, incorporation of new data, updated points of contact, improvements based off of user feedback, etc. Based on this knowledge, the team will generate different alternatives for managing these databases. Each of those alternatives can be considered with respect to its contribution or connection to the AGDIMP, as well as to future systems. Finally, the team will make a recommendation the database host-architecture that facilitates long-term reuse of available data by the M&S community.

The Army is transforming to anticipate future threats. Part of that transformation involves implementing a battle command system that is network-centric and compatible/interoperable with modeling and simulation. In order to efficiently achieve that, it is necessary to create a framework for managing and organizing our terrain databases. This research will provide an enhanced baseline catalogue and recommendations for its storage location and managers.

### **Tasks and Issues:**

Tasks to be performed and issues to address:

- Define Problem – Database Cataloguing

- Scope problem with client in terms of databases already catalogued, obvious gaps that need to be included in the virtual library, and identification of available resources to help fill those gaps.
  - Identify stakeholders and conduct needs analysis to capture ideas and issues for inclusion into the web-based interface design for easy access and retrieval into the ADTL/metadatabase and to use in data call for the continued cataloging of existing terrain databases.
- Conduct Design and Analysis of Alternatives with Stakeholders – ADTL Web-based Interface Design
  - Host stakeholder analysis and functional decomposition session(s) with focus and brainstorming questions
  - Revalidate Phase I metadata recommendations. Identify elements of terrain databases interfaces which sufficiently describe the content or make them unique. This is accomplished by conducting limited addition of terrain databases and performing searches for purpose of assessing sufficiency of metadata.
  - Develop several alternatives for data to include in a management and location assessment framework
  - Frame alternatives, based on stakeholder priorities, for presentation to those stakeholders and BCSE
- Recommend and Select Alternatives
  - Prioritize alternatives/elements, based on stakeholder input and a consideration of future requirements
  - Develop recommendations and present to clients and stakeholders
- Implement ADTL Framework – Develop and Test Interface Prototype
  - Develop ADTL user interface prototype
  - Conduct limited data call of terrain databases to test metadata and search engine capabilities
  - Use results of the data call populate ADTL
  - Develop ADTL Implementation Plans

### **Results Summary:**

This project resulted in the design and development of the Army Digital Terrain Catalog (ADTC) to help promote discovery, accessibility, and reuse of digital terrain databases—a key component of M&S that helps drive analysis, acquisition, and training for our Armed Forces. This research provides a framework that helps identify a suitable host and metadata manager for the ADTC so the catalog can serve as a way to help promote Army Transformation. The ADTC II is a follow-on project that builds upon the work that Major Grant Martin and Doctor Niki Goerger conducted in 2005. The catalog now consists of more than 490 unique terrain database catalog entries.

### Requirements and Milestones:

- Scope problem with client (systems on which to focus) **Complete** 14 Sep 2005
- Meet key stakeholders at Simulation Interoperability Workshop to help reduce redundant efforts **Complete** 22 Sep 2005
- Develop focus and brainstorming questions of needs analysis **Complete** 28 Sep 2005
- Conduct needs analysis with stakeholders to determine desired capabilities **Complete** 28 Sep 2005
- Conduct needs analysis with stakeholders (group sessions) **Complete** 28 Oct 2005

### Project Deliverables and Due Date:

- Interim IPR: **Complete** 13 Jan 2006
- Final Briefing: **Complete** 28 Feb 2006
- Technical Report: 28 Mar 2006  
**to be completed 15 October 2006**

### Presentations and Publications:

Wong, Ernest Y., Keeter, Robert R., Goerger, Niki C., and Goerger, Simon R. *The Army Digital Terrain Catalog II (ADTC)*, Operations Research Center of Excellence, Technical Report DSE-TR-0602, October 2006.

### Personnel Briefed:

- COL George Stone, Director, BCSE (DAMO-SB)
- LTC Scott Schutzmeister, BCSE (DAMO-SB)

**Status:** Tech Report to be Completed NLT 15 October 2006

## Army M&S Installation Facilities Layout

**DSE Project No: DSE-R-0603**

**Client Organization:** Director, Battle Command, Simulation, and Experimentation  
Directorate (HQDA G-3, DAMO-SB)

**Principal Analyst(s):** MAJ Gregory L. Boylan, MSIE  
**Senior Investigator(s):** LTC Simon R. Goerger, Ph.D.

### Points of Contact:

| NAME             | ADDRESS                                                               | PHONE | OTHER                    |
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| LTC Favio Lopez  | Battle Command, Simulation, & Experimentation Directorate             |       | Favio.lopez@us.army.mil  |
| COL George Stone | Director, Battle Command, Simulation, and Experimentation Directorate |       | George.stone@us.army.mil |

### Problem Description:

The Army requires a standardized design template for the development of future Battle Command Training Centers (BCTC) that provides adequate capabilities to train the force and achieve the Army Digital Training Strategy (ADTS), the Combined Arms Training Strategy (CATS), and the recently developed Army Force Generation (ARFORGEN) model. These facilities must be robust enough to accommodate the full spectrum of training across all echelons of the force. This includes day-to-day individual level training on the growing numbers of digital command, control, communications, computers, and intelligence (C4I) systems all the way up through Corps and Joint-level Warfighter Exercises (WFX) that integrate live training with large scale constructive simulations and require interoperability between multiple facilities across multiple continents.

To this point, BCTCs have been developed and designed independently of each other and tailored to the needs of specific unit types that were designated as “digitized units”. For a few installations, this has resulted in new facilities intended for use by one or two digitized brigades, typically Stryker Brigades. However, within the last five years, the Army has decided to digitize the entire force, indicating that facilities originally designed to support one or two Stryker Brigades would now need to support all digital force components on installations.

In conjunction with the BCTC Working Group and Design Board with which we worked, we believe that the Army requires a solid needs-based analysis coupled with a rigorous Operations Research (OR) approach that will 1) identify the precise functional requirements necessary to achieve live, virtual, and constructive training objectives and 2) validate those requirements and the metrics used to develop them. From there, we can develop and design facilities that possess the requisite core training capability to meet those requirements and achieve the Army’s training strategies and goals. In this report, we discuss our approach, beginning with a description of the problem background and the methodology we used. We will discuss some of the work of the BCTC Working Group relative to the metrics and functional requirements developed for the standardized design template, as well as the preliminary, or base case design templates that resulted. We will then delineate our findings and results in detail, focusing on our simulation-based

approach to assessing the adequacy of the training capability provided by the base cases and recommending modifications to them. Finally, we will conclude with our recommendation to the BCTC Working Group and the BCSE for creating standardized templates that will meet the Army's needs.

### **Proposed Work:**

The primary endeavor in this project is the development of a simulation-based approach to provide the Army with a means to validate BCTC facility requirements and capabilities. This includes a thorough data collection effort to ascertain current and future training requirements and methodologies, and the development of a complex simulation model that determines the training capability necessary to achieve annual training event throughput.

This research is somewhat exploratory in nature and, therefore, may lead to results not expressed within this proposal.

Products generated by this research include a research proposal; necessary presentations communicating data, modeling and simulation development, and applicable analytical methods; a draft report presentation; a final report presentation; a technical report; and all applicable and developed simulation models.

### **Results Summary:**

We utilized the Systems Engineering and Management Process (SEMP) taught in the Department of Systems Engineering at West Point as the overarching approach to addressing the Army's problem. Specifically, we applied the first three phases of the SEMP 1) to thoroughly and completely define the problem through an in-depth needs analysis and functional decomposition of the system, which would facilitate the development of base-case designs; 2) to develop a simulation-based approach to modeling the base-case designs in order to assess the adequacy of the training capabilities they possessed and then evaluate alternative configurations; and then 3) to provide recommended templates to the Army that possess the requisite capabilities to achieve annual training objectives.

The core of our efforts revolved around the central question concerning the adequacy of the training capabilities inherent in the base-case designs. As this paper will show, the results clearly indicate that the capabilities are indeed adequate to achieve annual training throughput objectives as they pertain to the Army's Digital Training Strategy, the Combined Arms Training Strategy, and the Army Force Generation Model. Although the base-case designs appear to be excessive relative to the results of our modeling and analysis process, we recommend them nevertheless for several reasons that stem from the flexibility they provide.

In the end, our efforts generated an analytical tool that the Army can use to assist in the design and development of training facilities to ensure they possess the capabilities required of them, as well as a simulation tool that can identify the potential impacts on training as a result of changes that run the gamut from space and staff levels to changes in training requirements to the unit composition on a particular installation. Our client, COL Stone at BCSE, and the HQDA Deputy G-3 (Mr. Jim Cooke) concurred with our modeling approach and with the utility of the model, resulting in a proposal for further work to refine the model by adding details in preparation for Army-wide employment.

**Requirements and Milestones:**

- Conduct literature search, data collection, and requirements development with BCTC Working Group (Winter 05-06) **Complete**
- Construct simulation and verify model (March 06) **Complete**
- Conduct optimization runs to determine training capability for all three BCTC sizes (April 06) **Complete**
- Write-up technical report and obtain model approval (April/May 06) **Complete**

**Project Deliverables and Due Date:**

- Complete Simulation Model (April 06) **Complete**
- Technical Report (June 06) **Complete**

**Presentations and Publications:**

Boylan, Gregory L., "A Simulation-Based Methodology for Developing a Standardized Design Template for Future Battle Command Training Centers", Operations Research Center of Excellence, Technical Report DSE-TR-0603, DTIC # ADA448072, June 2006.

Boylan, Gregory L., Presentation: Simulation-Based Assessment of BCTC Capabilities, In-Progress Reviews to COL Stone, Director BCSE, Feb/Apr 2006.

Boylan, Gregory L., Presentation: Simulation-Based Assessment of BCTC Capabilities, Final Results, Mr. Cooke, HQDA G-3, and COL Stone, Director BCSE, Apr 2006.

Boylan, G. and S. Goerger, IIE PRESENTATION, 2006 Annual IIE Conference, Orlando, FL, May 2006

Goerger, S. and G. Boylan, MORSS PRESENTATION, 74<sup>th</sup> MORS Symposium, USAFA, Colorado Springs, CO, June 2006.

Boylan, G. and S. Goerger, SIW PAPER & PRESENTATION

Boylan, G. and S. Goerger, US/CA Symposium PRESENTATION, Halifax, Nova Scotia, September 2006.

**Personnel Briefed:**

- COL George Stone, Director, BCSE (DAMO-SB)
- Mr. Jim Cooke, Deputy G-3, HQDA G-3/5/7

**Status:** **Complete** – 1 June 2006.

# High Energy Laser Weapons: Modeling & Simulation

**DSE Project No: DSE-R-0605**

## Client Organization:

**Principal Analyst(s):** Roger C. Burk, Ph.D.  
**Senior Investigator(s):** Roger C. Burk, Ph.D.

## Points of Contact:

| NAME                                   | ADDRESS                                                                                                                        | PHONE                      | OTHER                |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------|
| Ed Pogue                               | HEL Joint Technology Office<br>901 University Boulevard SE, Suite 100<br>Albuquerque, NM 87106                                 | (505) 248-8200             | Ed.pogue@osd.mil     |
| Glen P. Perram<br>Professor of Physics | Department of Engineering Physics<br>Air Force Institute of Technology<br>2950 P Street<br>Wright-Patterson AFB, OH 45433-7765 | (937) 255-3636<br>ext 4504 | glen.perram@afit.edu |

## Problem Description:

The HEL JTO is coordinating the services' efforts to develop high-energy laser weapons. As part of this effort, the JTO recognized the need for end-to-end modeling of such weapons. Physics-based models exist for laser generation, beam formation and control, atmospheric propagation, and target interaction, but the JTO has no available model for a complete laser weapon shot ("photon birth to death"). Higher-level models of a military engagement, the execution of a military mission, or they carrying out of a campaign involving HEL weapons are also unavailable. It is clear that low-level, very detailed, physics-based models need to be linked in some way to higher-level engagement, mission, and campaign models, but it is unclear how this linkage should be worked.

To fill this gap, the HEL JTO asked the two service graduate schools of engineering (AFIT and NPS) and the three service academies (USMA, USNA, and USAFA) to form a consortium to research what modeling is required and to develop a model or family of models to meet the JTO's needs. AFIT agreed to lead this effort and the other institutions agreed to participate in ways appropriate to their capabilities and areas of responsibility.

The objectives of the effort are: (1) to develop a tri-service research team to integrate DoD fundamental research in end-to-end HEL modeling; and (2) to develop a government-owned, DoD-accepted global interface, which integrates existing and future HEL models. The initial focus must achieve a balance between (1) on-going, high-fidelity technical analyses, (2) engineering trade studies, which allow analyses of a wide range of systems, not simply a deep analysis of any one selected system, and (3) analyses of HEL systems' military utility against a broad range of missions.

The lion's share of the effort will be with AFIT, as the institution with by far the greatest expertise and experience with high energy lasers. The participation of USMA will primarily in evaluating how HELs are or should be modeled in ground warfare and air and missile defense scenarios, and in helping develop linkages from physics-based models to higher-level engagement, mission, and campaign models.

## Proposed Work:

We have received and loaded a copy of Version 1.3 (May 05) of the High Energy Laser End-to-End Operational Simulation (HELEEOS), an AFIT-developed, stand-alone

executable, scaling law simulation that includes platform constraints and lethality and assesses both statistical and systematic uncertainties. We propose to explore the utility of this simulator for tactical-level end-to-end studies but attempting to use it to determine how large an area could be defended from rocket, artillery, and mortar attacks by the Army's Tactical High Energy Laser (THEL).

**Results Summary:**

- TBD

**Requirements and Milestones:**

- TBD

**Project Deliverables and Due Date:**

- TBD

**Presentations and Publications:**

- TBD

**Personnel Briefed:**

- TBD

**Status:**

- TBD

# CENTCOM Casualty Data Analysis

**DSE Project No: DSE-R-0606**

## Client Organization:

**Principal Analyst(s):** Paul West, Ph.D.  
**Senior Investigator(s):** Paul West, Ph.D.

## Points of Contact:

| NAME              | ADDRESS                                             | PHONE                          | OTHER                                 |
|-------------------|-----------------------------------------------------|--------------------------------|---------------------------------------|
| Mr. Charlie Tamez | US Army PEO Soldier<br>Systems Integration Division | (703) 704-4073<br>DSN 654-4073 | Charlie.tamez@peosoldier.army.<br>mil |

## Problem Description:

Soldier-level ballistic protection is problematic for the full spectrum of Army operations. The client organization is seeking insights for developmental standards and specifications for individual ballistic protection design, based on analysis of various forms of direct and indirect fire threats soldiers encountered on recent deployments.

## Proposed Work:

The Department of Systems Engineering will identify capabilities essential for a soldier ballistic protection system based on recent operational data. Specifically, DSE will:

- Conduct interviews, collect data, and perform analysis of the various forms of current direct and indirect fire threats.
- Identify threat munitions, frequency of hit, successful and unsuccessful counter measures, and other relevant survivability factors.
- Identify human factors that contribute to the degree of successful protection.

## Results Summary:

- TBD

## Requirements and Milestones:

- TBD

## Project Deliverables and Due Date:

- Interim IPRs: December, 2005; March, 2006
- Final Briefing: June 2006
- Technical Report: July 2006

## Presentations and Publications:

- TBD

## Personnel Briefed:

- TBD

## Status:

- TBD

## PEO Soldier Simulation Roadmap: Continued Efforts in Implementation

**DSE Project No: DSE-R-0610**

**Client Organization:** Program Executive Office (PEO) Soldier

**Principal Analyst(s):** MAJ Gregory L. Boylan, MSIE

**Senior Investigator(s):** LTC Simon R. Goerger, Ph.D.

### Points of Contact:

| NAME             | ADDRESS                                           | PHONE | OTHER                    |
|------------------|---------------------------------------------------|-------|--------------------------|
| Mr. Steve Kishok | PEO Soldier<br>Fort Belvoir, VA                   |       | Steve.kishok@us.army.mil |
| Mr. Ross Guckert | Director, Systems Integration<br>Fort Belvoir, VA |       | ross.guckert@us.army.mil |

### Problem Description:

The Army acquisition community requires high-resolution simulations that represent the dismounted infantry soldier in enough detail to conduct an analysis of alternatives (AOA) for individual weapons and equipment. These models must also be capable of assessing future, proposed capabilities and technologies. Previous work completed in May 2004 proposed the creation of a federation between three different simulation models to achieve this capability. Over the past two years, the Operations Research Center at the United States Military Academy has worked with PEO Soldier to implement this proposed solution. This project represents the second year of the implementation process.

### Proposed Work:

We first will describe the process of refining the requirements developed in the first year of implementation into a more useable set of analytical focus-areas for the three combat model developers. We will then address the critical topic of linking the three models. Finally, we will detail the procedure we used to capture the analytical needs and linkage elements into a comprehensive, flexible, and long-term Memorandum of Agreement between PEO Soldier and the proponents for the three combat models. We will conclude with a discussion the current state of the implementation process as we close out the second year and the road ahead for continued implementation efforts.

### Results Summary:

As of 31 May 2006, the annexes to the base MOA have been signed and are with PEO Soldier, awaiting the base MOA, which is in the signing process. Ultimately, this process took far longer than originally anticipated, due to unforeseen administrative delays and fiscal constraints beyond PEO Soldier's control. As it stands, although the Working Group's initial estimates for funding FY06 objectives exceeded \$1.2 million, budget reductions and unexpected shifts in priorities reduced the actual allocation to \$1.0 million, approximately 80% of the original request. Accordingly, we have elected to partition the \$1.0 million by funding the model developers at 80% of their original estimates. Using the matrices mentioned in, Technical Report DSE-TR-0610, Section

2.26, we worked with the members of the M&S Working Group to delineate precisely what each proponent would strive to perform and the period of performance.

As of 9 June 2006, all three model groups have received funding from PEO Soldier, and they have begun their work in earnest. Although the release of funds occurred late in the fiscal year (May 2006), the work will still span a 12-month period ending in June 2007. This date is tied to the release of OOS Version 1.2.

**Requirements and Milestones:**

- Develop and implement a meeting schedule for the M&S Coordination Working Group (Sep 05) **Complete**
- Develop analytical areas of endeavor and hard/soft linkage elements (Oct 05) **Complete**
- Finalize Base MOA and annexes (Dec 05) **Complete**
- Conduct/facilitate M&S Coordination Working Group meetings for Oct/Dec/Jan/Mar/May (Oct 05 – May 06) **Complete**
- Coordinate circulation and signing of Base MOA and annexes (Spring 06) **Complete**
- Write-up technical report (Jun 06) **Complete**

**Project Deliverables and Due Date:**

- Complete Simulation Model (April 06) **Complete**
- Technical Report (June 06) **Complete**

**Presentations and Publications:**

Boylan, Gregory L., “PEO Soldier Simulation Roadmap: Continued Efforts in Implementation”, Operations Research Center of Excellence, Technical Report DSE-TR-0610, DTIC # ADA448072, June 2006.

- This portion of PEO Soldier Simulation Roadmap did not require any in-progress reviews or client presentations. Likewise, the nature of this phase of the multi-year endeavor did not merit presentation or publication at conferences.

**Personnel Briefed:**

- Not applicable

**Status:** **Complete** – 1 June 2006; transition to 4<sup>th</sup> year of the project (3<sup>rd</sup> year of implementation).

# Heuristic and Exact Techniques for Solving a Temperature Estimation Model

**DSE Project No: DSE-R-06-11**

**Client Organization:** USMA - Department of Systems Engineering; University of Arizona - Department of Industrial Engineering

**Principal Analyst(s):** LTC Dale Henderson, Ph.D.  
**Senior Investigator(s):** Prof. Roger Burk, Ph.D.

## Points of Contact:

| NAME                                | ADDRESS                                                                         | PHONE                    | OTHER                |
|-------------------------------------|---------------------------------------------------------------------------------|--------------------------|----------------------|
| J. Cole Smith, PhD<br>(PhD Advisor) | Associate Professor, Industrial & Systems Engineering,<br>University of Florida | (352) 392-1464, ext 2020 | cole@sie.arizona.edu |

## Problem Description: (*Dissertation Research for PhD in Systems Engineering*)

This dissertation provides several techniques for solving a class of non-convex optimization problems that arise in the thermal analysis of electronic chip packages. The topic is of interest because the performance and reliability of systems containing delicate electronic components are impacted by the thermal behavior of these systems. A modeling paradigm, called Compact Thermal Modeling (CTM) has been demonstrated to show promise for estimating thermal behavior without resorting to computationally intensive finite element models or expensive direct experimentation. The CTM is a network model which gives rise to a non-convex optimization problem. This thesis explores techniques for solving the optimization problem. We present a heuristic technique which provides reasonable quality solutions. We next present several exact approaches using a global reformulation linearization convexification technique (RLT). We then explore several approaches to improving the performance of the RLT technique. Computational results, conclusions, and recommendations for further research are also provided.

## Proposed Work:

Complete dissertation defense Fall 2005, and present research at the INFORMS annual meeting in November. Submit two papers for publication in peer reviewed journals.

## Results Summary:

Dissertation Defense (10 Oct 05) – **Complete**

Dissertation Complete/Award of Degree (11 Dec 05) **Complete**

## Requirements and Milestones:

- All milestones completed.

## Project Deliverables and Due Date:

- Dissertation Defense (Fall 05) **Complete**
- Dissertation Write-up (Fall 05) **Complete**

**Presentations and Publications:**

Henderson, Dale L. Heuristic and Exact Techniques for Solving a Temperature Estimation Model, Doctoral Dissertation, 11 Decmber 2005.

Henderson, Dale L. Heuristic and Exact Techniques for Solving a Temperature Estimation Model, INFORMS, 2005.

Smith, J.C., Henderson, D., Ortega, A., and DeVoe, J., “A Parameter Optimization Heuristic for a Temperature Estimation Model,” submitted to *Optimization in Engineering*.

Smith, J.C., Ortega, A., Gabel, C.M., Henderson, D., “Parameter Optimization for a Temperature Estimation Model,” International Electronic Packaging Technical Conference and Exhibition, Maui, HI, 2003.

**Personnel Briefed:**

- Dr. Jeff Goldberg (U of A committee member)
- Dr. Ron Askin (U of A committee member)
- Dr. Pitu Mirchandani (U of A committee member)
- Dr. Robert Indik (U of A committee member)

**Status:** *Complete*

## USMA Study of the Residential Communities Initiative (RCI) Portfolio and Asset Management (PAM)

**DSE Project No: DSE-TR-0612**

**Client Organization:** Assistant Secretary of the Army for Installations and Environment, Privatization and Partnerships, Washington, D.C.

**Principal Analyst(s):** LTC (P) Robert A. Powell, Ph.D.

**Senior Investigator(s):** Prof. Gregory Parnell, Ph.D.

**Project Team:** Prof. Patrick J. Driscoll, Ph.D.

Major Gregory Boylan

LTC Daniel Evans

CPT Thaddeus Underwood

Mrs. Margaret Moten

### Points of Contact:

| Name                | Address                                       | Phone          | Other                           |
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| Mr. Bill Armbruster | DASA for I&E, Privatization and Partnerships  | (703) 692-9890 | william.armbruster1@us.army.mil |
| Mr. Don Spigelmyer  | OASAIE-RCI Director                           | (703) 601-2603 | don.spigelmyer@us.army.mil      |
| Mr. Sandy Clark     | OASAIE-RCI PM, Portfolio and Asset Management | (703) 601-2524 | Ian.clark@hqda.army.mil         |

### Purpose:

Conduct a functional evaluation of the Residential Communities Initiative (RCI) Portfolio and Asset Management (PAM) process. Provide an independent assessment of the adequacy of the Army's PAM process / program in achieving its intended objectives.

Below lists the tasks required to be addressed in this analysis:

Task 1: To determine whether there are sufficient safeguards in all aspects and across all phases of the PAM process to prevent conflicts of interest.

- Define conflict of interest as it relates to the RCI program
- Where in the process could conflicts of interest occur (e.g., negotiating the original deal or negotiating enhancements) and what positions are potentially involved?
- Is there any evidence of individuals having a conflict of interest in the PAM process?
- What safeguards are required to prevent, identify or resolve those instances?
- What safeguards are in place to prevent, identify, or resolve those instances
- Are those safeguards sufficient? If not, how can they be improved?

Task 2: To assess whether the processes within RCI ensure the government gets the best value.

- a. Define what factors are involved in a deal for both government and partner.
  - For example, given the structure of the deals and the constraints associated with the partner's use of the former governmental assets, should the value of the housing stock, the ground lease, and the government's cash contribution have any impact on the nature of the benefits (e.g. fees for service and return on equity) that the partner receives?
  - For example, are incentives in place to motivate the partner to seek long-term energy savings versus short-term profitability?
- b. Given the factors, what constitutes best value for the government for each phase of the RCI process.
  - Prepare / Issue / Award RFQ Solicitation
  - Develop CDMP / Obtain Approvals
  - Transition to Partner Operations
  - Oversee CDMP Execution
- c. What measures should be used to determine whether the government gets the best value in each of the phases of the RCI process?
- d. What systems should be in place to ensure the government receives the best value in each of those phases?
- e. What systems are in place to ensure the government receives the best value in each of those phases?
- f. How do those systems perform relative to the established measures?
- g. What changes are required to ensure that the government gets the best value in future RCI partnerships?

Task 3: To analyze the PAM process in the context of best practices compared to Real Estate Portfolio Management in the private sector.

- a. Identify appropriate private or public sector organizations that have similar characteristics to RCI with respect to:
  - Real estate portfolio management
  - Government involvement (city, state, federal)
- b. Understand RCI compliance and auditing processes.
- c. Assess how public / private sector organizations approach Portfolio and Asset Management to achieve their stated program objectives:
  - What are the portfolio management objectives for these private or public sector organizations which correlate to RCI objectives?
  - How do they measure achieving these objectives?
  - What portfolio management systems do private or public sector organizations use to monitor performance in conjunction with the stated objectives?

- How do these organizations monitor legal compliance?
  - How do these organizations obtain and use independent third party firms to enhance the oversight process :
    - (1) Adherence to construction and renovation standards?
    - (2) Control and release of funds?
    - (3) Audits of the financial reports?
    - (4) Governmental agency reports?
  - How do these organizations separate the management duties of asset managers and portfolio managers?
  - How do these organizations separate auditing duties between their portfolio managers and external auditors?
- d. Assess the effectiveness of the Army's PAM program in meeting its stated objectives:
- What are the portfolio management objectives for PAM?
  - How does the PAM process measure achieving these objectives?
  - What portfolio management systems does the RCI program use to monitor performance in conjunction with their stated program objectives?
  - How does the PAM process monitor legal compliance?
  - How does the PAM program obtain and use independent third party firms to enhance the oversight process :
    - (1) Adherence to construction and renovation standards?
    - (2) Control and release of funds?
    - (3) Audits of the financial reports?
    - (4) Governmental agency reports on the PAM program or certain aspects of the PAM program?
  - How does the PAM process separate the management duties of asset managers and portfolio managers?
  - How does the PAM process separate auditing duties between their portfolio managers and external auditors?
- e. Compare c. and d. above to determine potential enhancements to the PAM program.

Task 4: To evaluate whether the asset or portfolio management teams are adequately trained and able to perform the functions as described in the ASA (I&E) RCI PAM Handbook.

- a. For the portfolio management team:
- What are the functions of the portfolio management team as described in ASA (I&E) RCI PAM Handbook?

- For each function, what are the areas that require training?
  - Is the training adequate for the function?
  - What additional training is required?
- b. For the asset management team:
- What are the functions of the asset management team as described in ASA (I&E) RCI PAM Handbook?
  - For each function, what are the areas that require training?
  - Is the training adequate for the function?
  - What additional training is required?
- c. What is the mechanism for the asset manager to obtain assistance from the portfolio manager in the event the former requires assistance?
- e. How effective is that mechanism? Are any changes needed to improve it?

### **Proposed Work:**

Our analysis to address the tasks presented above will be accomplished in the four phases described below. These parts will be accomplished in an order deemed appropriate to accomplish the stated purpose in the proposed timeframe.

Phase I – RCI Program Overview: We will conduct extensive background research pertaining to the tasks listed above. This research will begin with obtaining a full understanding of the RCI Program from the ASA (I&E) RCI Program Office personnel.

#### Phase II – Background Research:

##### Phase IIa – Private and Public Sector

We will begin with background research of Private and Public Sector organizations that have embarked on similar privatization initiatives to determine their approach to Portfolio and Asset Management.

##### Phase IIb – Participant Interviews

We will conduct interviews with individuals involved in the RCI PAM process and with other individuals who can provide insight into the tasks proposed above. The objectives of these interviews will be to learn more about each participant's role in the RCI PAM program with the objective of determining if the PAM process is functioning as designed. These interviews will be conducted with asset level personnel, the partners in the program, the third party participants in the oversight process and the financial institutions that are loaning the money to the projects.

Phase III - Preliminary Findings and Recommendations: We will consolidate our information gained from Phases I through II into a list of findings and recommendations about the RCI PAM program. These findings and recommendations will be developed throughout the process and will be presented to the ASA (I&E) RCI Program Office through periodic updates in the form of Interim Progress Reports.

Phase IV - Present Final Brief and Report: Based on our findings, we will present our final report including our recommendations for future actions to be taken directly to the DASA (I&E).

**Requirements and Milestones:**

Phase I - May 31<sup>st</sup> to June 15<sup>th</sup> (*Completed Jun '05*)

Phase II – June 16<sup>th</sup> to July 31<sup>st</sup> (*Completed Aug '05*)

Phase III – August 1<sup>st</sup> to September 30<sup>th</sup> (*Completed Nov '05*)

Phase IV – October 1<sup>st</sup> to October 30<sup>th</sup> (*Completed Feb '06*)

**Project Deliverables and Due Date:**

Initial Project briefing: 20 June 2005

Interim IPRs: July 22<sup>nd</sup>, August 31<sup>st</sup>, September 30<sup>th</sup> and October 30<sup>th</sup>. IPR's to cover progress to date, summary of findings to date, upcoming activities including interviews, discussion topics and objectives.

Final briefing and presentation of final report NLT 31 October 2005

**Results Summary:**

The RCI PAM program is an innovative Army privatization program that is properly structured to yield substantial benefits for both the Army and the Partners. The RCI PAM program enables Partners to leverage Army and Partner investments and apply commercial portfolio management and real estate development best practices to deliver best value to Army stakeholders. The Partners receive a fair and reasonable profit for providing quality residential communities with dramatically improved service and maintenance support for Army soldiers and their families unattainable under traditional MILCON programs.

The RCI PAM process is an integrated system of oversight and management whose strongly top-driven approach has insured success to date. A singularly critical component of this approach is the portfolio level's constant effort to facilitate a free flow of timely and accurate information between portfolio level and installation level agencies and across the span of installation projects.

The RCI PAM process is not without its challenges. The dynamically evolving nature of the environment within which the RCI PAM program resides (e.g., BRAC, force transformation, recruiting challenges, federal employee turnover, OPTEMPO, unit deployment, market responses by off-post commercial housing, etc.) dictates that the RCI PAM program must continue to adapt in concert with this environment while maintaining the fundamental delineation of roles and responsibilities that permit productive leveraging of both government and Partner core competencies. Defining, developing, and sustaining the proper level of technical and management skills for government personnel involved in RCI real estate development oversight activities should continue to be one of the top priorities of the program. Identifying the proper government – Partner relationships that should exist for the long term health of the projects and addressing these in comparison to the traditional contractor – government culture that has provided significant safety against contra-productive activities by the unscrupulous should continue to be a high priority of the program as well.

In order for the RCI PAM program to continue to provide best value, actions should be taken to sustain and strengthen those activities that have been identified as critical drivers of success for the program: centralized management, incentivized Partner performance,

tailored CDMP structuring, exploiting commercial best practices, focused use of contractual support to government teams, training and education of PAM team members; to adjust those dimensions of the RCI PAM process that appear to offer opportunities for enhancement: professional development of PAM team members, education of SJA in real estate law, creative rent concessions, tailored conflict of interest guidelines, alternative financial performance summary charting; and to reduce any identified risks to continued success over the 50-year planning horizon of the program.

The RCI program is a unique venture and is establishing a new standard of best practice in community development both in the Government and civilian sectors. It is an outstanding program that is achieving its' objective of providing quality homes to soldiers and their families. To maintain the value of the program, continual oversight should be given to ensuring value is maintained and increased across several domains. The leadership of this highly visible program should be commended on their valuable accomplishments in such a short time. Their continued attention and support is needed to respond to the evolving demands of the program and to ensure the program continues to deliver value to the Army and its most precious commodity – soldiers and their families.

The success that the RCI PAM program enjoys is due in a very large part to the centralized and talented government management oversight that is currently in-place. Under this structure, program managers have maximized the flow of knowledge between all government elements, thereby facilitating informed decision-making at all contact points in the system with the numerous civilian partner agencies. The cross-functional continuity afforded by this organizational structure goes a long way towards guaranteeing that the government will achieve best value amidst continued program evolution, changes in participating civilian companies, decentralized incentive fee review and CDMP re-negotiations. Significant changes to this management structure should only be undertaken, if at all, after a careful and cautious examination of their impact on the host of core success elements illuminated in this study.

**Personnel Briefed:**

- Mr. Keith Eastin, ASAIE
- Mr. Geoffrey Prosch, PDASAIE
- Mr. William Armbruster, DASAIEPP
- Mr. Don Spigelmeyer, RCI Program Office
- Mr. Nelson Ford, ASAFMC
- Mrs. Rhonda Hayes, RCI Program Office
- Mr. Ian Clark, RCI Program Office
- Mr. Barry Scribner, Jones Lang LaSalle
- Mr. Tom McGarrity, Jones Lang LaSalle

**Status: *Complete***

## Condition-Based Maintenance

**DSE Project No: DSE-R-0614**

**Client Organization:** U.S. Army Aviation and Missile Command (AMCOM), Redstone Arsenal, Huntsville, AL 35898

**Principal Analyst(s):** MAJ Ernest Y. Wong, M.S., M.A.  
**Contributing Analyst(s):** MAJ Stephen E. Gauthier, M.S.  
**Senior Investigator(s):** LTC Simon R. Goerger, Ph.D.

### Points of Contact:

| NAME                                |       | ADDRESS                                                        | PHONE        | OTHER                      |
|-------------------------------------|-------|----------------------------------------------------------------|--------------|----------------------------|
| Mr. Robert Brown, AMCOM<br>G-3, CBM |       | AMCOM G-3, Redstone Arsenal, Huntsville, AL<br>35898           | 256-842-8911 | Robert.brown29@us.army.mil |
| COL Adkins<br>G-3, CBM              | AMCOM | AMCOM G-3, CBM Lead, Redstone Arsenal,<br>Huntsville, AL 35898 | 256-842-3060 |                            |

### Problem Description:

Condition-based maintenance is a new maintenance paradigm that AMCOM is currently introducing to help predict equipment failures based on real-time or near real-time assessments of equipment condition obtained from embedded sensors. The goal of CBM is to help reduce maintenance down time and improve operational readiness of the aviation fleet by repairing or replacing system components based on the actual condition of components rather than on a scheduled or time-phased basis. Currently in its incipient stages, this maintenance paradigm is already demonstrating considerable value in those aircraft already configured with CBM enabling technology. The Proof-of-Principal demonstrations that have taken place since July 2005 attest to the potential that CBM can have on the entire U.S. Army aviation fleet.

### Proposed Work:

The Operations Research Center of Excellence (ORCEN) will provide a full-time analyst and additional faculty members to provide data modeling, architecture design, and statistical and analytical research. The ORCEN will generate graduate school interest into CBM research by way of potential Master's and Ph.D. thesis proposals. Additionally, the ORCEN endeavors to involve cadets in this year's research effort. Cadet involvement is beneficial in that it exposes cadets to real Army challenges and enables them to make an impact on the future of the Army which they will serve. As future leaders, this experience also gives them an insight into Army Aviation and enables them to see how CBM will affect future aviation operations. Cadets will be offered Academic Individual Advanced Development (AIAD) opportunities to work as summer interns with CBM operations both in the field and with Westar headquarters. Analysts will conduct a thorough review of existing documentation and interviews of appropriate personnel to fully understand the current CBM mission, goals and measures of effectiveness.

## Results Summary:

While a large number of partnerships form as defensive measures in response to fierce global competition, distress over future uncertainties, and a lack of alternative methods to ensure continued survival, synergistic partnerships are characterized as being cooperative learning experiences that benefit all the parties involved. The best partnerships are those that develop into strategic alliances helping to capture and create value that would otherwise have been difficult to realize if not for the mutually shared goals and resources of the partnership. In this paper, we discuss how government, industry, and academia are able to converge upon a new maintenance paradigm aimed at benefiting our nation's military forces. In particular, representatives from all three domains are working together to determine how condition-based maintenance (CBM) can best serve U.S. Army aviation and bolster our soldiers engaged in the war against terrorism. Described as is a set of maintenance processes and capabilities aimed at improving U.S. Army aviation fleet's operational readiness and reducing soldiers' maintenance burden, CBM leverages advanced technologies to help generate enhanced diagnostics for key components on-board a select number of AH-64 Apache, UH-60 Blackhawk, and CH-47 Chinook helicopters. The near real-time assessment of data from the embedded sensors seeks to provide the U.S. Army with a more effective and efficient way to conduct maintenance based on need rather than scheduled periods, the capability to perform supply chain actions in a more proactive manner, and the ability to optimize the competing demands of warfighting and planned maintenance. In short, CBM attempts to improve the way the U.S. Army approaches maintenance, transforming it from the industrial age of the 20th Century into the information age of this new century. We believe that through the successful partnering of government, industry, and academia, we will be able to exemplify how CBM is demonstrating business transformation for the U.S. Army.

## Requirements and Milestones:

- Describe how the use of simulation can promote CBM capabilities that “optimize operational readiness through affordable, integrated, embedded diagnostics and [predictive] prognostics, automatic identification technology, and iterative technology refreshment” (DoD Instruction 5000.2).

Envisioned End-Product: A white paper that describes the viability of simulation modeling to exploit CBM benefits. Focuses on how to introduce and incorporate simulation modeling to help attain CBM goals.

Estimated Time to Complete: 23 August 2005. **Complete**

Determine the metrics that quantify success of the CBM program.

Envisioned End-Product: A paper that details both the challenges and benefits associated with each stage of the CBM process. Overall success of the program will be measured against how CBM is able to “improve maintenance agility and responsiveness, increase operational availability, and reduce life cycle total ownership costs” (DUSD(LMD) Memorandum, November 2002, CBM+). This paper and accompanying chart/matrix will eventually help to structure and outline the future direction of CBM.

Estimated Time to Complete: 27 February 2006. **Complete**

- Develop a plan for incorporating continual academic research into CBM.

Envisioned End-Product: A paper that details how AMCOM can leverage research capabilities from the academic realm into CBM. With the availability and accessibility of the newly constructed data warehouse, this paper will provide a process flow chart that depicts how AMCOM can develop a habitual relationship with academic researchers to not only use, exploit, and provide feedback into the data warehouse, but also initiate prognostic analysis that directly addresses aircraft safety, operational readiness, and reduced maintenance burdens on aircraft maintainers. MAJ Stephen Gauthier, a Naval Postgraduate Master's student, will serve as the archetype for the ORCEN to model this synergistic relationship between government and academia.

Estimated Time to Complete: 30 May 2006. **Complete**

- Initiate a study that assesses the feasibility of using simulation capabilities to augment and possibly replace current methods of failure verification for aircraft components.

Envisioned End-Product: A paper that outlines the feasibility of leveraging available data to help replace certain time-consuming and costly methods for aircraft component failure verification. Much of this paper will be based on case studies from industry and other government agencies that have demonstrated success in this regard. Not only will this paper help to generate cost-benefit analyses, it will also attempt to categorize those aircraft components that are most appropriate for simulated failure verification.

Estimated Time to Complete: 30 May 2006. **Complete**

#### **Project Deliverables and Due Date:**

- Final Briefing (Summer 2006) **Complete**
- Technical Report (Summer 2006) **Complete**

#### **Presentations and Publications:**

Wong, Ernest Y., *Presentation: In-Progress Review on the CBM Project*, Mr. Robert Brown, AMCOM G3, CBM Lead, Huntsville, Alabama, October 2005.

Wong, Ernest Y., *Presentation: Condition-Based Maintenance (CBM) for U.S. Army Aviation: A Component Selection Methodology*, 2005 Institute for Operations Research and the Management Sciences Conference, San Francisco, California, November 2005.

Wong, Ernest Y., *Presentation: Condition-Based Maintenance (CBM) for U.S. Army Aviation: How to Leverage Computer Simulation for CBM*, 2005 Winter Simulation Conference, Orlando, Florida, December 2005.

Gauthier, Stephen E., *Master's Thesis: A Nonhomogeneous Poisson Process Model and Simulation to Assist in Condition-Based Maintenance Plus Component Selection*, Naval Postgraduate School, May 2006.

Wong, Ernest Y., *Presentation: Condition-Based Maintenance—A Six-Sigma & Lean Paradigm that Enhances Combat Power for the U.S. Army*, 2006 Military

Operations Research Society Symposium, Colorado Springs, Colorado, June 2006.

Wong, Ernest Y., Presentation: Deciding on Maintenance Paradigms—A Decision Analysis Tool for Categorizing Components for Condition-Based, Schedule-Based, or Run-To-Failure Maintenance, 2006 Military Operations Research Society Symposium, Colorado Springs, Colorado, June 2006.

Wong, Ernest Y., *Condition-Based Maintenance (CBM): A Working Partnership between Government, Industry, and Academia*, Operations Research Center of Excellence, Technical Report DSE-TR-0614, June 2006.

Wong, Ernest Y., *Presentation: CBM—A Working Partnership between Government, Industry, and Academia*, COL Adkins, AMCOM G3, CBM Lead, Huntsville, Alabama, August 2006.

**Personnel Briefed:**

- Mr. Robert Brown, AMCOM G3, CBM Lead
- COL Adkins, AMCOM G3, CBM Lead

**Status:** *Complete* – 07 August 2006.

# Office of the Director of the Army Staff (ODAS) Effectiveness and Efficiency Review

**DSE Project No: DSE-R-0615**

**Client Organization:** Office of the Director of the Army Staff

**Principal Analyst(s):** MAJ Howard D McInvale, M.S.

**Senior Investigator(s):** LTC Simon R. Goerger, Ph.D., COL Darrall Henderson, Ph.D.

## Points of Contact:

| NAME             | ADDRESS                                                                                     | PHONE        | OTHER                     |
|------------------|---------------------------------------------------------------------------------------------|--------------|---------------------------|
| Ms Colleen Carey | Office of the Chief of Staff, Army<br>200 Army Pentagon, 3D548<br>Washington, DC 20310-0200 | 703-697-1341 | colleen.carey@us.army.mil |

## Problem Description:

- a. Background: BG Brooks, VDAS, and his staff have identified a few issues with the current staff action processes in the Office of the Director of the Army Staff. Some of these challenges include:
  - o While HQDA is an integrated staff, it is still stove-piped.
    - Every G Staff is self contained with little cross talk/cross walk between staffs
    - That situation/environment enables duplicative efforts particularly for many basic requirements, such as personal services
    - Further, it does not allow for easy identification of efficiencies or effectiveness opportunities
  - o As COL Henderson, USMA Department of Mathematical Sciences, continues his study on the contract management processes in the ODAS, his course(s) of action may enhance risk(s)/impact(s) and second and third order effects. For example, consolidation of requirements, may lead to fewer large contracts which may impact the ability of Small and Disadvantaged Businesses to compete fairly for those types of opportunities.
  - o The HQDA is challenged in Information Flow --- does the HQ, USAF operate their SGS function more efficiently than the Army?
  - o Training --- HQDA questions how it should prepare people to operate in the current environment.
- b. Discussion: VDAS desires a possible review of ODAS staff processes using a Lean Six Sigma training module in the curriculum. He would also like USMA to consider organizing/arranging a staff trip to the PNT as a familiarization method for those involved with this study.

**Conclusions:** VDAS request a review of the ODAS staff actions to identify possible alternatives that provide the most efficient and effective means to manage HQDA business with savings to the Army in resources (time/money/people).

**Proposed Work:**

Tasks to be performed and issues to address will be performed in two stages:

Stage 1 (S: Feb '06)

- h. Review and stratify GO3 in order to frame the issue(s); adequately define all tasks and functions.
- i. Identify key and sub processes in place to integrate, coordinate, and synchronize ODAS actions affecting the Army Staff.
- j. Define effects based metrics to assess alternatives.
- k. Determine if the ODAS is structured appropriately to support the process.
- l. Identify ways (alternatives) in which to leverage technology to perform these tasks.

Stage 2 (S: May '06):

- a. Review previous study to determine how continuity is addressed.
- b. Identify processes that are in place to insure a trained a ready staff capably of effectively integrating, coordinating, and synchronizing.
- c. Identify opportunities to better leverage all the information technology solutions currently available to efficiently and effectively perform the processes.

**Results Summary:**

The ODAS used the recommendations from this research as a bases for developing a new organizational hierarch and functional responsibilities for the modified hierarchy which stream lined operations and reduced the overall redundancy of activities.

**Requirements and Milestones:**

| Activity/Deliverable                                                                                                                        | Date          |
|---------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Initial meeting between primary analyst(s) and Ms Casey                                                                                     | o/a 26 Sep 05 |
| Review and stratify GO3 in order to frame the issue(s); adequately define all tasks and functions.                                          | 15 Oct 05     |
| Identify key and sub processes in place to integrate, coordinate, and synchronize the Army Staff.                                           | 01 Nov 05     |
| Define effects based metrics to assess alternatives.                                                                                        | 15 Nov 05     |
| Determine if the ODAS is structured appropriately to support the process.                                                                   | 15 Dec 05     |
| Identify ways (alternatives) in which to leverage technology to perform these tasks.                                                        | 1 Jan 06      |
| In-Process Review                                                                                                                           | o/a 15 Feb 06 |
| Review previous study to determine how continuity is addressed.                                                                             | 15 Mar 06     |
| Identify processes that are in place to insure a trained a ready staff capably of effectively integrating, coordinating, and synchronizing. | 15 Apr 06     |

| Activity/Deliverable                                                                                                                                         | Date          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Identify opportunities to better leverage all the information technology solutions currently available to efficiently and effectively perform the processes. | 01 May 06     |
| Final Out Brief to VDAS                                                                                                                                      | o/a 15 May 06 |
| Technical Report Complete                                                                                                                                    | o/a 15 Jun 06 |

Estimated Time to Complete: 30 May 2006. **Complete**

**Project Deliverables and Due Date:**

- a. Memoranda of Agreement / Memoranda of Understanding signed (NLT 15 Sep 05). Complete
- b. In-Progress Reviews (15 Feb '06) **Complete**
- c. Brief to VDAS, then DAS ( o/a 15 May '05) **Complete**
- d. DAS to formulate recommendations for a potential VCSA brief that will/may include:
  - Holistic changes in how we do business
  - Changes designed to not interfere or alter principals' ability to do their primary function/tasks
  - Will capitalize on efficiencies
- e. Technical Report. (o/a 15 Jun 06) **Complete**

**Presentations and Publications:**

McInvale, Howard, D., *Office of the Director of the Army Staff (ODAS) Effectiveness and Efficiency Review*, Operations Research Center of Excellence, Technical Report DSE-TR-0615, June 2006.

**Personnel Briefed:**

- Interviews were conducted with the following members of the ODAS and its clients from November 2005 – February 2006:

| Date      | Position                             | Name          |
|-----------|--------------------------------------|---------------|
| 25-Oct-05 | VDAS                                 | BG Brooks     |
| 25-Oct-05 | VDAS                                 | BG Brooks     |
| 25-Oct-05 | VDAS                                 | BG Leo Brooks |
| 20-Dec-05 | VDAS                                 | BG Leo Brooks |
| 25-Oct-05 | Management Div                       | Branch Chiefs |
| 26-Oct-05 | ECC                                  | COL Arnold    |
| 25-Oct-05 | DAS XO                               | COL Flanigan  |
| 25-Oct-05 | DAS XO                               | COL Flanigan  |
| 25-Oct-05 | EOH Staff Grp                        | COL Rocke     |
| 25-Oct-05 | OJDA                                 | COL Spinelli  |
| 29-Nov-05 | Director of the Army Staff           | LTG Campbell  |
| 19-Dec-05 | Army G-3/5/7 (also the previous DAS) | LTG Lovelace  |

| Date      | Position               | Name           |
|-----------|------------------------|----------------|
| 20-Dec-05 | Army G-8               | LTG Melcher    |
| 13-Feb-06 | DUSA                   | Mr Kelly       |
| 19-Dec-05 | Director, Mgmt Divison | Mr. Randol,    |
| 19-Dec-05 | AA for the Sec Army    | Ms. Riley      |
| 25-Oct-05 | Exec Outreach          | Ms. Stephenson |
| 26-Oct-05 | Protocol               | Ms. York       |

- MAJ McInvale and COL Henderson, assisted by Ms Colleen Carey (ODAS), conducted Interim Report Briefing to the DUSA on 13 February 2006, in the Pershing Conference Room of the Pentagon:

Mr. Kelly (DUSA), Dr. Clement, COL White, LTC Trybula, Mr. Kirby and Mr. Rezek

- MAJ McInvale and LTG Goerger, assisted by Ms Colleen Carey (ODAS), conducted the Final Report Briefing was presented to the following members of the Office of the Director of the Army Staff (ODAS) on 23 February 2006, in the Pershing Conference Room of the Pentagon:

LTG Campbell (DAS), BG Brooks (VDAS), COL Flanigan, COL Arnold, COL Rocke, Mr. Randol, Ms. Stephenson, Ms. York, COL Moak, COL Spinelli, CW4 Davis, and Joan Ruepp

**Status:** *Complete* – 08 August 2006.

# Chaplain Deployment Assignment Tool

**DSE Project No: DSE-R-0616**

**Client Organization:** Office of the Chief of Chaplains

**Principal Analyst(s):** MAJ Howard D McInvale, MS

**Senior Investigators:** COL Darrall Henderson, Ph.D.

LTC Simon R. Goerger, Ph.D.

## Points of Contact:

| NAME               | ADDRESS                                                                                          | PHONE        | OTHER                   |
|--------------------|--------------------------------------------------------------------------------------------------|--------------|-------------------------|
| LTC Eric R. Keller | Office of the Chief of Chaplains, Army<br>200 Army Pentagon, 2A514A<br>Washington, DC 20310-0200 | 703-693-5775 | Eric.keller@us.army.mil |

## Problem Description:

The Office of the Chief of Chaplains is responsible for scheduling chaplains to support the religious needs of soldiers deployed as well as soldiers and family members at home station. With the current rate of deployment of active, reserve, and guard forces the demand for chaplains exceeds the chaplains available. Current means of scheduling the assignment of chaplains to deployed units has been limited to the same process utilized for years and requires consistent updates by hand.

The Office of the Chief of Chaplains has requested assistance in identify and implement a means of assigning Army chaplains to deploying/deployed units to ensure appropriate coverage of services and reduce the man hours required to develop the assignment plan.

## Proposed Work:

Tasks include the analysis of the availability of chaplains (based on estimated date of completion of OBC for incoming chaplains, last date deployed, file priority, current organization, state of residence (for guard and reserve units), estimated date of retirement, and endorsement from controlling religious organization) and develop a tool to assist the Chaplin's Office in tracking and forecasting chaplains for deployment. The tasks include:

- First, define a listing of possible of initial data calls required to assist in the initial stages of the needs analysis (o/ 15 Sept '05).
- Second, needs analysis to identify the key stake holders, data sources, and assignment process.

Envisioned End-Product: Process Flow Diagram of chaplain assignments, a listing of relevant data sources with metadata descriptions, and a listing of key stakeholders, their potential issues, and their desired end state.

Estimated Time to Complete: on or about 15 October 2005.

- Thirdly, identify possible solutions to issues raised.

Envisioned End-Product: A recommendation to the client based on a list of several viable alternatives. Options currently include a spreadsheet based system

which feeds from current data bases and allows the user to generate assignments through the execution of a series of macros.

Estimated Time to Complete: 15 November 2005.

- d. Fourth, develop at least one alternative into a product which can be utilized by the Office of the Chief of Chaplains to assign chaplains to deploying and deployed units.

Envisioned End-Product: A product which allows the Office of the Chief of Chaplains to efficiently assign chaplains to units deployed or deploying to current areas of operation. The tool will take into account such issues as estimated date of completion of OBC for incoming chaplains, last date deployed, file priority, current organization, state of residence (for guard and reserve units), estimated date of retirement, and endorsement from controlling religious organization.

### **Results Summary:**

The project resulted in the development of the Chaplain's Office Model For Operational Resource Tracking (COMFORT). COMFORT improves the current chaplain assignment process by synthesizing, in seconds, multiple pieces of information which previously took days to compile and analyze. COMFORT augments the assignment process by providing a tool to analyze the pool of available chaplains and wargame operational forecasting strategies quickly and easily. This information management tool synthesizes key assignment data from multiple Department of Defense and Department of the Army databases and provides decision-makers meaningful insights into the Chaplain assignment landscape. This automated tool is also accurate, eliminating nearly most of the administrative error in the process. Furthermore, this model helps the chaplain assignment officer monitor the wear and tear on each chaplain so that he can determine which are best qualified for deployments. The model also assists assignment officers to ensure compatibility between chaplains and their units in terms of religious denomination or other qualifications. The model tracks participation in various campaigns, provides a template for estimating force requirements, and facilitates war gaming of the impacts of deployment strategies over a two year period.

The model was presented to CH(MG) Hicks, on 28 April 2006, and several members of his staff. Both the Access tool and the Excel forecasting tool were demonstrated. CH(LTC) Keller, assured CH(MG) Hicks that, with COMFORT, he could now provide a two year outlook of chaplain deployments with relative ease. There is a great deal of hope that the OCCH will become far more efficient and effective with these new tools. The COMFORT model will go a long way to address chaplain assignment challenges and aid the OCCH effort to render comfort to the force in the form of uniform spiritual coverage to soldiers and their families.

### **Requirements and Milestones:**

| Activity/Product                                                                                               | Date          |
|----------------------------------------------------------------------------------------------------------------|---------------|
| Initial meeting between primary analyst(s) and the Office of the Chief of Chaplains                            | o/a 26 Sep 05 |
| Review and stratify current process in order to frame the issue(s); adequately define all tasks and functions. | 15 Oct 05     |

| Activity/Product                                                                                                                                 | Date          |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Identify ways (alternatives) in which to leverage technology to perform these tasks.                                                             | o/a 15 Nov 05 |
| In-Program Review                                                                                                                                | o/a 15 Nov 05 |
| Process/tool to assist the Office of the Chief of Chaplains in assigning chaplains to units deployed or deploying to current areas of operation. | o/a 15 Dec 05 |
| Final Out Brief to the Office of the Chief of Chaplains                                                                                          | o/a 15 Jan 06 |
| Technical Report Complete                                                                                                                        | o/a 01 Feb 06 |

- Estimated Time to Complete Tool: 15 December 2005. **Complete**
- Review and stratify current process in order to frame the issue(s); adequately define all tasks and functions.

Envisioned End-Product: IPR and inclusion of results in the final technical report.

Estimated Time to Complete: 27 February 2006. **Complete**

- Identify ways (alternatives) in which to leverage technology to perform these tasks.

Envisioned End-Product: IPR and inclusion of results in a final technical report.

Estimated Time to Complete: 30 May 2006. **Complete**

- Process/tool to assist the Office of the Chief of Chaplains in assigning chaplains to units deployed or deploying to current areas of operation

Envisioned End-Product: A users guide for the assignment tool.

Estimated Time to Complete: 30 May 2006. **Complete**

#### **Project Deliverables and Due Date:**

- Memoranda of Agreement / Memoranda of Understanding signed (NLT 15 Sep 05) **Complete**
- In-Progress Reviews (15 Nov '05) **Complete**
- Process/tool to assist the Office of the Chief of Chaplains in assigning chaplains to units deployed or deploying to current areas of operation ( o/a 15 Dec '05) **Complete**
- Final Out Brief (o/a 15 Jan '06) **Complete**
- Technical Report (o/a 01 Feb 06) **Complete**

#### **Presentations and Publications:**

McInvale, Howard D., *C.O.M.F.O.R.T. (Chaplain's Office Model For Operational Resource Tracking)*, Operations Research Center of Excellence, Technical Report DSE-TR-0615, June 2006.

McInvale, Howard D., *Chaplain's Office Model For Operational Resource Tracking User Guide* Operations Research Center of Excellence, June 2006.

McInvale, Howard D., *Chaplain Deployment Assignment Tool*, 74<sup>th</sup> Military Operations Research Society Symposium, 2006.

**Personnel Briefed:**

- Final briefing was held on 28 April 2006 at the Office of the Chief of Chaplains, HQDA, 12th floor conference room in Presidential Towers, Alexandria, VA. The following personnel were present: CH(MG) Hicks, Chief of Chaplains and his staff [six CH(COL) primary staff officers two each from the Active Duty, Reserve, and National Guard], CH(LTC) Keller, CH(COL) Groseclose, MSG Lightcap, and Mr. Racster. From the Comfort Team were MAJ McInvale, Cadets Maciuba and Mingler, and LTC Goerger.

**Status:** *Complete* – 08 August 2006.

## Armed Forces-CARES (Casualty Assistance Readiness Enhancement System)

**DSE Project No: DSE-R-0619**

**Principal Analyst(s):** MAJ Ernest Y. Wong, M.S, M.A.

**Senior Investigator(s):** LTC Simon R. Goerger, Ph.D.

### Points of Contact:

| NAME                           | ADDRESS                                                               | PHONE                     | OTHER                 |
|--------------------------------|-----------------------------------------------------------------------|---------------------------|-----------------------|
| COL Mary Torgersen<br>Director | Army Casualty and Memorial Affairs (HRC)<br>Washington, DC 20310-0200 | 703-325-7777<br>DSN (221) | torgeml@us.army.mil   |
| LTC Robert Amico               | Army Casualty and Memorial Affairs (HRC)<br>Washington, DC 20310-0200 | 703-325-0070              | bob.amico@us.army.mil |

### Problem Description:

To help enhance the process for those assigned the responsibility of being of Casualty Assistance Officer (CAO) so that the primary next-of-kin (PNOK) of deceased soldiers and retirees get timely and responsive assistance.

The families of fallen soldiers are required to complete a considerable number of forms in order to receive various benefits and entitlements from the Department of Defense, Department of Veterans Administration, Internal Revenue Service, and Social Security Administration. They must do so at a time when the families' grief is raw and normal tasks seem an unbearable burden. Active duty soldiers appointed Casualty Assistance Officers (CAOs) assist surviving families through the process. However, CAOs tend to be inexperienced, usually serving in this capacity for the first and only time, and they oftentimes find themselves challenged to provide accurate and thorough assistance. Moreover, changing laws and updated regulations regarding casualty entitlements add to the pressures and perplexities that many CAOs experience. As a consequence, some families do not receive all benefits and entitlements in a timely manner. Furthermore, in some instances potential benefits may be overlooked entirely. To help remedy these shortcomings, we have developed the Armed Forces Casualty Assistance Readiness Enhancement System (CARES)—an information system that improves how the Department of Defense cares for military families in arguably their greatest time of need.

### Proposed Work:

Development of a user-friendly computer assisted software package that streamlines, simplifies, and automates the laborious and time-consuming task that Casualty Assistance Officers (CAOs) oversee when assisting surviving family members in the Casualty Assistance Program. Successful deployment of the Armed Forces-CARES software depends largely on how well the program satisfies the following three critical stakeholders: surviving family members, CAOs, and the Casualty Assistance Centers and the Casualty and Memorial Affairs Operations Center.

### Results Summary:

To help create better allocative efficiency for the military's casualty assistance program, we have developed the Armed Forces-CARES. We believe CARES will help to generate

improved effectiveness for soldiers performing duties as CAOs, provided increased transparencies of the military's casualty assistance process for surviving family members, and give greater managerial responsiveness to CACs overseeing this extremely sensitive and important responsibility. It is our belief that the work on this project and the development of the Armed Forces-CARES is a way to leverage information technology to enhance the military's Casualty Program. We also believe our work on this project is helping to advance the tenets of Army Transformation. Our hope is that CARES will expand and be embraced for use throughout the Department of Defense. The flexible design that we have incorporated into CARES nicely suits the particular needs of each of the individual service components—Army, Air Force, Coast Guard, Marines, and Navy—and allows future developers to modify it in accordance with new legislation and regulations. We believe that both our approach in the design of CARES as well as the use of CARES itself in the Casualty Program will serve as key enablers in helping to further advance our military towards the fulfillment of its vision in this 21<sup>st</sup> Century.

The Beta Test Version of the Armed Forces-CARES 1.0 currently helps to automate the 38 Microsoft Word formatted potential claims and benefits forms through a Microsoft Excel user interface. The software package also helps to educate and guide CAOs through the steps required of them. We have developed CARES to be an easily modifiable system that is able to keep pace with new and changing legislation.

#### **Requirements and Milestones:**

- First, define all the possible courses of action that a Casualty Assistance Command (CAC) and CAO may have to contend with in the event of a soldier or retiree's death. This will entail a functional decomposition of AR 600-8-1, Army Casualty Operations/Assistance/Insurance, DA Pam 608-4, A guide for Survivors of Deceased Army Members, and DA Pam 600-5, Handbook for Retiring Soldiers and Their Families.

Envisioned End-Product: A flow chart that diagrams all possible scenarios that the CAC and CAO may face. This flow chart will help ensure all possible resources, tools, and requirements are considered for the project.

Estimated Time to Complete: 20 September 2005. **Complete**

- Second, construct an aid that streamlines the processing of paperwork associated with the casualty assistance program.

Envisioned End-Product: A software package, preferably based on existing applications that are widely-available (such as Adobe Acrobat or Microsoft Excel), that makes it very easy for an assigned CAO to execute his or her duties.

Estimated Time to Complete: 25 November 2005. **Complete**

- Third, identify the most appropriate method for enabling CACs and CAOs to gain access to this aid.

Envisioned End-Product: A recommendation to the client based on a list of several viable alternatives. Options currently include a CD-ROM, link to appropriate portals such as the official military service sites, or a self-contained CAO website and server.

Estimated Time to Complete: 20 January 2006. **Complete**

- Fourth, conduct stakeholder analysis with all service components and agencies external to the Department of Defense in order to determine feasibility of linking and further automating benefits and entitlements process.

Envisioned End-Product: Upgrade to software package (alpha version) that enables automated and paperless processing to external agencies such as Defense Finance and Accounting Service, Department of Veterans Affairs, Internal Revenue Service, and Social Security Administration.

Estimated Time to Complete: 20 March 2006. ***Dropped—Version 2.0 Rqmt***

- Fifth, contract with software developer to produce fielded test software package (beta version).

Envisioned End-Product: Software package that enables select users to test the viability of the product and to identify improvements to the system.

Estimated Time to Complete: 26 June 2006. ***Ongoing Rqmt***

- Sixth, contract with software developer to produce fielded software package (release version of AF-CARES 1.0).

Envisioned End-Product: Software package that is delivered to CACs and CAOs for field use.

Estimated Time to Complete: 21 August 2006. ***Ongoing Rqmt***

- Lastly, conduct a software usability study to identify needed changes to package and complete software development package and technical report (release version of AF-CARES 1.0 Documentation).

Envisioned End-Product: Software development package and technical report for AF-CARES 1.0 delivered to Army Casualty and Memorial Affairs (HRC) with results of usability study, software requirements documentation, and software architecture.

Estimated Time to Complete: 31 December 2006. ***Ongoing Rqmt***

#### **Project Deliverables and Due Date:**

- Initial Program Meeting with CAO: 14 September 2005. ***Complete***
- Process Flow Chart of CAO Scenarios: 20 September 2005. ***Complete***
- In-Progress Review Briefing: 20 January 2006. ***Complete***
- Software Package AF-CARES Alpha Test: 20 March 2006. ***Complete***
- In-Progress Review Briefing (AF-CARES Alpha): 15 April 2006. ***Complete***
- Software Package AF-CARES Beta: 26 June 2006. ***Complete***
- Technical Report for AF-CARES development: 30 June 2006. ***Complete***
- In-Progress Review Briefing (AF-CARES Beta): 01 August 2006 -19 Sep '06 ***Complete***
- Software Package AF-CARES 1.0: 21 August 2006 - 01 Oct '06 ***Complete - 10 Oct '06***

- Final Briefing: 15 November 2006. *awaiting*
- Software Development for AF-CARES 1.0: 31 December 2006. *awaiting*
- Final Technical Report for AF-CARES 1.0: 31 December 2006. *awaiting*

#### **Presentations and Publications:**

Wong, Ernest Y., *Presentation: In-Progress Review on the CAO Flow Chart*, CPT Sonya Alexander and Mr. Dan Ruiz, U.S. Army Casualty & Memorial Affairs Operations Center, West Point, New York, September 2005.

Wong, Ernest Y., *Presentation: In-Progress Review on the Armed Forces-CARES Methodology*, COL Mary Torgersen, CMAOC, Alexandria, Virginia, November 2005.

Wong, Ernest Y., *Presentation: In-Progress Review on the Armed Forces-CARES Alpha Test Version*, COL Mary Torgersen, CMAOC, Mr. Mark Ward, and Ms. Betsey Graham, Office of the Secretary of Defense, Alexandria, Virginia, December 2005.

Wong, Ernest Y., *Presentation: Status Update of the Armed Forces-CARES at the Quarterly Casualty Assistance Board Meeting*, to members of the CAB as well as members of the Government Accounting Office, San Antonio, Texas, January 2006.

Wong, Ernest Y., *Presentation: In-Progress Review on the Armed Forces-CARES and Potential Linkages with SERCO Group*, COL Mary Torgersen, CMAOC, West Point, New York, March 2006.

Wong, Ernest Y., *Presentation: In-Progress Review on the Armed Forces-CARES Beta Test Version*, COL Mary Torgersen, CMAOC, West Point, New York, May 2006.

Wong, Ernest Y., *Presentation: In-Progress Review on the Armed Forces-CARES Beta Release*, LTC Robert Amico, CMAOC, Alexandria, Virginia, May 2006.

Wong, Ernest Y., *Presentation: The Armed Forces CARES Tool—Simplifying, Enhancing, and Improving the Military's Casualty Assistance Program*, 2006 Military Operations Research Society Symposium, Colorado Springs, Colorado, June 2006.

Wong, Ernest Y., *The Armed Forces Casualty Assistance Readiness Enhancement System (CARES): Design for Flexibility*, Operations Research Center of Excellence, Technical Report DSE-TR-0619, June 2006.

#### **Personnel Briefed:**

- COL Mary Torgersen, Director, U.S. Army Casualty & Memorial Affairs Operations Center (CMAOC), Human Resources Command
- COL Gawkins, Director, U.S. Army Casualty & Memorial Affairs Operations Center (CMAOC), Human Resources Command
- LTC Robert Amico, CMAOC
- CPT Sonya Alexander, CMAOC
- Mr. Dan Ruiz, CMAOC

- Mr. Mark Ward, Office of the Secretary of Defense (OSD), Mortuary Affairs
- Ms. Betsey Graham, OSD, Mortuary Affairs
- Dr. Jack Edwards, Government Accounting Office (GAO)
- Ms. Jacki Randolph, GAO
- Ms. Suzanne Perkins Sapp, GAO

**Status:** Armed Forces CARES Version 1.0 ***Complete*** – 10 October 2006.

Tech Report for Armed Forces CARES Version 1.0 due in December 2006.

## Future Force Warrior Analytical Support

**DSE Project No: DSE-R-0620**

**Client Organization: Program Manager, Future Force Warrior**

**Principal Analyst(s):** LTC John Brantley Halstead, Ph.D.  
**Senior Investigator(s):** LTC John Brantley Halstead, Ph.D.

### Points of Contact:

| NAME                 | ADDRESS                                                                                  | PHONE          | OTHER                                |
|----------------------|------------------------------------------------------------------------------------------|----------------|--------------------------------------|
| Mr. Bill Harris      | Future Force Warrior Integrated Analysis Co-lead, TSM<br>Soldier, Fort Benning, GA 31905 | (706) 545-6826 | william.harris@benning.army.mil      |
| Mr. Bob O'Brien      | Future Force Warrior Systems Engineering Co-lead, NSC,<br>Natick, Massachusetts 01760    | (508) 233-4924 | robert.obrien@natick.army.mil        |
| Ms. Carol Fitzgerald | Program Manager, Future Force Warrior, NSC,<br>Fort Belvoir, VA 22060                    | (703) 704-1427 | carol.fitzgerald@peosoldier.army.mil |

### Problem Description:

To support its transformation to a soldier centric force, the Army is developing and demonstrating future transformational capabilities for the “soldier as a system” using an incremental, System of Systems (SoS) approach. The Future Force Warrior (FFW) Advanced Technology Demonstration (ATD) program demonstrates the feasibility of desired soldier and Small Combat Unit (SCU) capabilities. Notional concepts that might be developed include head to toe individual protection, netted effects, soldier worn power sources, soldier battlefield applications, and enhanced human performance. The FFW program is researching how to improve the combat effectiveness of the soldier in the 2010 time frame.

As an ATD program, FFW is focused on identifying value added technologies (specifically Land Warrior Advanced Capability) for the soldier as a system and on refining the capabilities described in the Ground Soldier System Capabilities Development Document. As value added technologies are identified, individual technologies may be transitioned to the Land Warrior-Stryker Interoperability program or the current force before the ATD is completed.

Although the FFW ATD is not an acquisition program, FFW supports Land Warrior (LW) block III. Analysis is being done to determine the appropriate capabilities to recommend for LW block III and to assess the utility of emerging technologies in improving combat effectiveness of the soldier and small combat units.

As an important part of this program, the Analysis and Experimentation (A&E) team will perform operational analysis, which includes exploratory, operational power and energy, and Soldier Battle Lab (SBL)/Soldier in the Loop (SITL) analyses. Analysis processes focus on model-test-model and exploratory analysis.

Information systems are at the core of the FFW simulation and analysis problem. However, current information capabilities and emerging information technologies are not easily modeled. Considering current analysis methods, the advantages of potential

information systems capabilities over existing capabilities are difficult to determine. Current difficult analysis issues include:

- 1) What does each leader and soldier need to know (and when) to affect decision-making in order to enhance combat effectiveness?
- 2) What are the primitives of this information knowledge that need to be modeled in order to conduct exploration of information technologies as an independent and dependent capability?
- 3) How can distribution of this information be modeled without devolving into an engineering-level analysis of communications systems? and
- 4) What are appropriate measures of effectiveness to use to assess improved information superiority?

### **Proposed Work:**

The Operations Research Center of Excellence (ORCEN), Systems Engineering Department at the United States Military Academy will provide an individual to serve as the Government co-lead of the A&E Team for FFW with an individual assigned as the Contractor co-lead from General Dynamics C4 Systems, the FFW Lead Technology Integrator (LTI). Duties include:

- Assistance with experimentation
- Assistance with analysis and analysis strategy
- Advise and provide technical assistance to analytical proponents (mainly SAIC)
- If necessary, liaison with TRAC Monterey and WSMR
- Participate in LTI evaluation activities
- Participate in open reviews and other periodic reviews and activities
- Support activities leading to the analysis, evaluation, and acquisition of the FFW System of Systems
- Participate in ongoing development of technical and operational exit criteria

### **Results Summary:**

We provided doctoral assistance preparing FFW for the next POM defense. The assistance's primary focus was providing analysis strategy in coordination with SAIC for verification and communicating the comparative analysis of FFW with Land Warrior. The analysis support involved SUTES verification and appropriate output analysis.

We conducted liaison with TRAC-Monterey, which lead to three cadet advanced individual academic development internships. All three cadets will assist in FFW and Land Warrior analysis either at TRAC Monterey or Fort Lewis the summer of 2006. The cadets will further be utilized in FFW AY07 Capstones.

Department of Systems Engineering will conduct FFW IWARS simulation AY07. The department will leverage the personal knowledge obtained by those cadets who conducted FFW AIAD at TRAC-Monterey and Fort Lewis.

**Requirements and Milestones:** Not Applicable

**Project Deliverables and Due Date:** Not Applicable

**Presentations and Publications:**

- Cadets Comstock, Freeborg, Martinez, Turner, and Wilson (2005), *Future Force Warrior: Building the Simulation*, West Point, NY
- Cadets Comstock, Freeborg, Martinez, Turner, and Wilson (2005), *Future Force Warrior: Course of Action Briefing*, West Point, NY

**Status:** *Complete*

## Recruiter Selection Model

**DSE Project No: DSE-R-0623**

**Client Organization: Director, Center for Accessions Research (CAR),  
United States Army Accessions Command (USAAC)**

**Principal Analyst(s):** LTC John Brantley Halstead, Ph.D.  
**Senior Investigator(s):** LTC John Brantley Halstead, Ph.D.

### Points of Contact:

| NAME           | ADDRESS                                                   | PHONE          | OTHER                      |
|----------------|-----------------------------------------------------------|----------------|----------------------------|
| LTC Linda Ross | USAREC Command Psychologist, Center One, Fort Jackson, SC |                | linda.ross@usarec.army.mil |
| COL Rocky Gay  | Director, CAR, USAAC, Fort Knox, KY 40121                 | (502) 626-0321 | ralph.gay@usaac.army.mil   |

### Problem Description:

Currently, the USAREC administers the Non Commissioned Officer Leadership Skills Inventory (NLSI) to all incoming recruiters at the Recruiter and Retention School. The NLSI was jointly developed by Center One at Fort Jackson, South Carolina and Army Research Institute (ARI) beginning in 2001 with Secretary of the Army Recruiting Initiatives research funding. The NLSI currently measures the potential recruiting performance of Non Commissioned Officers (NCO) selected for recruiting duty. When the selection instrument was envisioned, the intent was to administer the instrument early in NCO careers (NCOES). With this intent, the instrument would predict most of the non-commissioned officer population for potential recruiting performance.

Recruiter selection provides leverage to the existing recruiting system of systems. If an instrument can accurately predict recruiting performance, the opportunity to select the right soldiers for recruiting exists. The selection of the right soldiers serves as a lever that provides “value added” to existing mission and market systems.

Initial analysis of the NLSI discovered a non-linear relationship between the NLSI score and recruiting performance, measured by gross write rate (GWR). As a stand alone test, the NLSI was, therefore, not suitable for accurately predicting recruiting performance. Within state-of-the-art methods, non-linear statistical learning methods have demonstrated success with classifying and predicting non-linear relationships that involve human dimensions.

In summary, the current situation of the recruiter selection tool is not matching the tool’s initial intent. The tool is not administered early enough enabling recruiter selection. Rather, it is used more as a prediction instrument for newly detailed recruiters. Further, the NLSI, as a stand-alone instrument, is not capable of accurate prediction through most of its score range. Although there is some value associated with predicting detailed recruiter performance, the full potential of the instrument is not reaped unless utilized earlier in the non commissioned officer education system (NCOES) and a better prediction model can be found.

**Proposed Work:**

To place the NLSI earlier in the NCOES, the instrument has to significantly predict recruiting performance. Improving the prediction capability involves the application of multivariate statistics, data mining, and statistical learning. The Operations Research Center (ORCEN) assists the Command Psychologist in Center One with all modeling and statistical aspects of the research.

This research is exploratory in nature and, therefore, may lead to results not expressed within this proposal.

Products generated by this research include a research proposal; necessary presentations communicating data, summary statistics, and applicable analytical methods; a draft report presentation; a final report presentation; a technical report; and all applicable and developed models.

**Results Summary:**

After exploring numerous non-linear statistical models, RandomForest models outperformed all other statistical learning methods, including support vector regression. The RandomForest model was improved by applying feature selection methods. The improvement produced better model generalization, the ability to accurately predict recruiter success from new and unseen data. Feature selection determines the best subset of prediction variables that enable generalization. This research used a greedy algorithm to determine the better feature subset. The result is a local optimal, but doesn't guarantee a global optimal.

Deploying the RandomForest model required innovation. Rather than investing in high-cost modeling software for a new system, we explored existing or free software alternatives. The deployment model uses Excel to drive R Statistical Software, which is the best statistical software available provided not for profit use and free. Visual basic application (VBA) language was used within Excel to call the R program. The RandomForest model and output is controlled by R statistical language, which can also be used within S+ applications.

The model produces an order of merit list (OML) that chooses the best potential recruiters from the enlisted force. The Command General of Recruiting Command, MG Bostick, recommends deployment and is coordinating the model deployment within NCOES and recruiter selection (derived from the model OML) with Human Resource Command (HRC).

**Requirements and Milestones:**

- Create algorithm using R programming language (Winter 05-06) **Complete**
- Write VBA code for Excel (Winter 06) **Complete**
- Conduct Theoretical tests on new algorithm and validate model (Spring 06) **Complete**
- Write-up technical report and obtain model approval (Spring 06) **Complete**

**Project Deliverables and Due Date:**

- Deployed Model (Spring 06) **Complete**

- Technical Report (Spring 06) **Complete**

**Presentations and Publications:**

Halstead, John Brantley, Ph.D., *Recruiter Selection Model*, Operations Research Center of Excellence, Technical Report DSE-TR-06-23, May 2006.

Halstead, John Brantley, Ph.D., *Developing a Recruiter Selection Model*, Submission to IEEE Computational Intelligence Magazine.

Halstead, John Brantley, Ph.D., *Presentation: Recruiter Selection Model, Initial Results*, MG Bostick, CG USAREC, January 2006.

Halstead, John Brantley, Ph.D., *Presentation: Recruiter Selection Model, Final Results*, MG Bostick, CG USAREC, April 2006.

**Personnel Briefed:**

- MG Bostick, CG Recruiting Command
- Mr. John McLaurin, ASA M&RA

**Status:** **Complete** - 12 April 2006.

# 3<sup>rd</sup> Annual Base Camp Conference and Requirements Analysis for Base Camp Knowledge Center

**DSE Project No: DSE-R-0624**

**Client Organization:** U.S. Army Engineer School (USAES), Ft. Leonard Wood, MO

**Principal Analyst(s):** MAJ TJ Lindberg, M.S.  
MAJ Travis Thompson, M.S.

**Senior Investigator(s):** COL Timothy E. Trainor, Ph.D.

## Points of Contact:

| NAME                   | ADDRESS                                                                                                                                                                                          | PHONE          | OTHER                          |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------|
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| Kurt Kinnevan          | Chief<br>Evaluation, Standardization, Synchronization<br>Directorate of Environmental Integration<br>United States Army Engineer School<br>197 Replacement Avenue<br>Fort Leonard Wood, MO 65473 | (573) 329-1925 | kurt.kinnevan@erdc.us.army.mil |

## Problem Description:

Establishing an effective and secure operating and logistics base under austere conditions, either at home or abroad, regardless of whether the origin of the crisis is military or strictly humanitarian in nature, is a complex mission. Unfortunately, the doctrine supporting the life-cycle management of base camp facilities is poorly codified and usually unstructured due to the disparate nature of the governmental organizations tasked with accomplishing these missions. In order to overcome this problem, the Department of Systems Engineering at the United States Military Academy (USMA) at West Point has developed functional and non-functional requirements for, and has partially implemented a commercial-off-the-shelf (COTS) knowledge management (KM) system that facilitates the sharing of this type of specialized information for military and civilian members of the “Base Camp Community of Practice (CoP)”.

## Proposed Work:

- Conduct requirements analysis for Knowledge Management (KM) System for the Base Camp Community of Practice (CoP)
- Help coordinate and execute the 3<sup>rd</sup> Annual Base Camp Conference (in conjunction with ENFORCE) in St. Louis, MO in order to conduct hand-off of base camp conference responsibilities with the U.S. Army Engineer School.

## Results Summary:

The 3<sup>rd</sup> Annual Base Camp Workshop in May 2006 attempted to achieve closure on some very long-standing issues related to the Base Camp CoP. The fact that the U.S. Army Engineer School volunteered to serve as the Army’s proponent for this community was incredibly significant. Their willingness to take ownership for the systemic problems

associated with Base Camp Life-Cycle management issues facilitated the establishment of an interim KM solution. Furthermore, the purpose of the technical report was to convey the process that occurred as a result of developing and implementing this KM solution on behalf of the Base Camp CoP.

It should be noted that at the time of completion, ArmyBaseCamp/JFOB.net has facilitated (at times significant) dialogue on other topics that are relevant to this community of practice. The topic that has provided the greatest opportunity for both operational and intellectual collaboration is the topic of Stability and Reconstruction Operations (S&RO). The authors believe that the KM initiatives that were born out of the most recent Base Camp Workshop will continue to help foster related research opportunities in the future between seemingly disparate entities that are seeking solutions in an increasingly complex and networked world.

**Requirements and Milestones:**

- Base Camp Conference (Complete, May 2006)
- U.S. Army Engineer School receives *ArmyBaseCamp/JFOB.net* requirements analysis (Complete, June 2006)

**Project Deliverables and Due Date:**

- U.S. Army Engineer School receives *ArmyBaseCamp/JFOB.net* requirements analysis brief during Base Camp Conference (Complete, May 2006)
- Base Camp Conference continuity information provided to U.S. Army Engineer School (Complete, June 2006)

**Presentations and Publications:**

Trainor, Timothy E., Thompson, Travis, Lindberg, TJ. *Overview of Knowledge Management & KM Requirements Development for the Base Camp Community of Practice*, Base Camp Conference Presentation/ Break-out Session, 1 – 2 May 2006.

Lindberg, TJ, Trainor, Timothy E. PhD, *Enabling Knowledge Management for the Joint Forward Operating Base (JFOB)/ Base Camp Community of Practice (COP)*, Operations Research Center of Excellence, Technical Report DSE-TR-0624, September 2006.

Lindberg, TJ, Trainor, Timothy E. PhD, *Enabling Knowledge Management for the Joint Forward Operating Base (JFOB)/ Base Camp Community of Practice (COP)*, Presentation and Conference Proceedings, 2006 Annual ASEM Conference, October 2006.

**Personnel Briefed:** (See attached Base Camp Conference attendee roster)

**Status:** *Complete.*

## Small Arms Weapon Effective Life

**DSE Project No: DSE-R-0625**

**Client Organization:** Program Executive Office (PEO) Soldier Programs

**Principal Analyst(s):** MAJ Gary Kramlich, MS  
**Senior Investigator(s):** LTC Simon R. Goerger, Ph.D.

### Points of Contact:

| NAME                  | ADDRESS                                                                  | PHONE                          | OTHER                          |
|-----------------------|--------------------------------------------------------------------------|--------------------------------|--------------------------------|
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| Mr. Charlie Tamez     | PEO Soldier<br>5901 Putnam Road, Bldg 328<br>Fort Belvoir, VA 22060-5422 | (703) 704-4073<br>DSN 654-4073 | Charlie.tamez@us.army.mil      |
| Mr. Joe Colarusso     | TACOM-Rock Island<br>AMSTA-LC-CSI<br>Rock Island, IL 61299-7630          | (309) 782-4491<br>DSN 793-4491 | Joe.colarusso@us.army.mil      |
| Ms. Catherine Jackson | TACOM-Warren<br>ATTN: AMSTA-LC-LPIJ<br>Warren, MI 48397-5000             | (586) 574-4136<br>DSN 786-4136 | catherine.jackson@us.army.mil  |

### Problem Description:

As with other equipment, small arms (5.56mm to 40mm) weapons systems for the US Army undergo extensive wear and tear. Traditionally larger weapons systems and machinery are replaced based on a myriad of means to determine the level of use or wear of the mechanisms. However, small arms weapons systems do not have the same level or type of tracking systems as larger, less numerous but more expensive weapons platforms. The critical role of small arms in current operations has elevated the need to determine an "effective life" in years, rather than rounds, for these systems. The Army seeks an effective measure to forecast when units require replacement weapons in order to have appropriate levels ready for use and shipment.

AMC looks for a holistic approach to condition based maintenance (CBM) for small arms weapons (pistols to MK-19 grenade launchers). The overall methodologies examined and recommended will be those that best fit the needs to arm the force; some of the factors – types of units, number and type of operational deployments, areas/regions of utilization—are some of the primary factors to be considered. Currently, the M249 Squad Automatic Weapon (SAW) is one of the weapons of greatest interest.

### Objective:

The objectives of this study are to (a) identify the minimal maintenance levels required for the sustained use of an individual SAW, (b) to develop a baseline methodology for assessing the remaining life of individual SAWs, and (c) to provide a framework for future assessment for the effectiveness of the methodology.

### Technical Approach (Methodology):

For this research, we propose to employ the Systems Engineering Management Process (SEMP) to identify potential players, measures of effectiveness, and viable alternatives to

resolve the methodology issues. The SEMP is a robust, deliberate problem solving methodology taught in the Department of Systems Engineering at the United States Military Academy. It has been used widely in a variety of applications, both on military and commercial problems. The SEMP has recently been employed in development of an operational assessment system for Operation Enduring Freedom, in support of the Base Realignment and Closure (BRAC) study group, and to analyze the regional structure of the Army Installation Management Agency. The SEMP will be used to review the needs of the client, identify the key components of the current system, develop and assess viable alternatives to the current system, and present recommended small arms CBM methodology options to the client. More elaboration on SEMP-related tasks follows.

The Army is transforming to anticipate future threats. Part of that transformation involves implementing a condition based maintenance system for appropriate equipment which will assist in reducing battlefield maintenance failures, increase lethality and effectiveness, track maintenance status and efficiency, and reduce overall cost in time and dollars to the nation. In order to efficiently achieve this, it is necessary to create a methodology for managing and replacing our small arms (5.56mm to 40mm) weapons systems. This research will provide an enhanced baseline methodology predicated on the SAW.

#### **Proposed Work (Tasks and Issues):**

Tasks to be performed and issues to address:

- Define Problem – Small Arms (5.56mm to 40mm) Weapon Effective Life
  - Scope problem with client in terms of options for small arms weapon effective life methodology with regards to users, maintenance personnel, supply chain, and manufacturing for the Squad Automatic Weapon (SAW).
  - Develop focus and brainstorming questions for needs analysis sessions
  - Identify stakeholders and conduct needs analysis to capture ideas and issues for possible SAW Effective Life Methodologies
  - Identify existing and developing SAW users, maintenance personnel, supply chain, and manufacturing organizations
- Conduct Design and Analysis of Alternatives with Stakeholders
  - Host stakeholder analysis and functional decomposition session(s) with focus and brainstorming questions
  - Identify essential elements of use, maintenance, supply, and manufacturing of SAWs which make their life expectancy unique
  - Develop several alternatives to SAW Effective Life Methodologies and CBM options
  - Frame alternatives, based on stakeholder priorities, for presentation to those stakeholders
- Recommend and Select Alternatives
  - Prioritize alternatives/elements, based on stakeholder input and a consideration of future requirements

- o Develop recommendations and present to clients and stakeholders
- Implement M&S Installation Facilities Layout
  - o Follow-on work for future funding: 1) Conduct case study to assess the effectiveness of SAW Effective Life Methodologies and CBM options and 2) develop effective life methodologies for other small arms (5.56mm to 40mm) weapons systems.

### Results Summary:

- TBD

### Milestones and Deliverables:

#### Milestones:

**Table 1. Project Milestones**

| Milestone                                                                                                      | Tentative Dates               |
|----------------------------------------------------------------------------------------------------------------|-------------------------------|
| Scope problem with client (systems on which to focus)                                                          | 15 Jun 2006 - <b>Complete</b> |
| Request available data on weapon system(s) from appropriate sources (PM-Soldier, units, AMSO)                  | 15 Jul 2006 - <b>Complete</b> |
| Develop focus and brainstorming questions for needs analysis                                                   | 15 Jul 2006 - <b>Complete</b> |
| Identify stakeholders for potential usability study                                                            | 01 Aug 2006 - <b>Complete</b> |
| Conduct needs analysis with stakeholders to determine desired capabilities                                     | 15 Sep 2006 - <b>Complete</b> |
| Conduct needs analysis with stakeholders (group sessions)                                                      | 15 Oct 2006 - <b>Complete</b> |
| Identify essential elements of methodologies and weapon system that makes it unique                            | 28 Oct 2006- <b>Complete</b>  |
| Develop several alternatives methodologies                                                                     | 13 Jan 2007                   |
| Conduct IPR with client to review current issue and status of research to date                                 | 13 Jan 2007                   |
| Develop prioritized list of methodologies and potential test units                                             | 17 Feb 2007                   |
| Conduct Final Briefing with client with recommendations for methodology and possible implementation test cases | 15 Mar 2007                   |
| Establish possible test units and/or follow-on methodologies                                                   | 15 Mar 2007                   |
| Final tech report on work completed                                                                            | 15 May 2007                   |

#### Project Deliverables and Due Date:

- Initial Research Team Briefing with Client: On or About 15 June 2006 **Complete**
- Conduct IPR with client to review current issue and status of research to date: 13 January 2007
- Conduct Final Briefing with client with recommendations for methodology and possible implementation test cases: 15 March 2007
- Establish possible test units and/or follow-on methodologies: 15 March 2007

- Final Technical Report: 15 May 2007

**Presentations and Publications:**

- TBD

**Personnel Briefed:**

- TBD

**Status:** Final Technical Report to be completed NLT 15 May 2007

# Shaping Insurgent Behaviors on the Battlefield: VBIED Detection and Defeat through Insights into Insurgent Decisioning and Response to Traffic Flow Strategies

**DSE Project No: DSE-R-0627**

**Client Organization:** US Army Engineer Research and Development Center (ERDC)

**Principal Analyst(s):** MAJ Paul Evangelista, MS  
MAJ Greg C. Griffin, MS

**Senior Investigator(s):** Niki C. Goerger, Ph.D.  
LTC Simon R. Goerger, Ph.D.  
Paul W. Richmond, Ph.D.  
Paul West, Ph.D.

## Points of Contact:

| NAME                | ADDRESS                                                                                                                                    | PHONE                                 | OTHER                               |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------|
| Dr. Robert E. Davis | Technical Director<br>US Army Engineer Research and Development Center<br>Cold Regions Research and Engineering Laboratory<br>72 Lyme Road | (603) 646-4219<br>FAX: (603) 646-4109 | robert.e.davis@erdcr.usace.army.mil |

## Project Summary:

Insurgents have effectively employed asymmetric tactics, such as the use of vehicle-borne improvised explosive devices (VBIEDs), as viable threats in urban environments. VBIEDs are often devastating in their physical and emotional effects. They are hard to detect and have proven difficult to thwart or defeat. They would be easier to thwart or defeat if the political, cultural, and physical environments in which they were implemented were more readily constrainable as in full combat operations. However, in stability and support operations, it is important to allow the nearly free flow of people (noncombatants) and goods through an economically developing or thriving community. Moreover, our limited understanding of human behaviors that drive the insurgent's planning, actions, and reactions, and the insurgent's ability to capitalize on the nature of the urban environment in stability and support operations adds to the complexity and challenges of detecting and defeating this threat.

There is a need to increase our understanding of the behavioral aspects, or decision making processes, of threats in the larger context of the physical and cultural environment so that we can provide a means to identify threats by evoking responses or producing recognizable patterns such that we begin to shift the advantage in this contemporary operational environment in our favor.

The objective of this proposed research is to provide insights into insurgent behaviors, or decisioning, given different tactics, techniques, and procedures (TTPs), particularly those associated with traffic flow/ traffic control point (TCP) strategies, employed by counterinsurgents with the goal of shaping insurgent behaviors to make detecting them or defeating them more likely. For example, behaviors can include avoiding a TCP by turning off the main route through a neighborhood with one particular affiliation versus selecting a third route. Can our placement of TCPs affect our ability to thwart and detect

VBIED? We will accomplish this via constructive large-scale simulation experiments employing agent based models and extensions of electromagnetic field theory applied to path estimation for infiltration routes. This will create a crucible for providing insights into cause-and-effect relationships associated with counter insurgent tactics, techniques, and procedures and VBIED insurgent response, or decisioning. Thus, this will enable faster generation of viable and effective TTPs/TCP strategies as well as inform their dynamic modification in the evolving environment. The scope includes urban environments, stability and reconstruction operations (SRO), traffic control point strategies and associated TTPs, and VBIEDs employed against stationary targets.

### **Objective:**

The objective of this overall project which this proposed research is supporting is to provide insights into insurgent behaviors, or decisioning, given traffic flow/ traffic control point (TCP) strategies, employed by counterinsurgents. The objectives of this statement of work are to: (a) develop realistic vignettes for assessing traffic flow and TCP strategies in urban environments during stability and reconstruction operations, (b) examine use of artificial electromagnetic (AEM) field theory for route assessment, and (c) assist in data generation and analysis.

### **Project Description:**

This problem, or class of problems, has not been solved to date. If successful, this research will positively impact the current and future fight by assisting in countering the ongoing and effective VBIED asymmetric threat challenging our forces and noncombatants today, keeping our Troops and the local population safer, saving lives and property. Moreover, the methodologies and insights should form a basis for countering to other asymmetric challenges such as IED employed against convoys.

The team has already demonstrated the potential for success through a pilot project looking at the feasibility of utilizing agent based models and simulations as an environment for studying these types of problems. There is key blend of analytical capabilities and operational experience, to include current operational experience, on the team. The methodologies and results should further uncover new dimensions for exploration into the “brain lid” and drive modification of theory applied in other fields, such as site percolation theory, information entropy, and artificial electromagnetic field theory, for utility in this area of research.

Technical Approach: The technical approach will involve the following tasks:

- Task a: Identify potential behavior shaping actions and ranges of responses utilizing historical or realistic behaviors, as validated by subject matter experts. This will involve selecting a geographic area, most likely Baghdad, where we have terrain and ongoing operations and potential information resources. We will research types of targets that were or could be sought by VBIED and associated defining factors such as links to key events or heavily populated areas. Similarly, we will research data and theories on insurgent shaping methods associated with TCPs and other tactics. This information will be used to construct realistic vignettes, establishing targets and conditions, that will be reviewed and approved by SMEs.
- Task b: Utilize modified artificial electromagnetic (AEM) field theory with threat templates to derive potential routes insurgents would use. Task a will

inform the creation of threat templates in the area of interest, such as those utilized in the intelligence preparation of the battlefield (IPB) process. This will be used in modified AEM with A\* algorithms to pick the k-best routes as possible routes to be used by the enemy when seeking a target. TCPs can be charged to repel the insurgents and certain neighborhoods or areas can be used to attract VBIED for example.

- Task c: Implement route selection factors and trigger points, events triggering state changes/ behaviors in the agents, in simulation. The results of task b will be used in the agent based model, Map Aware Nonuniform Automata (MANA), scenario generation and in setting agent properties and trigger points. More information in MANA is given after the explanation of tasks.
- Task d: Design and run large-scale simulation experiments to provide insights based on key variables affecting success of traffic flow strategies/TTPs on shaping behaviors. To facilitate the exploration of alternatives, a Nearly Orthogonal Latin Hypercube (NOLH) design of experiments will be used to reduce the number of runs while ensuring good coverage of the design space. Factors identified in the previous tasks will be examined across several levels (design settings) to capture interesting insights. We expect to examine 7 – 20 factors with 17 or so levels each.
- Task e: Analyze results. Logistic regression and/or classification and regression trees will be used to elicit insights regarding behaviors of insurgents. The product will be an assessment of factors/ combinations and levels that contribute to effectiveness.

MANA is more conducive to political, social, and cultural interactions than tradition combat simulations. It consists of entities, or agents, representing military units and noncombatants and allows for agents to change sides or roles. It is not intended to model high-fidelity physics-based interactions but is designed to capture effects, including those on human behaviors, communications, situational awareness, and low-level decision making capabilities. MANA is part of the family of the U.S. Marine Corps Combat Development Command's Project Albert family of agent based models.<sup>1</sup> The Defence Technology Agency of New Zealand developed MANA to conduct research into implications of chaos and complexity theory for combat and other military operational modeling.<sup>2</sup> The entities in MANA utilize their "memory maps" to inform their decisions and provide individual, or group, goals to guide them in the battlescape. MANA entities can also be classified as complex adaptive systems (CAS) which allows agents to adapt, evolve and coevolve with their environment.<sup>3</sup>

### **Proposed Work:**

- Data collection for modeling insurgent behaviors (July 06) - **Completed**

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<sup>1</sup> Project Albert Fact Sheet. [WWW Document]. Retrieved 01 April 2004 from [http://www.mcwl.quantico.usmc.mil/fact\\_sheets/fs/Pro%20Albert%2007\\_31\\_03.pdf](http://www.mcwl.quantico.usmc.mil/fact_sheets/fs/Pro%20Albert%2007_31_03.pdf), 10 December 2002.

<sup>2</sup> D. P. Galligan, M. A. Anderson, & M. K. Lauren., *MANA, Map Aware Non-uniform Automata, Version 3.0, Users Manual (Draft)*. Unpublished manuscript, 2003.

<sup>3</sup> S. R. Goerger. *Validating Computational Human Behavior Models: Consistency and Accuracy Issues*. Dissertation. Naval Postgraduate School. Monterey, CA. June 2004.

- Extend AEM work previously conducted to plan traffic flow for vignettes (Aug 06) - **Completed**
- Develop 1 – 2 vignettes with excursions (July 06) - **Completed**
- Assist in data generation and analysis (Sep 06) - **Completed**

#### **Results Summary:**

- TBD

#### **Requirements and Milestones:**

- Review data/ conduct research on behavior shaping actions and response ranges (1 mos) - **Completed**
- Run modified AEM models for path prediction (2 mos) - **Completed**
- Design, implement, and test vignettes (2 mos) - **Completed**
- Conduct initial experimental runs (3 mos) - **Completed**
- Conduct follow-on experiments (4 mos) - **Completed**
- Finalize analysis (5 mos) – **to be Completed Oct ‘06**
- Provide insights/recommendations regarding shaping insurgent behaviors (5 mos) – **to be Completed Oct ‘06**
- Submit report (6 mos) – **to be Completed Oct ‘06**

#### **Project Deliverables and Due Date:**

- Technical Report – Nov ‘06

#### **Presentations and Publications:**

Goerger, S., Goerger, N., Griffin, G., West, P., *Modeling Traffic Flow Strategies in Countering Improvised Explosive Devices (06S-SIW-045)*, 2006 Spring Simulation Interoperability Workshop, April 2-7, 2006, Huntsville, AL.

Goerger, N., Evangelista, P., Goerger, S., Griffin, G., Richmond, P., *Insights into Insurgent Decisioning and Response to Traffic Flow Strategies (06F-SIW-098)*, 2006 Fall Simulation Interoperability Workshop, September 10-15, 2006, Orlando, FL.

#### **Personnel Briefed:**

- TBD

**Status:** Tech Report to be completed October 2006

# Stochastic Modeling of Metropolitan Infrastructure Resiliency

**DSE Project No: DSE-R-0628**

**Client Organization:** Dept of Homeland Security

**Principal Analyst(s):**

**Senior Investigator(s):** Patrick J. Driscoll, Ph.D.

Niki C. Goerger, Ph.D.

## Points of Contact:

| NAME                 | ADDRESS                           | PHONE | OTHER |
|----------------------|-----------------------------------|-------|-------|
| Ms. MaryAnn Maricolo | Office of Emergency Planning, NYC |       |       |

## Problem Description:

The challenge of adequately planning for disasters is substantial for major U.S. metropolitan areas. When a man-made or natural disaster strikes, history has demonstrated that some cities have rapidly recovered while others stagnate in their devastation, seemingly without regard to the extent of resources dedicated to their recovery. In this context, two issues are of concern. First, how can one accurately estimate the resiliency of a metropolitan area? And second, is it possible to estimate the productivity lost due to executing response plans? This study focused on developing a decision tool that could be used to enhance response planning with these two questions in mind.

## Proposed Work:

- Characterize the system dynamics for the infrastructure of a U.S. metropolitan area in terms of linear control expressions in a discrete dynamic system framework that includes both physical layer and services provided.
- Define resiliency, robustness and robustness thresholds in terms of this framework. Characterize preparedness and response planning in the face of system shocks.
- Link the structure of response vectors to loss of productivity for a rational group to demonstrate how various options will cause undue loss of productivity.

## Results Summary:

A rather complicated linear system representation was developed to model the dynamics involved with infrastructure systems and the services provided. This system contains representations for maintenance, response and preparedness investments, system shocks to both state condition levels and system linkages. Using this representation, system shocks and policy plans are defined that effectively capture levels of resource investments to both prepare for system shocks and to respond to them.

In this case, system shocks were considered singular events rather than repeated stochastic events. Stochastic effects of state level degradation of physical layer elements and services were modeled using appropriate probability distributions. Human learning effects and physical deterioration effects are being developed.

Linking the appropriate response vectors to CUSUM charting that dynamically captures the loss of productivity due to response options is still being developed.

**Requirements and Milestones:**

- TBD

**Project Deliverables and Due Date:**

- TBD

**Presentations & Publications:**

*Stochastic System Modeling of Infrastructure Resiliency*, with Niki Goerger, 48th Annual Conference of Operational Research Society (ORS), Bath, England, September 2006.

*Stochastic System Modeling of Infrastructure Resiliency*, with Niki Goerger, INFORMS MAS Conference: Homeland Security in the 21st Century, Mystic, CT, July 2006.

**Personnel Briefed:**

COL Shep Barge, LTC Steve Knight, Bob Larkin, Doug Herbert and Paul Warhola from the J8, 30 August 2006.

**Status:**

- TBD

# Modeling System Interaction via Linear Influence Dynamics

DSE Project No: DSE-R-0629

Client Organization: None

Senior Investigator(s): Patrick J. Driscoll, Ph.D.

## Points of Contact:

| NAME | ADDRESS | PHONE | OTHER |
|------|---------|-------|-------|
|------|---------|-------|-------|

TBD

## Problem Description:

Securing the US borders is a daunting task made ever so much challenging due to the adaptive nature of illegal crossing tactics used. Initiatives such as the America Shield Initiative [1] and the SBInet Initiative [2] seek to improve the situation by deploying sophisticated sensor and communications technology along the borders, especially the areas the various areas in between official crossing points. Any technological system deployed in this manner becomes part of an existing networked environment of interacting systems, and in doing so, propagates a host of affects throughout this network.

This paper introduces a methodology aimed at assisting systems decision making by illuminating the tradeoff options with regards to system effects as influence is propagated stochastically throughout the composite border network over time. Using an example core set of nine interacting systems exhibiting asymmetric influence relationships, we demonstrate that it is possible to uncover first and higher order stochastically-based effects using elements of social network theory, influence dynamics, and cause maps. The collective set of these effects, being comprised of both beneficial and detrimental elements from the perspective of major system stakeholders, coupled with the midrange dynamic characterizations of the composite system behavior, form a basis for choosing the level of technology to deploy in the context of tradeoff. A natural measure of the relative stress the new system will experience once deployed follows directly, which by subsequently applying graph theoretical measures.

## Proposed Work:

- Characterize the system dynamics of the border environment in terms of linear control expressions.
- Define first and higher order influence propagation measures.
- Create a methodology to assess the end-state tradeoffs in state condition factors that support the systems decision concerning the level of technology to deploy along the US border.

## Results Summary:

A simple, linear system representation,  $s(t+1) = A^T s(t)$  was used to model the dynamics involved with relevant systems. Pairwise causal relationships,  $a_{ij}$  between factors  $i$  and  $j$  were then estimated using reference sources in the literature relevant to system

interaction. The asymmetric influence matrix  $A$  was then adjusted to include individual probabilities of successful transmission of influence on each arc, proportional to the degree of presence of that factor within the border environment.

Nine interacting systems and over 100 major driving factors were identified as significant to the influence network comprising the US border environment. A reduced set of 27 factors were used to demonstrate the efficacy of this modeling approach. The component values of  $A$  were selected in such a way to reasonably represent both positive and negative influence as it is propagated through a single time step. A discrete dynamic system was then modeled in software to time step through sufficient number of epochs to allow for patterns of direction to be assessed for each state condition level.

Technology was then inserted into the mix, using three notional levels of sensor package capability and the appropriate major system factors associated with technology. The immediate and midterm effects were then propagated via the discrete dynamic system. Stress on this new technology factor was estimated using measures of centrality and degrees of dependence upon the technology factors by the other systems.

The resulting stochastic simulation showed that the modeling process is capable of determining the effects of influence, that is, the direction and degree of movement of the state condition levels relative to the influence dynamics present. At this point, the final state condition vector clearly shows that a pattern of beneficial and detrimental effects will arise via this propagation. Some of these effects are non-monotonistic over the period of the simulation. This is important because it illustrates that there could be periods where a beneficial effect of technology might be observed for a short period of time, followed by a detrimental effect, and vice-versa, confounding assessment activities during those time periods. A forecasted level of stress under which the sensor system will be placed upon deployment was easily determined using a series of shortest path routines over the influence network.

**Requirements and Milestones:**

- TBD

**Project Deliverables and Due Date:**

- TBD

**Presentations and Publications:**

*Meta-models, Perspectives, and Systems Thinking*, invited presentation to the staff and faculty of Dept of Industrial & Systems Engineering, University of Arkansas, Fayetteville, Arkansas, May 2006.

**Personnel Briefed:**

- TBD

**Status:**

- TBD

## PART VI - Faculty Activity, Academic Year 2006

(\* Indicates multiple department authors)

Figure IV.1 is a roll-up of DSE faculty activities for Academic Year 2006. The numbers represented are inclusive.

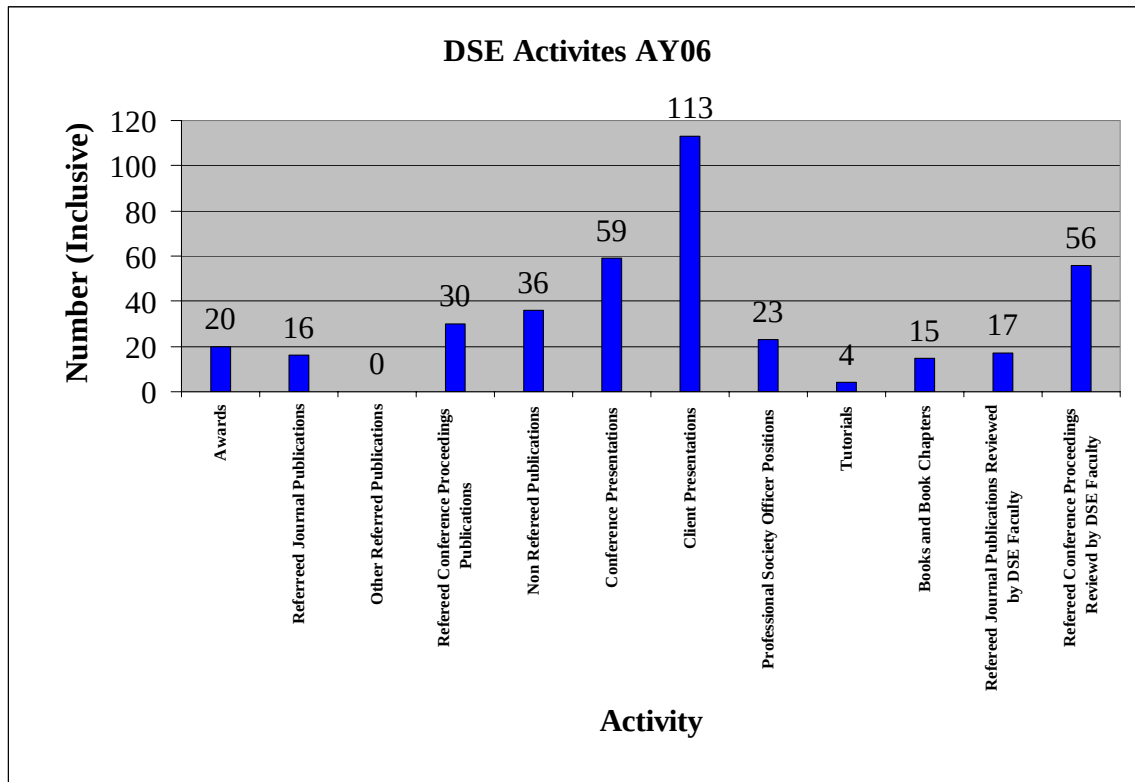


**Figure IV.1 Department of Systems Engineering Faculty Activities for Academic Year 2006**

The remainder of this section is a layout of specific faculty activities for each of the DSE faculty members for Academic Year 2006. These are the activities reported by each faculty member as of 31 May 2006 and are inclusive from 01 July 2005 until 30 June 2006.

## ***BLAND, WILLIAM, PH.D., Lieutenant Colonel***

### **Refereed Journal Publications**

Bland, William S., "A Simulation-Based Policy Iteration Approach to Sensor Management," submitted to Military Operations Research, currently under revision.

Bland, William S., "SNOOPS: A Distributed Sensor Network Simulation Model," submitted to Military Operations Research, currently under revision.

### **Non-Refereed Publications**

LTC Tim Trainor\*, Dr. Greg Parnell\*, LTC Brigitte Kwinn\*, MAJ John Brence\*, CPT Eric Tollefson\*, Ms. Robin Burk\*, MAJ Patrick Downes\*, LTC William Bland\*, CPT Jason Wolter\*, MAJ John Harris\*, USMA Study of the Installation Management Agency CONUS Region Structure, DSE-R-0506, DTIC # ADA-427027, United States Military Academy, November, 2004.

**Number of Refereed Journal Publications reviewed:** Two

### **Non-Refereed Publications (List each by name)**

Bland, William. S, McFadden, Willie, J., and McGinnis, Michael L., "Decision Making Education through Information Visualization and Simulation Technology," Proceedings of Society for Applied Learning Technology New Learning Technologies 2006 Conference, February 8-10, 2006.

Bland, William. S, McFadden, Willie, J., and McGinnis, Michael L. "Creating an Immersive Command and Control Environment for Military Decision Making Education," abstract accepted for Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), December 4-7, 2006.

Bland, William. S, McFadden, Willie, J., and McGinnis, Michael L., "Creating an Immersive Command and Control Simulation Environment," abstract accepted for Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), December 4-7, 2006.

Bland, William. S, McFadden, Willie, J., and McGinnis, Michael L., "Creating an Immersive Command and Control Environment for Military Decision Making Training," abstract accepted for Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), December 4-7, 2006.

### **Conference Presentations**

COL Mike McGinnis, LTC William Bland, and LTC Willie McFadden, "Decision Making Education through Information Visualization and Simulation Technology," Society for Applied Learning Technology New Learning Technologies 2006 Conference, February 8-10, 2006, Orlando, FL.

## **BOYLAN, GREGORY L., M.S.I.E., Major**

### **Awards**

2006 Barchi Prize nomination for best presentation in 73<sup>rd</sup> MORSS working group, West Point, NY, June, 2005 (paper submitted in January 2006).

### **Refereed Journal Publications**

Boylan, G. L., E.S. Tollefson, M.J. Kwinn, Jr., and R. Guckert, "Using Value Focused Thinking to Select a Simulation Tool for the Acquisition of Infantry Soldier Systems," to be published in the *INCOSE Journal of Systems Engineering*, Vol. 9, No. 1.

Tollefson, E.S., G.L. Boylan, and M.J. Kwinn, Jr., "A Systems Engineering Approach to Determining Simulation Requirements for the Acquisition of Infantry Soldier Tactical Mission Systems," submitted to *Military Operations Research Journal*, January 2006, in review.

Boylan, G. L., B. L. Foote, R. Burk, "A Preliminary Analysis of Loitering Aircraft as a Capability Added to Anti-Ballistic Missile Systems," submitted to *Military Operations Research Journal*, February 2006, in review.

### **Refereed Conference Proceedings Publications**

Boylan, G. L., B. L. Foote, R. Burk, 2005, "A Preliminary Analysis of Launching KE Kill Missiles From a UAV with Loitering Capability," published in the *Proceedings of the 73<sup>rd</sup> Military Operations Research Society Symposium*, West Point, NY.

Boylan, G. L., S. R. Goerger, 2006, "Capabilities-based Design of a Battle Command Training Center," Presentation only, *2006 IIE Annual Conference*, Orlando, FL, 21-24 May 2006.

### **Non-Refereed Publications**

Boylan, G. L., B. L. Foote, R. Burk, "Loitering Aircraft as a Capability Added for Anti-Ballistic Missile Systems," in *Phalanx: The Bulletin of the Military Operations Research*, Vol. 39, No. 1, 10-11, March 2006.

***BURK, ROBIN***

**Non-Refereed Conference Presentations**

Burk, Robin and Martin, Phillip. "Client-based Projects in a Capstone Course", Presentation, SUNY Geneseo, Conference on Faculty-Student Partnerships in Teaching and Learning, May 17, 2006.

## **BURK, ROGER C., PH.D.**

### **Award**

Army Commander's Award for Public Service for work on the USMA periodic review of institutional accreditation.

Nominated for Barchi Prize for best presentation at Military Operations Research Society (MORS) Symposium, West Point, NY, 22 Jun 2005.

### **Refereed Conference Presentation**

Greg Boylan, Roger Burk, and Bobbie Foote. "Loiter Aircraft as a Capability Added to ABM Systems," Presentation, Institute of Industrial Engineers (IIE) Annual Conference, Orlando, FL, 20-24 May 2006.

### **Refereed Conference Proceedings Publication**

J. Wolter, R. C. Burk, B. Foote, N. Goerger, W. McFadden, and T. E. Trainor. "Development of an Acquisition Management Course," Proceedings of the 2005 American Society for Engineering Education Annual Conference and Exposition.

### **Non-Refereed Publication**

G. L. Boylan, B. L. Foote, and R. C. Burk. "Loitering Aircraft as a Capability Added for Anti-Ballistic Missile Systems," *Phalanx*, Vol. 39, No. 1 (March 2006), pp. 10-11.

### **Non-Refereed Conference Presentations**

L. Germann, B. Lee, T. Severson, M. Wesmiller, and R. C. Burk. "Arming Army UAVs," Presentation, Military Operation Research Society Symposium (MORSS), West Point, NY, 22 Jun 2005.

Roger C. Burk. "The Research and Development Portfolio Problem," Presentation, International Federation of Operational Research Societies (IFORS) Triennial Conference, Honolulu, HI, 11 Jul 2005.

G. L. Boylan, B. L. Foote, and R. C. Burk. "A Preliminary Analysis of Launching KE Kill Missiles from a UAV with Loitering Capability," Presentation, Military Operations Research Society (MORS) Symposium, West Point, NY, 22 Jun 2005.

Roger C. Burk. "The Research and Development Portfolio Problem," Presentation Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

### **Client Presentation**

"Lunar Base Logistical Support," Not Applicable SA Marshall Space Flight Center, Jun 2005.

### **Books or Book Chapters**

Burk, Roger C. (2006). Chapter 6: Systems Engineering in Professional Practice, *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

**Professional Society Officer Position**

Co-Chair, Working Group 11 (Unmanned Vehicles), Military Operations Research Society (MORS Council Member, Military Applications Section (MAS), Institute for Operations Research and Management Sciences (INFORMS).

**Number of Refereed Journal Publications Reviewed**

Three

**Professional Committee Representations**

Chair of the Faculty Development Subcommittee of the Faculty Council, USMA.

## **DRISCOLL, PATRICK J., Ph.D.**

### **Refereed Journal Publications**

“A Meta-Model Architecture for Fusing Battlefield Information,” with Steve Henderson. Military Operations Research Journal, Vol 11(1), 27 – 48. Meta-models, Perspectives, and Systems Thinking, invited presentation to the staff and faculty of Dept of Industrial & Systems Engineering, University of Arkansas, Fayetteville, Arkansas, May 2006.

### **Non-Refereed Conference Presentations**

A Meta-model Architecture for Operational State Inference with Steve Henderson. Invited presentations given to:

- Staff and faculty of the Defense Analysis Department, Naval Postgraduate School, Monterey, CA, January 2005;
- NYC INFORMS Professional Chapter, New York, New York, February 2005; and
- Office of Force Transformation, Office of Secretary of Defense, Crystal City, Maryland, March 2005. Reliability of Information-Fueled Services in Network Centric Operations. With Mike Tortorella. 10<sup>th</sup> International Command and Control Research and Technology Symposium, Tysons Corners, Virginia, June, 2005.

Considerations of Quality and Reliability in Designing a Common Operating Picture. With Ed Pohl, Mike Tortorella. International Federation of Operational Research Societies (IFORS) tri-annual conference, Honolulu, HI, July, 2005.

Information Uncertainty in a Sense and Respond Logistics Architecture. With Ed Pohl and Joel Nachlas. International Federation of Operational Research Societies (IFORS) tri-annual conference, Honolulu, HI, July, 2005.

Frameworks, Meta-models, and Systems Thinking. Invited presentation to the faculty and graduate students of Department of Industrial & Systems Engineering, University of Arkansas, Fayetteville, AR, May, 2006.

Measuring Resiliency of Metropolitan Areas: A Systems Interdependency Framework. With Niki Goerger, 74<sup>th</sup> MORS Symposium, Colorado Springs, CO, June, 2006.

### **Books or Book Chapters**

Parnell, Gregory S., Driscoll, Patrick J, and Henderson, Dale L. (2006). *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

### **Professional Society Officer Positions**

Chairperson, IFORS Military Applications Cluster

Chairperson, INFORMS COMAP Subcommittee

**Number of Refereed Journal Publications you reviewed:** Four

***EVANGELISTA, PAUL F. Captain***

**Awards**

Rensselaer Founders Award of Excellence

I/ITSEC Graduate Student (Doctoral) Scholarship

**Refereed Conference Proceedings Publications** (List each by name)

Evangelista, Paul F., Mark J. Embrechts, Piero Bonnisone, and Boleslaw K. Szymanski.

“Fuzzy ROC Curves for Unsupervised Nonparametric Ensemble Techniques,”  
IJCNN 2005, pp. 3040-3045, Montreal, Canada, August 2005.

Evangelista, Paul F., Mark J. Embrechts, and Boleslaw K. Szymanski. “Data Fusion for  
Outlier Detection through Pseudo-ROC Curves and Rank Distributions,” IJCNN  
2006, (in print), Vancouver, Canada, July 2006.

Evangelista, Paul F., Mark J. Embrechts, and Boleslaw K. Szymanski. “Taming the Curse  
of Dimensionality in Kernels and Novelty Detection,” in Ajith Abraham, Bernard  
de Baets, Mario Köppen, Bertram Nickolay (Eds.), Applied Soft Computing  
Technologies: The Challenge of Complexity, Springer Verlag, 2006.

**Number of Refereed Journal Publications you reviewed:** Four

***FOOTE, BOBBIE LEON, PH.D.***

**Non-Refereed Publications**

Bobbie Leon Foote and Simon R. Goerger. “Design Considerations for Simulating ABM Systems,” Tech Report DSE-R-0531, Operations Research Center of Excellence, West Point, NY, Oct 2005.

## ***GOERGER, NIKI C., PH.D.***

### **Awards**

SIWzie nomination for must see paper presentation at 2006 Spring Simulation Interoperability Workshop, Huntsville, AL, 02-07 April, 2006.

### **Refereed Journal Publications**

Paul W. Richmond, Curtis L. Blais, and Niki C. Goerger. “Development of a Ground Vehicle Maneuver Ontology to Support the Common Operational Picture”, CrossTalk The Journal of Defense Software Engineering. July 2006.

### **Refereed Conference Proceedings Publications**

Blais, C. L., N. C. Goerger, P. Richmond, B. Gates, and J. B. Willis (2005b). “Global Information Grid Services and Generation of the Mobility Common Operational Picture,” Paper 05F-SIW-107, Fall Simulation Interoperability Workshop, Simulation Interoperability Standards Organization, Orlando, FL, September 2005.

Goerger, N. C., C.L. Blais, B. Gates, J. A. Nagle, and R. R. Keeter (2006). “Toward Establishing the Mobility Common Operational Picture: Needs Analysis and Ontology Development in Support of Interoperability,” Paper 06FS-SIW-044, Spring Simulation Interoperability Workshop, Simulation Interoperability Standards Organization, Huntsville, AL, April 2006.

Simon R. Goerger, Niki Goerger, Gregory C. Griffin, and Paul West. “Modeling Traffic Flow Strategies in Countering Improvised Explosive Devices”, 06S-SIW-045, 2006 Spring Simulation Interoperability Workshop, Huntsville, AL, 02-07 April, 2006.

Ernest Wong, Niki Goerger, Robert Keeter, and Simon Goerger. “Creating the Army Digital Terrain Catalog—A Case Study in Rapid Prototyping and Allowing Market Forces to Help Determine Standards”, 10th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI), Orlando , FL. 16-19 July 2006.

Robin Burk, Niki Goerger, Burhman Gates, Curt Blais, Joyce Nagel, and Simon Goerger. “Knowledge Representation for Military Mobility Decision-Making by Humans and Intelligent Software Agents”, INFORMS Computing Science Conference Proceedings. To appear January 2007.

### **Non-Refereed Publications**

Richmond, P., J. Willis, C. L. Blais, N. C. Goerger, and J. A. Nagle (2005a). Synthesis of Data Representations for Ground Vehicle Mobility and Suggested Representation of the Mobility COP. Project No SIMCI-2005-007. U.S. Army Engineer Research and Development Center, Vicksburg, MS, 31 July 2005. ERDC LR-05-01.

Blais, C. L., N. C. Goerger, J. A. Nagle, B. Q. Gates, P. Richmond, and J. Willis (2005a). Stakeholders Analysis and Design of a Common Data Model for the Mobility COP. Project No SIMCI-2005-007. U.S. Army Engineer Research and Development Center, Vicksburg, MS, 31 December 2005. ERDC LR-05-02.

Richmond, P., C. L. Blais, J. A. Nagle, N. C. Goerger, B. Gates, and J. Willis (2006). Web Services Identified for the Mobility-COP. Project No SIMCI-2005-007. U. S. Army Engineer Research and Development Center, Vicksburg, MS, 1 February 2006. ERDC LR-06-01.

### **Non-Refereed Conference Presentations**

LTC John Willis, Paul Richmond, Curtis Blais, and Niki Goerger. “Defining a Common Operational Picture for Ground Vehicle Mobility”, Presentation, International Federation of Operational Research Societies (IFORS), Tri-annual meeting, Honolulu, HI, 11-15 July 2005.

Niki C. Goerger, Simon R. Goerger, Greg Griffin, and Paul West. “Feasibility Study - Modeling VIED Detection and Defeat in Urban Environments using Agent Based Mode”, Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Niki C. Goerger, Simon R. Goerger, Paul West, and Willie McFadden. “Vehicle Mobility Model Fidelity in M&S; Exploring Higher-Order Effects”, Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Niki C. Goerger and Patrick J. Driscoll, “Measuring Resiliency of Metropolitan Areas: A Systems Interdependency Framework”, Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Burhman Gates, Niki Goerger, Curtis Blais, Joyce Nagle, Paul Richmond, and John Willis. “Interoperable Common Maneuver Networks”, Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Simon R. Goerger, Niki Goerger, Gregory C. Griffin, and Paul West. “Assessing Effects of Traffic Control Point Strategies on Vehicle-Borne Improvised Explosive Devices using Agent Based Models”, Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

### **Workshop Presentations**

Niki C. Goerger. “MOVE Standards Category Overview and Path Forward”, Presentation, Army M&S Standards Workshop, Fort Belvoir, Virginia, 19-21 July 2005.

Niki C. Goerger. “USMA M&S Education and Activities Update”, DoD M&S Education Colloquium. Alexandria, Virginia, 13-14 September 2005.

### **Client Presentations**

Visitor Demos – (GEN Byrnes, GEN Kern (Ret), GEN Griffin, LTG Otstott, MG Bostick, BG Halstead, COL Stone, COL Bray, Rotary Club International, ERDC)

In-Progress Reviews & Final Briefings – 26 (ADTC (4), VBIED (2), Armed Robotic Platforms (8), Resilience for DHS (10), MCOP (2))

**Professional Society Officer Positions**

Executive Council, Military Operations Research Society – elected secretary, June 2006.

Board of Directors, Military Operations Research Society.

Military Environmental Factors, Working Group Chair, Military Operations Research Society.

Publications Committee Chair, Military Operations Research Society.

**Number of Refereed Journal Publications Reviewed:** One

**Number of Refereed Conference Proceedings Publications you reviewed:** One

**Professional Committee Representations**

Military Operations Research Society Special Meeting Committee, “Capabilities-Based Planning II: Identifying, Classifying and Measuring Risk in a Post 9-11 World”, June 2005 – December 2005.

Search and Selection Committee, Force Transformation Chair, United States Military Academy, October – November 2005.

DoD M&S Education Colloquium, Defense Model and Simulation Office, United States Military Academy representative.

US Army Engineer Research and Development Center Representative to the Soldier Focus Area Collaborative Team Executive Committee.

US Army Engineer Research and Development Center Representative to the Urban Operations Focus Area Collaborative Team, Executive Committee.

Military Operations Research Society, Publications Committee, Chair, June 2005-June 2006.

Military Operations Research Society, Education and Professional Development Committee, June 2005 – June 2006.

Military Operations Research Society, Prize Committee, June 2005 – June 2006.

Military Operations Research Society, Education Colloquium Planning Committee, June 2005 – April 2006.

US Army MOVES Standards Category Coordinator, 1997 – present.

**Proposal Reviews**

Reviewed over 50 proposals seeking funding as member of the Executive Committee for the Urban Operations Focus Area Collaborative Team and Soldier Focus Area Collaborative Team.

## **GOERGER, SIMON R., PH.D., Lieutenant Colonel**

### **Awards**

SIWzie nomination for must see paper presentation at 2006 Spring Simulation Interoperability Workshop, Huntsville, AL, 02-07 April, 2006.

### **Refereed Conference Proceedings Publications**

Simon R. Goerger, Niki Goerger, Gregory C. Griffin, and Paul West. "Modeling Traffic Flow Strategies in Countering Improvised Explosive Devices", 06S-SIW-045, 2006 Spring Simulation Interoperability Workshop, Huntsville, AL, 02-07 April, 2006.

Ernest Wong, Niki Goerger, Robert Keeter, and Simon Goerger. "Creating the Army Digital Terrain Catalog—A Case Study in Rapid Prototyping and Allowing Market Forces to Help Determine Standards", 10th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI), Orlando , FL. 16-19 July 2006.

### **Non-Refereed Publications**

Bobbie Leon Foote and Simon R. Goerger. "Design Considerations for Simulating ABM Systems," Tech Report DSE-R-0531, Operations Research Center of Excellence, West Point, NY, Oct 2005.

### **Non-Refereed Conference Presentations**

Bobbie Leon Foote and Simon R. Goerger. "Design Considerations for Simulating ABM Systems," Presentation, Huntsville Simulation Conference 2005, Huntsville, AL, 26-27 October 2005.

Michael Kwinn, Simon R. Goerger, Greg Boylan, and Tom Morel (2005). "Effects Based Assessment Support System (EBASS) Implementation," Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Niki C. Goerger, Simon R. Goerger, Greg Griffin, and Paul West. "Feasibility Study - Modeling VIED Detection and Defeat in Urban Environments using Agent Based Mode," Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Niki C. Goerger, Simon R. Goerger, Paul West, and Willie McFadden. "Vehicle Mobility Model Fidelity in M&S; Exploring Higher-Order Effects," Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Simon R. Goerger, Niki C. Goerger, Paul West, and Willie McFadden. "Assessing Ground Mobility Model Fidelity Effects on Simulation for the Future Force," Presentation, Future Ground Forces *The Next Generation of Warfighters*, Arlington, VA, 28 -29 June 2005.

Simon R. Goerger, Niki Goerger, Gregory C. Griffin, and Paul West. "Assessing Effects of Traffic Control Point Strategies on Vehicle-Borne Improvised Explosive Devices using Agent Based Models", Presentation, Military Operation Research

Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Simon R. Goerger, Stephen P. Fuller, Jeffrey D. Glick, Thomas P. Kavanaugh, and Arlan C. Sheets. "Using Commercial Simulation Software to Model Linear and Non-Linear Processes: US Military Academy Reception-Day Simulation and Optimization," Presentation, 8th Annual Systems Engineering Conference, San Diego, CA, 24-27 October 2005.

Simon R. Goerger, Stephen P. Fuller, Jeffrey D. Glick, Thomas P. Kavanaugh, and Arlan C. Sheets. "Educating Future Systems Engineers: US Military Academy Reception-Day Simulation and Optimization," Presentation, 8th Annual Systems Engineering Conference, San Diego, CA, 24-27 October 2005.

Simon R. Goerger. "Effects Based Assessment Support System (EBASS)," Presentation, 9<sup>th</sup> US/German Operations Research Symposium, Aberdeen Proving Grounds, MD, 05-07 October 2005.

#### **Non-Refereed Conference Presentations (Presented by not Authored)**

Doug McInvale. "Chaplain Deployment Assignment Tool", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Ernest Wong. "Conditioned Based Maintenance: A Lean & Six Sigma Paradigm that Enhances Combat Power for the US Army", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Ernest Wong. "Deciding on Maintenance Paradigms—A Decision Analysis Tool for Categorizing Components for condition-Based, Schedule-Based, or Runt-to-Failure Maintenance", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Ernest Wong. "Six Sigma and the Systems Engineering & Management Process—Two Contrasting Approaches to Better," Presentation, 2006 Institute for Operations Research and the Management Sciences (INFORMS) International, Hong Kong, China. 25-28 June 2006.

Ernest Wong. "The Armed Forces CARES—A Tool for Simplifying, Enhancing, and Improving the Military's Casualty Assistance Program", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Greg Boylan. "Using Systems Engineering and Simulation to Develop and Design a Capabilities-based Battle Command Training Center", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

John Halstead. "Support Vector Machine Feature Selection with an Application towards US Army Delayed Entry Program Losses", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Steve Henderson. "Data Warehouse to Support Condition Based Maintenance," Presentation, International Federation of Operational Research Societies, Honolulu, HI, 12 July 2005.

### **Non-Refereed Conference Proceedings Publications**

Bobbie Leon Foote and Simon R. Goerger. "Design Considerations for Simulating ABM Systems," Proceedings from Huntsville Simulation Conference 2005, Huntsville, AL, 26-27 October 2005.

### **Client Presentations**

"AY05 Final Briefing and AY06 Initial IPR to Brigadier General Moran, PEO-Soldier"

Visitor Demos – (Dr College, GEN Kern (Ret), GEN Griffin, LTG(R) Otstott, MG Thompson, MG Bostick, BG Halstead, BG Finnegan, COL Torgersen, COL Stone, etc...)

Initial Client Meetings – 15 (AMC, Battle Command Simulation Experiment Directorate, Casualty Assistance Office, Chaplains Office, DRAPER Labs, Human Resources Command, J5, J9, JFCOM, Joint IED Task Force, Mobile Gun System, Not ApplicableTICK, ODAS, PEO-Soldier, PM-Soldier, State Department, TACOM, etc...)

In-Progress Reviews – 17 (ADTC, BCTC, EBASS, AF-CARES, COMFORT, ODAS, HRC, TACOM, AMC, PEO-Soldier, PM-Soldier, MGS, VBIED)

Final Briefings – 9 (ADTC, BCTC, EBASS, AF-CARES, COMFORT, ODAS, HRC, PEO-Soldier, MGS)

### **Books or Book Chapters**

West, Paul D., Kobza, John E., and Goerger, Simon R. (2006). Chapter 3: Systems Modeling and Analysis, *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

### **Tutorials delivered**

Simon. R. Goerger. "EBASS: Effects Based Methodologies", Presentation to J5-IMPC-EM, Pentagon, Alexandria, VA, 03-05 August 2005.

### **Professional Society Officer Positions**

Advances in Military Operations Research, Working Group Chair, Military Operations Research Society (MORS); 74<sup>th</sup> MORS Symposium, United States Air Force Academy, Colorado Springs, CO.13-15 June 2006.

Army and R&D Representative to Gaming Special Committee for Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), 2006.

Army Representative to Research and Development (R&D) Committee Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), 2006.

Chair, Academic Research Council, United States Military Academy, March 2006 to May 2007.

Session Chair (Military Operations Research Activities at USMA) in Military Applications Cluster, Institute for Operations Research and Management Sciences (INFORMS); 2005 INFORMS Annual Meeting, San Francisco, CA. 13-16 November 2005.

### **Number of Refereed Journal Publications Reviewed**

Seck, Mamadou; Giambiasi, Norbert; Frydman, Claudia; and Baati, Lassaad. (2005) “DEVS For Human Behavior Modelling in CGFs” To be published in *The Journal of Defense Modeling and Simulation: Applications, Methodology, Technology*, Summer 2005.

### **Number of Refereed Conference Proceedings Publications you reviewed**

“Using Ontologies to Harmonize Data Models Among Communities of Interest (cOIs)”, 10th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI), Orlando , FL. 16-19 July 2006.

37 Abstracts for R&D Committee, I/ITSEC 2006

Bird Dog for one paper for R&D Committee, I/ITSEC 2006

Five papers for - 3DUI 2006: The 1st IEEE Symposium on 3D User Interfaces, Alexandria, Virginia USA. 25-26 March 2006

- #132 - Spatio-Temporal Visualization of Battlefield Entities and Events
- #162 - Notational Based Simulation of Mixed Interactions: Simulation-Based Prototyping
- #171 - Route Previews: Enhancing the Route Selection Process in Large-Scale Virtual Environments
- #178 - Survey on Challenges Regarding the Design of 3D User Interfaces for Car Drivers
- #188 - WorldMirror and WorldBottle: Components for Multispace Visualization in a 3D Virtual Environment

### **Professional Committee Representations**

DSE Representative to the 27<sup>th</sup> ORSA Advisory Committee. Fort Lee, VA. 12 October 2005.

DSE Representative to the Interagency Working Group on R&D for Regional Stability Workshop on Models, Simulations, Games and Tools for Regional Stability, Alexandria, VA, 15-16 December 2006.

ORCEN and DSE Representative to the Soldier FACT, Fort Benning, GA, 12-13 January 2006.

## ***GRIFFIN, GREGORY C., Major***

### **Awards**

SIWzie nomination for must see paper presentation at 2006 Spring Simulation Interoperability Workshop, Huntsville, AL, 02-07 April, 2006.

### **Refereed Conference Proceedings Publications**

Simon R. Goerger, Niki Goerger, Gregory C. Griffin, and Paul West. “Modeling Traffic Flow Strategies in Countering Improvised Explosive Devices”, 06S-SIW-045, 2006 Spring Simulation Interoperability Workshop, Huntsville, AL, 02-07 April, 2006.

### **Non-Refereed Conference Presentations**

Niki C. Goerger, Simon R. Goerger, Greg Griffin, and Paul West. “Feasibility Study - Modeling VIED Detection and Defeat in Urban Environments using Agent Based Mode,” Presentation, Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2005, San Francisco, CA, 13-16 November 2005.

Simon R. Goerger, Niki Goerger, Gregory C. Griffin, and Paul West. “Assessing Effects of Traffic Control Point Strategies on Vehicle-Borne Improvised Explosive Devices using Agent Based Models”, Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

## **HALSTEAD, JOHN B., PH.D., Lieutenant Colonel**

### **Refereed Journal Publications**

Halstead, John, Support Vector Machine Feature Selection with a Recursive Kernel Criterion, *IEEE Transaction on Systems, Man, and Cybernetics*, Submitted December 2005.

Halstead, John, Support Vector Machine Feature Selection with an Application towards U.S. Army Delayed Entry Program Losses, *Military Operations Research Journal*, Submitted January 2006.

### **Refereed Conference Proceedings Publications**

Sullivan, Shane and John Halstead, *Improved Ballistic Test and Evaluation Methodology*, IEEE Systems and Information Engineering Conference, Charlottesville, VA, April 2006.

### **Non-Refereed Publications**

Halstead, John. *Support Vector Machine and Regression Feature Selection with an Application towards Classification*, Doctoral Dissertation, University of Virginia, Charlottesville, VA, August 2005.

Halstead, John. *Recruiter Selection Model*. Technical Report AFIT/EN-TR-02-01, Operations Research Center of Excellence, United States Military Academy, West Point, NY, March 2006.

Halstead, John. *Improved Ballistic Test and Evaluation Methodology*. Technical Report AFIT/EN-TR-02-01, Operations Research Center of Excellence, United States Military Academy, West Point, NY, April 2006.

### **Conference Presentations**

Halstead, John “*Support Vector Machine Feature Selection with an Application towards U.S. Army Delayed Entry Program Losses*,” Accessions Research Conference, United States Army Accessions Command, Hampton, VA, October 2005.

Halstead, John “*Support Vector Machine Feature Selection with an Application towards U.S. Army Delayed Entry Program Losses*,” Military Operations Research Symposium, Military Operations Research Society, Colorado Springs, CO, June 2006.

Halstead, John “*Support Vector Machine Feature Selection with a Recursive Kernel Criterion*,” Military Operations Research Symposium, Military Operations Research Society, Colorado Springs, CO, June 2006.

### **Client Presentations**

Halstead, John. “Recruiter Selection Data Mining Proposal” Presentation, MG Bostick, Commanding General, United States Army Recruiting Command, Fort Knox, KY, January 2006.

Halstead, John. “Recruiter Selection Data Mining Proposal” Presentation, Mr. John McLaurin, Assistant Secretary of Army, Manpower and Reserve Affairs, Pentagon, January 2006.

Halstead, John. "Recruiter Selection Model Approval and Implementation" Presentation, MG Bostick, Commanding General, United States Army Recruiting Command, Fort Knox, KY, April 2006.

## ***HENDERSON, DALE L., PH.D., Lieutenant Colonel***

### **Books or Book Chapters**

Henderson, Dale, L., Heuristic and Exact Techniques for Solving a Temperature Estimation Model, Dissertation, The University of Arizona, Tucson, Arizona, December 2005.

### **Conference Presentations**

Henderson, Dale L. “Heuristic and Exact Techniques for Solving a Temperature Estimation Model,” Institute for Operations Research and the Management Sciences, San Francisco, California, 15 November 2005.

### **Tutorials**

Henderson, Dale L. “A Gentle Introduction to LaTeX and Digital Typesetting,” Department of Systems Engineering Professional Develop Program, West Point, NY, 15 March 2006.

### **Books or Book Chapters**

Parnell, Gregory S., Driscoll, Patrick J, and Henderson, Dale L. (2006). *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

***HOYLE, HEIDE J., Major***

**Refereed Conference Proceedings Publications**

Trainor, Timothy E., and Heidi J. Hoyle. “Systems Engineering as a Foundation of Engineering Management Education,” 113<sup>th</sup> Annual American Society of Engineering Education Annual Conference and Exposition, Chicago, Illinois USA, 18-21 June 2006.

**Conference Presentations**

Trainor, Timothy E., and Heidi J. Hoyle. “Systems Engineering as a Foundation of Engineering Management Education,” 113<sup>th</sup> Annual American Society of Engineering Education Annual Conference and Exposition, Chicago, Illinois USA, 18-21 June 2006.

## ***KEETER, ROBERT R., M.S., Major***

### **Refereed Journal Publications**

Haimes, Yacov Y., Keeter, Robert R., "Assessing Officer Strength in the War on Terrorism," submitted for consideration to Military Operations Research Journal 1 July 2005.

Goerger, Niki C., Keeter, Robert R., Wong, Ernest Y., Goerger, Simon R., "Creating the Army Digital Terrain Catalogue—A Case Study in Prototyping and Allowing Market Forces to Determine Standards," submitted for consideration to WMSCI 2006, April 2006.

### **Non-Refereed Publications**

Blais, Curtis L., Goerger, Niki C., Keeter, Robert R., Nagle, Joyce A., Gates, Burhman, "Toward Establishing the Mobility Common Operational Picture: Needs Analysis and Ontology Development in Support of Interoperability," 2006 Spring Simulation Interoperability Workshop, 2-7 April 2006.

Keeter, Robert R., Parnell, Gregory, "Applying Value-Focused Thinking to Effects Based Operations," ORCEN Technical Report DSE-BCR-0520, September 2005.

### **Conference Presentations**

Keeter, Robert R., Parnell, Gregory, "Applying Value-Focused Thinking to Effects Based Operations," ORCEN Technical Report DSE-BCR-0520, June 2005.

Keeter, Robert R., McCulloh, Ian, "Using Simulation to Analyze Detailed Chemical Decontamination", 74<sup>th</sup> MORSS, USAFA, Colorado Springs, Colorado, July 2006.

Blais, Curtis L., Goerger, Niki C., Keeter, Robert R., Nagle, Joyce A., Gates, Burhman, "Toward Establishing the Mobility Common Operational Picture: Needs Analysis and Ontology Development in Support of Interoperability," 2006 Spring Simulation Interoperability Workshop, 2-7 April 2006.

### **Client Presentations**

Goerger, Niki C., Keeter, Robert R., "Army Digital Terrain Catalog", AMSO, 1 February 2006.

Keeter, Robert R., McCulloh, Ian, "Using Simulation to Analyze Detailed Chemical Decontamination," JPM DECON, 7 April 2006.

## ***KEWLEY, ROBERT H., PH.D., Lieutenant Colonel***

### **Refereed Conference Proceedings Publications**

Newkirk, Brandon, David Dunham, Michael McClain, Jason McCoy and Robert Kewley, "United States Military Academy: Simulation Modeling of Inventory and Distribution," *Proceedings of the 2006 Systems and Information Engineering Design Symposium*, Ellen J. Bass, editor, To be published.

### **Books or Book Chapters**

Kewley, Robert H., Mark J. Embrechts, and Robert A. Bress. *Feature Selection via Sensitivity Analysis with Direct Kernel Partial Least Squares* in Feature Extraction: Foundations and Applications I. Guyon, S. Gunn, M. Nikravesh, and L. Zadeh eds., Springer, 2006.

Kwinn, M. J. and R. Kewley (2006). Chapter 11: Decision Making, *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

### **Conference Presentations**

Kewley, Robert H. "Army Model of Indigenous Guerilla Operations" Workshop on Agent Based Models and Other Analytic Tools in Support of Stability Operations, Military Operations Research Society, McLean, Virginia, 26 October 2005.

Kewley, Robert H., Andy Farnsler, Mike Stollenwerk, Mark Brantley, John Bott, and Seth Howell. "Geospatial Analysis for Assessments of the Effectiveness of Joint Operations" West Point, New York: Presentation at 73<sup>rd</sup> Military Operations Research Society Symposium, June 2005.

## **KOBZA, JOHN, PH.D., Visiting Professor**

### **Refereed Journal Publications**

Sheldon H. Jacobson, Tamana Karnani, John E. Kobza, and Lynsey Ritchie, “A Cost-Benefit Analysis of Alternative Device Configurations for Aviation Checked Baggage Security Screening,” *Risk Analysis*, Vol. 26, No. 2, pp. 297-310, April, 2006.

Julie L. Virta, Laura A. McLay, Sheldon H. Jacobson and John E. Kobza, “Integer Program Models for Deployment of Airport Baggage Screening Security Devices,” *Optimization and Engineering*, Vol. 6, No. 3, pp. 339-359, September, 2005.

Laura McLay, Sheldon H. Jacobson and John E. Kobza, , “Multilevel Passenger Screening Strategies for Aviation Security Systems,” *Naval Research Logistics* (accepted).

### **Non-refereed Publications**

Laura A. McLay, Sheldon H. Jacobson, and John E. Kobza, “Making Skies Safer,” *ORMS Today*, Vol. 32, No. 5, pp. 24-31, October, 2005.

### **Refereed Conference Presentations**

Contributed Paper (with Jackrapong Attagara and Sheldon H. Jacobson), IIE Annual Conference, 20-24 May 2006, Orlando, Florida, “Allocating Explosive Screening Devices for Aviation Security.”

### **Non-Refereed Conference Presentations**

Contributed Paper (with Laura McLay and Sheldon H. Jacobson), INFORMS 2005 National Meeting, 13-16 November 2005, San Francisco, California, “Intelligence vs Technology: A Tale of Two Approaches in Aviation Security Baggage Screening.”

Contributed Paper (with Laura McLay and Sheldon H. Jacobson), INFORMS 2005 National Meeting, 13-16 November 2005, San Francisco, California, “Integer Programming Models and Analysis for Multilevel Passenger Prescreening Problems.”

Invited Presentation, IIE Annual Conference, 20-24 May 2006, Orlando, Florida, “How to Attend a Conference.”

### **Client Presentations**

AY06 Final Briefing – Mr. James L. Nelson, JPM Individual Protection, JPEO for Chemical and Biological Defense.

### **Books or Book Chapters**

West, Paul D., Kobza, John E., and Goerger, Simon R. (2006). Chapter 3: Systems Modeling and Analysis, *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

**Professional Society Service**

Reviewer for Computers & Operations Research, 2005.

Judge, Mathematical Contest in Modeling, 2006.

***KWINN, BRIGITTE T., MS., Lieutenant Colonel***

**Refereed Journal Publications**

Trainor, Timothy E., Gregory S. Parnell, Brigitte Kwinn, John Brence, Eric Tollefson, Pat Downes. *The US Army Uses Decision Analysis in Designing Its US Installation Regions*. Interfaces Vol. xx, No. x, Xxxxx 2006, issn 0092-2102.

## **KWINN, MICHAEL J. Jr., PH.D., Lieutenant Colonel**

### **Refereed Journal Publications**

Brence, J., Kwinn, M. J., and Thomas, D., “Qualitative and Quantitative Analysis for US Army Recruiting Input Allocation”, accepted in the *Military Operations Research Journal*, June 2006.

Tollefson, E. S., G. L. Boylan, M. J. Kwinn and R. Guckert, “A Systems Engineering Approach to Determining Simulation Requirements for the Acquisition of Infantry Soldier Tactical Mission Systems,” accepted for publication in *Systems Engineering*, March 2006.

Tollefson, E. S., G. L. Boylan, and M. J. Kwinn, “Using Systems Engineering to Provide Decision Support for the Acquisition of Infantry Soldier Systems,” submitted to *Military Operations Research Journal*, January 2006, in first review.

Downes, P., M. J. Kwinn, D. Brown, “Proving Situational Awareness Impact in the Land Warrior Project,” submitted to *Military Operations Research Journal*, November 2005, in first review.

Brockett, P. L., W.W. Cooper, L. Golden, S.C. Kubhakar, M.J. Kwinn and B. Layton “Estimating Elasticities with Frontier and Other Regressions for Use in Evaluating Alternative Advertising Strategies for Military Recruitment” submitted to *Management Science*, January 2006, in 1<sup>st</sup> Review.

### **Non-Refereed Publications**

Morel, T., E. Wong, S. Goerger, M. J. Kwinn, R. Dodge, “Effects Based Assessment Support System (EBASS)” Tech Report DSE-R-0539, Operations Research Center of Excellence, West Point, NY, June 2006.

### **Books or Book Chapters**

K. Wormer, A. Hall, M. J. Kwinn, T. Shriver and D. Cashman, “Manpower and Personnel,” Best Practices in Operational Analysis, ed. Larry Rainey and Andy Loerch, book in final editing, December 2005.

Kwinn, M. J. and R. Kewley (2006). Chapter 11: Decision Making, *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

### **Professional Society Officer Positions**

Secretary, Executive Council and Board of Directors, Military Operations Research Society, June 2005-June 2006.

**LINDBERG, TRAVIS J., M.S., Major**

**Non-Refereed Publications**

Joe Manous, Timothy E. Trainor, Travis J. Lindberg, et. al. "Infrastructure Intelligence and Data Collection Soldier's Guide," USMA Infrastructure Assessment Team, Jun 2005.

*The aforementioned guide contributed directly to the following publication: "The SWEAT/ IR Book, Infrastructure Reconnaissance," Version 2.1, U.S. Army Engineer School, 06 Oct 2005.*

**Non-Refereed Conference Presentations**

Travis J. Lindberg, Joe Manous, Ronald Welch, and Tim E. Trainor. "Infrastructure Assessment Methodology" Presentation, Military Operation Research Society Symposium (MORSS), US Military Academy, West Point, NY, 13-15 June 2005.

**Workshop Presentations**

Timothy E. Trainor, Ronald W. Welch, Hurt T. Thompson, Travis J. Lindberg. "Overview of Knowledge Management for the Base Camp/ JFOB Community of Practice," Presentation and Working Group, U.S. Army Engineer School ENFORCE 2006, St. Louis, MO, 1 – 2 May 2006.

## **MARTIN, PHILLIP G., M.S., Major**

### **Refereed Conference Proceedings Publications**

Martin\*, P. G., Schamburg, J. B., and Kwinn\*, M. J., Jr., 2005, "Acquisition-Based Simulation," *Proceedings of the 2005 Winter Simulation Conference*, Orlando, FL, 2005.

Martin, P. G., "Systems Engineering Capstone Experience at United States Military Academy," accepted for publication in the *Proceedings of the 2006 American Society of Engineering Education*, Chicago, IL, June 2006.

### **Non-Refereed Publications**

Martin\*, P. G., Schamburg\*, J. B., Goerger\*, M. N., and Kwinn\*, M. J., Jr., *Modeling and Simulation Terrain Database Management*. Technical Report DSE-R-0504, Operations Research Center of Excellence, United States Military Academy, 2005.

Martin\*, P. G., Schamburg\*, J. B., and Kwinn\*, M. J., Jr., *PEO Soldier Simulation Roadmap: Initial Steps in Implementation*. Technical Report DSE-R-0501, Operations Research Center of Excellence, United States Military Academy, 2005.

### **Conference Presentations**

Martin\*, P. G., Schamburg\*, J. B., Goerger\*, M. N., and Kwinn\*, M. J., Jr., 2005, "Finding the Right Terrain Database," in the *Proceedings of the 73rd Military Operations Research Society Symposium*, West Point, NY, 2005.

Martin\*, P. G., Schamburg\*, J. B., and Kwinn\*, M. J., Jr., 2005, "Creating Requirements for High-Resolution Infantry Simulations," Presentation at the 17th Triennial Conference of the International Federation of Operational Research Societies (IFORS), 2005, Honolulu, HI.

## **McINVALE, HOWARD, D., M.S. Major**

### **Awards**

Silver Quill Award. Presented by the Army Chemical Review for excellence in journal publication. October 2005.

### **Refereed Journal Publications**

McInvale, H.D. "Decontamination," Co-directed undergraduate research authored by Cadets Meredith Walton and Edward Hoogland (Probability and Statistics Writing Competition winner). *Journal for Undergraduate Science and Engineering (JUSE)*. Accepted for publication.

McCulloh, I.A., McInvale, H.D., and Gussenhoven, R. *Take Boards! Problems, Resources and Issues in Undergraduate Mathematics Studies (PRIMUS)*. June 2005. pp 145-156.

### **Non-Refereed Publications**

McCulloh, I.A., McInvale, H.D. "Cadets Study Decontamination," *Army Chemical Review*. October 2005.

Howard D. McInvale. "Hollis Award Coming: Sharpen Your Minds (and Your Pencils)," *Pointer View*. 07 October 2005.

Howard D. McInvale. "Cadet Jorgensen Wins 2006 Hollis Award," *Pointer View*. 05 May 2006.

### **Non-Refereed Conference Presentations**

Howard D. McInvale. "Chaplain Deployment Assignment Tool", Presentation, Military Operation Research Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

Howard D. McInvale. "Quality Drives Lean Conference." Joint Meetings of the American Society for Quality and the Institute of Industrial Engineers. Atlanta, GA. 30-31 October 2006.

Howard D. McInvale, Adam Maciuba and Michael Mingler. "COMFORT (Chaplain's Office Model For Operational Resource Tracking)," Spuyten Duyvil Undergraduate Mathematics Conference. 25 March 2006.

Ernest Y. Wong and Howard D. McInvale. "All Aboard the Lean and Six-Sigma Bandwagon in the DOD: Are We Monitoring the Most Appropriate Measures of Effectiveness?" Quantitative Methods & Statistical Applications in Defense and National Security. Santa Monica, CA. 15 February 2006.

Howard. D. McInvale. "One Summer School and Two Pentagon Projects." Seminar presentation. Department of Mathematical Sciences Center for Faculty Development. 20 October 2005.

### **Client Presentations**

Visitor Briefing Participant for Department of Systems Engineering Briefs to MG Thompson (Director of Program Analysis & Evaluation) and Mr. Kelly (Deputy Undersecretary of the Army).

#### Initial Client Meetings – 2

Office of the Chief of Chaplains, Pentagon, Washington, DC  
Office of the Director of the Army Staff, Pentagon, Washington, DC

#### In-Progress Reviews – 2

Office of the Chief of Chaplains, Pentagon, Washington, DC  
Office of the Director of the Army Staff, Pentagon, Washington, DC

Final Briefing for COMFORT (Chaplain's Office Model For Operational Resource Tracking) presented to CH(MG) David Hicks, Chief of Chaplains. Crystal City, VA. 28 April 2006.

Final Briefing for Office of the Director of the Army Staff Effectiveness and Efficiency Review presented to LTG James Campbell, Director of the Army Staff. Pentagon, Washington, DC. 28 February 2006.

#### **Tutorials delivered**

Howard D. McInvale. "Acid Redux," Presentation to CGSC-ILE, Fort Belvoir, VA, August 2005.

#### **Professional Societies/Memberships/Honors**

Institute for Industrial Engineering (IIE); Alpha Pi Mu; Omega Rho.

Command and General Staff Officer Course- Intermediate Level Education (CGSOC-ILE)  
Fort Belvoir, VA. Graduated 9 Sept. 2005.

Six Sigma certifications. Presented by the Institute of Industrial Engineering (IIE).

Six Sigma Green Belt, completed 27 September 2005.

Six Sigma Yellow Belt, completed 15 November 2005.

Lean Enterprise: An Introduction, completed 6 March 2006.

Six Sigma Black Belt, completed 10 April 2006.

#### **Professional Committee Representations**

Hollis Award Committee Chair. USMA representative and coordinator for the 2006 Walter W. Hollis Award. 19 April 2006.

***MILLER, KENT, M.S., Lieutenant Colonel***

**Non-Refereed Publications (List each by name)**

Miller, Kent, "Risk Assessment in Military Decision Making," USAWC Thesis, May 2006.

## **PARNELL, GREGORY S., Ph.D.**

### **Awards**

Military Operations Research Journal Award, Military Operations Research Society, 2005

Who's Who in Engineering Education, 2005

United States Army, Dr. Wilbur B. Payne Memorial Award, Special Award, 2005

United State Army Outstanding Civilian Service Award, 2006

### **Refereed Journal Publications**

Buckshaw, D. L., Parnell, G. S., Unkenholz, W. L., Parks, D. L., Wallner, J. M. and Saydjari, O. S., "Mission Oriented Risk and Design Analysis of Critical Information Systems," *Military Operations Research*, 2005, Vol 10, No 2, pp. 19-38.

Westphal D., Szafranski R., and Parnell G., "Strategic Planning for the Air Force: Leveraging Business Planning Insights to Create Future Value," *Air Power: Journal of Air Power and Space Studies*, Center for Air Power Studies, New Delhi, India, Vol 2, No 2, Summer 2005 (April-June), pp. 119-139 [Reprinted from Aerospace Power Journal].

Ewing, P., Tarantino, W., and Parnell G., "Use of Decision Analysis in the Army Base Realignment and Closure (BRAC) 2005 Military Value Analysis," *Decision Analysis Journal*, Vol 3, No1, March 2006, pp. 33-49.

Trainor\*, T., Parnell\*, G., Kwinn\*, B., Brence\*, J and Tollefson\*, E., Downes, P., "Decision Analysis Aids Regional Organization Design", *Interfaces*, accepted November 2005, awaiting publication.

### **Non-Refereed Publications**

LTC(P) Robert Powell\*, Gregory S. Parnell\*, Patrick J. Driscoll\*, Major Gregory Boylan\*, LTC Daniel Evans, CPT Thaddeus Underwood, Mrs. Margaret Moten, USMA Study of the Residential Communities Initiative (RCI) Portfolio and Asset Management (PAM) Operations Research Center Of Excellence Technical Report No. DSE-TR-0612, DTIC#: ADA444325, United States Military Academy, March 2006.

Tierney, Susan F., Chapman, Robert, Dyer, James S., Heller, Miriam, Nelson, Gary G., Nicol, David M., Parnell, Gregory S., Paulson, Glenn, and Radzicki, Michael, Technical Review Report, February 28- March 1, 2006, Critical Infrastructure Protection Decision Support System (CIPDSS) for Department of Homeland Security, Office of Science and Technology, April 1, 2006.

### **Conference Presentations**

LTC Tim Trainor\* and Gregory S. Parnell\*, "USMA Study of the Installation Management Agency CONUS Region Structure," Military Operations Research Society Symposium, June 21-23, 2005, United States Military Academy, West Point, NY.

- COL William Tarantino, MAJ Paul (Lee) Ewing, MAJ John Harris\*, and Gregory S. Parnell\*, “Using Decision Analysis for BRAC 2005,” Military Operations Research Society Symposium, June 21-23, 2005, United States Military Academy, West Point, NY.
- Corky Parks, Bill Unkenholz, Don Buckshaw, and Gregory S. Parnell, “Characterizing, Quantifying, and Trading-Off Security Risk in Competing Information System Architectures,” Military Operations Research Society Symposium, June 21-23, 2005, United States Military Academy, West Point, NY.
- LTC Tim Trainor\*, Gregory S. Parnell\*, “USMA Study of the Installation Management Agency CONUS Region Structure,” International Federation of Operations Research Societies Triennial Conference 2005, July 11-15, 2005, Honolulu, Hawaii.
- Gregory S. Parnell, “Value-Focused Thinking for Environment, Defense and Intelligence,” ORCONXUVRAXUVT Conference: OR 47 Conference, September 9-13, 2005, Chester University College, UK.
- Gregory S. Parnell, “Decision Analysis: The Science of Better (Decisions),” Methodologies for Allocation of Resources Conference, September 23, 2005, Buenos Aires, Argentina.
- COL William Tarantino, MAJ Paul (Lee) Ewing, and Gregory S. Parnell, “2005 Base Realignment and Closure (BRAC) Analysis Support for The Army Basing Study,” 44<sup>th</sup> Army Operations Research Symposium, October 11 – 13, 2005, U.S. Army Logistics Management College, Ft. Lee, Virginia.
- Don Buckshaw, Robin Dillon-Merrill and Gregory S. Parnell, “Applying Mission Oriented Risk and Design Analysis to a Mission Assurance Problem,” Institute for Operations Research and Management Science (INFORMS) Annual Meeting, November 13-15, 2005, San Francisco, CA.
- COL William Tarantino, MAJ Paul (Lee) Ewing, and Gregory S. Parnell, “Use of Decision Analysis in Army Base Realignment and Closure (BRAC) 2005 Military Value Analysis,” INFORMS Annual Meeting, November 13-15, 2005, San Francisco, CA.
- Gregory S. Parnell and Robin Dillon, “Decision Analysis Insights for Homeland Security,” Society for Risk Analysis Annual Meeting, December 4-7, 2005, Orlando, FL.
- Don Buckshaw and Gregory S. Parnell, “Threat Modeling in Mission Oriented Risk and Design Analysis (MORDA),” Society for Risk Analysis Annual Meeting, December 4-7, 2005, Orlando, FL.
- Gregory S. Parnell, “Decision Analysis Tools for Risk Management of Industrial Ports and Harbors,” North Atlantic Treaty Organization Workshop - Risk Management Tools for Port Security, Critical infrastructure, and Sustainability, March 13-16, 2006.
- Gregory S. Parnell, “Staying Relevant and Creating Enduring Value,” Keynote Address, Decision Analysis Affinity Group Meeting, March 30-31, 2006, Baltimore, MD.
- COL William Tarantino, MAJ Paul (Lee) Ewing, and Gregory S. Parnell, “Military Value Analysis: Using Decision Analysis in the 2005 Army Base Realignment and

Closure,” INFORMS Practice Conference 2006, April 30-May 2, 2006, Miami, FL.

### **Service/Professional Society Officer Positions**

President, Decision Analysis Society, Institute for Operations Research and Management Science

Member, Technology Panel of the National Security Agency Advisory Board

Member, Department of Homeland Security, Office of Science and Technology, Critical Infrastructure Protection Decision Support System, Technical Review Panel

Member, INFORMS Decision Analysis Journal Editor Search Committee

Member, Distinguished Review Board for the Air Force Institute of Technology’s Center for Operational Analysis

Working Group Chair, Military Operations Research Workshop - Analysis for Non-Traditional Security Challenges: Methods and Tools, February 21-23, 2006

Decision Analysis Working Group Co-Chair, Not Applicable TO Workshop - Risk Management Tools for Port Security, Critical infrastructure, and Sustainability, March 13-16, 2006

### **Client/Invited Presentations**

“Value-Focused Thinking for Capability-Based Planning: Leadership Overview,” June 29, 2005, Ministério da Defesa Nacional, Lisbon, Portugal.

“Value-Focused Thinking for Capability-Based Planning: Technical Overview,” June 30, 2005, Portuguese Military Academy, Lisbon, Portugal.

“Swing Weight Matrix”, September 14, 2005, London School of Economics and Political Science, London, UK.

“Representing Uncertainty and Risk in Intelligence Analysis,” President’s Foreign Intelligence Advisory Board, March 13, 2006, New Executive Office Building, Washington, DC.

### **Books or Book Chapters**

Parnell, G. S., Dillon-Merrill, R. L., and Bresnick, T. A., 2005, *Integrating Risk Management with Homeland Security and Antiterrorism Resource Allocation Decision-Making*, **The McGraw-Hill Handbook of Homeland Security**, David Kamien, Editor, pp. 431-461.

Parnell, G. S., *Value-Focused Thinking Using Multiple Objective Decision Analysis, Methods for Conducting Military Operational Analysis: Best Practices in Use Throughout the Department of Defense*, Military Operations Research Society, (Forthcoming Fall 2006).

Parnell, Gregory S., Driscoll, Patrick J, and Henderson, Dale L. (2006). *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

**Number of Refereed Journal Publications Reviewed:** Five

**POWELL, ROBERT A., Ph.D., Lieutenant Colonel**

**Awards**

Institute for Operations Research and the Management Sciences (INFORMS) Young Researcher Roundtable Recipient, 2006 Conference on OR/MS Practice, 30 April – 2 May 2006.

**Refereed Journal Publications**

Powell, R.A. and Dennis Buede. Decision Making for Successful Product Development. *Project Management Journal*, vol 37 no.1, 2006.

**Refereed Conference Proceedings Publications**

Powell, R. A. and Dennis M. Beude. *Innovative Systems Engineering: A Creative System Development Approach*, Proceedings of the INCOSE 2006: Systems Engineering: Shining Light on the Tough Issues, Orlando, Florida, 9-13 July 2006.

Sullivan, Shane, Matt Hoffman, Tynika Holland, Sean Kim and Robert Powell. *First Term Dental Readiness—Ft. Benning*, Proceedings of the IEEE Systems and Information Engineering Design Symposium, Charlottesville, Virginia, 28 April 2006.

**Books or Book Chapters**

Powell, Robert. (2006). Chapter 12: Solution Implementation. *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

**Client Presentations**

Powell, Robert, Gregory Parnell, Patrick Driscoll, Gregory Boylan, Daniel Evans, Thaddeus Underwood, and Margaret Moten. 2006. “USMA Study of the Residential Communities Initiative (RCI) Portfolio and Asset Management (PAM),” ORCEN *Technical Report* No. DSE-TR-0612, West Point, New York.

**Number of Refereed Conference Proceedings Publications you reviewed:** Eight

## **RIPPERT, THOMAS A., M.S., Major**

### **Refereed Conference Proceedings Publications**

Rippert, Thomas A., and Jeffrey B. Schamburg. "Simulation Modeling for the Future Force Warrior," Tenth Annual International Conference on Industrial Engineering Theory, Applications and Practice, Clearwater Beach Florida USA, December 4-7, 2005.

Rippert, Thomas A., and Jeffrey B. Schamburg. "Simulation Data Analysis for the Future Force Warrior," Tenth Annual International Conference on Industrial Engineering Theory, Applications and Practice, Clearwater Beach Florida USA, December 4-7, 2005.

### **Non-Refereed Publications**

Comstock, James M., Christopher D. Freeborg, Brian J. Martinez, Cameron P. Turner, Darcy L. Wilson, Thomas A. Rippert. *Future Force Warrior: Simulation Produced Data Analysis*. Operations Research Center of Excellence Technical Report XXXXXX. DTIC XXXXXXXX. West Point, New York: United States Military Academy, January 2006.

### **Conference Presentations**

Rippert, Thomas A., and Jeffrey B. Schamburg. "Simulation Modeling for the Future Force Warrior," Tenth Annual International Conference on Industrial Engineering Theory, Applications and Practice, Clearwater Beach Florida USA, December 4-7, 2005.

Rippert, Thomas A., and Jeffrey B. Schamburg. "Simulation Data Analysis for the Future Force Warrior," Tenth Annual International Conference on Industrial Engineering Theory, Applications and Practice, Clearwater Beach Florida USA, December 4-7, 2005.

### **Client Presentations**

Comstock, James M., Christopher D. Freeborg, Brian J. Martinez, Cameron P. Turner, Darcy L. Wilson, Thomas A. Rippert. *Future Force Warrior: Simulation Produced Data Analysis*. To Mr. Bill Harris of the FFW Analysis and Experimentation Team. West Point, New York: United States Military Academy, January 19, 2006.

***ROEDERER, RODNEY L., M.S., Lieutenant Colonel***

**Professional Society Officer Positions**

Manpower and Personnel, Working Group Co-Chair, Military Operations Research Society (MORS); 74<sup>th</sup> MORS Symposium, United States Air Force Academy, Colorado Springs, CO.13-15 June 2006.

## ***SPERLING, BRIAN K., PH.D., Lieutenant Colonel***

### **Awards**

Best Project in Decision Analysis Working Group at 2006 Capstone Conference, United States Military academy, West Point, N.Y., 4 May, 2006.

### **Refereed Conference Proceedings Publications (accepted for publication)**

Brian K. Sperling and Amy Pritchett, Georgia Institute of Technology. “Information Distribution to Improve Team Performance in Military Helicopter Operations: An Experimental Study”, Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) 2006.

Brian K. Sperling and Amy Pritchett, Georgia Institute of Technology. “Information Sharing During Team Navigation: An Experimental Study”, Human Factors and Ergonomics Society’s 50<sup>th</sup> annual meeting (HFES), 2006.

### **Non-Refereed Publications**

Brian K. Sperling and Amy Pritchett, Georgia Institute of Technology; and Arthur Estrada and Gina E. Adam, USAARL. “Information Distribution in Complex Systems to Improve Team Performance”, USAARL Report 2006-03. Fort Rucker, Al., January 2006.

### **Non-Refereed Conference Presentations**

Sperling, Brian, Hwang, Peter, Domme, Sarah, Kim, Philip , Wang, Matthew. “Identifying the Top Hazards in Army Ground Vehicle Operations” Presentation, 2006 IEEE Systems and Information Engineering Design Symposium, University of Virginia, 28 April 2006.

Sperling, Brian , Stramara, Kevin, Gutierrez, Thomas , Wells, Caleb, Caleb, Tanner, Christopher. “Casualty Assistance System Analysis” Presentation, 2006 IEEE Systems and Information Engineering Design Symposium, University of Virginia, 28 April 2006.

Sperling, Brian, Hwang, Peter, Domme, Sarah, Kim, Philip , Wang, Matthew. “A Value Focused Approach to Identifying the Top Hazards in Army Ground Vehicle Operations” Society Symposium (MORSS), US Air Force Academy, Colorado Springs, CO, 13-15 June 2006.

### **Non-Refereed Conference Proceedings Publications**

Sperling, Brian, Hwang, Peter, Domme, Sarah, Kim, Philip, Wang, Matthew. “Identifying the Top Hazards in Army Ground Vehicle Operations” 2006 IEEE Systems and Information Engineering Design Symposium, University of Virginia, 28 April 2006.

Sperling, Brian, Stramara, Kevin, Gutierrez, Thomas, Wells, Caleb, Caleb, Tanner, Christopher. “Casualty Assistance System Analysis” 2006 IEEE Systems and Information Engineering Design Symposium, University of Virginia, 28 April 2006.

**Client Presentations**

Initial Client Meetings – Two (Human Resources Command, Combat Readiness Center)

In-Progress Reviews – Four (Human Resources Command, Combat Readiness Center)

Final Briefings – Two (Human Resources Command, Combat Readiness Center)

***THOMPSON, KURT T., M.S., Major***

**Refereed Conference Proceedings Publications**

Thompson, Kurt T., Trainor, Timothy, E. “Developing Base Camps to Support Military Operations Worldwide,” 26<sup>th</sup> Annual National Conference of the American Society of Engineering Management (ASEM). Virginia Beach, Virginia, October 2005.

**Conference Presentations**

Thompson, Kurt T., Trainor, Timothy E. “Developing Base Camps to Support Military Operations Worldwide,” Presented at the 26<sup>th</sup> National Conference of the American Society of Engineering Management (ASEM). Virginia Beach, Virginia, October 2005.

**Workshops Delivered**

Trainor, Timothy, Welch, Ronald, Thompson, Kurt T., Lindberg, Travis J. 3<sup>rd</sup> Annual Base Camp Workshop. Held in partnership with the Department of Systems Engineering, Department of Civil and Mechanical Engineering, and the U.S. Army Engineer School. St. Louis, Missouri 1-2 May 2006.

## **TRAINOR, TIMOTHY, L., Ph.D., Colonel**

### **Awards**

Best Undergraduate Engineering Management Program in the Nation for 2005 – Selected by the American Society of Engineering Management while I was the EM Program Director.

### **Refereed Journal Publications**

Trainor, Timothy E., and Gregory Parnell (2006). Using Stakeholder Analysis to Define the Problem in Systems Engineering. Submitted to *Systems Engineering*, The Journal of the International Council on Systems Engineering, May 2006.

Trainor, Timothy E., Parnell, Gregory, Kwinn, Brigitte, Brence, John, Tollefson, Eric, and Downes, Patrick (2005). Decision Analysis Aids Regional Organizational Design. *Interfaces*, accepted for publication Oct 2005.

### **Refereed Conference Proceedings Publications**

Trainor, Timothy E. and Hoyle, Heidi. (2006). Systems Engineering as a Foundation of Engineering Management Education. *Proceedings of the 2006 National Conference of the American Society of Engineering Education (ASEE)*. June 2006.

Lee, Matthew, Noblin, Jack, Reynolds, Brian, Roberts, Brad and Trainor, Timothy (2006). 2005 BRAC Attribute Analysis. *Proceedings of the 2006 Systems and Information Engineering Design Symposium*. Sponsored by the Institute of Electrical and Electronics Engineers (IEEE). IEEE Catalog Number: 06EX1421C, pages 254-259.

Thompson, Kurt, T., and Trainor, Timothy, E. (2005). Developing Base Camps to Support Military Operations Worldwide. *Proceedings of the 26<sup>th</sup> National Conference of the American Society for Engineering Management (ASEM)*. Norfolk, Virginia, October 26-29, 2005.

### **Non-Refereed Publications**

Dacunto, P., Doyle, B., Epolito, W., Fleming, S., Guerrie, M., Jordano, J., Klosky, L., Lindberg, TJ, Manous, J., Trainor, T., and Welch, R. (2005). *A Soldier's Guide for Infrastructure Information & Data Collection (I2DC)*. United States Military Academy, West Point, NY, June 15, 2005.

### **Books or Book Chapters**

Trainor, Timothy E., and Parnell, Gregory (2006). Chapter 9: Problem Definition, *Systems Decision Making in Systems Engineering and Management*. John Wiley & Sons, Inc., Hoboken, New Jersey. To be published July 2006.

### **Workshops / Tutorials delivered**

Trainor, Timothy, Welch, Ronald, Thompson, Travis and Lindberg, TJ. Ran a workshop for the US Army Engineer School (USAES) on “Preparing for Tomorrow’s Base Camps” for approximately 75 primarily Army personnel involved in planning and supporting base camps. Workshop was held in St. Louis on 1-2 May 2006.

***WOLTER, JASON, A., Major***

**Honors & Awards**

US Delegate. Member of a US delegation headed by the Deputy Undersecretary of the US Army, to attend the 9<sup>th</sup> US-German Operations Research & Simulation Symposium, Aberdeen Proving Ground, MD.

**Refereed Conference Proceedings Publications**

Kwinn, Michael J. Jr., Ph.D., Henderson, Steve, Wolter, Jason A., Operations Research Assistance for Deployed Operational Units. Presentation at the 17<sup>th</sup> Triennial Conference of the International Federation of Operational Research Societies (IFORS) July 2005, Honolulu, Hawaii.

## **WONG, ERNEST Y., M.S., M.A, Major**

### **Awards**

United States Military Academy Center for Teaching Excellence Master Teacher Certification, 15 May 2006.

Institute for Operations Research and the Management Sciences (INFORMS) Young Researcher Roundtable Recipient, 2006 Conference on OR/MS Practice, 30 April – 2 May 2006.

Alpha Pi Mu National Honor Society for Excellence in Industrial Engineering Inductee, 8 March 2006.

West Point Black & Gold Volunteer Award for Exemplary Service as an Officer Representative for the Army Men and Women's Tennis Teams, September 2005.

Omega Rho International Honor Society for Operations Research and Management Science Inductee, 26 May 2005.

### **Refereed Conference Proceedings Publications**

Wong, Ernest Y. "Seeing is Believing: Interactively Simulating A Financial Portfolio to Demonstrate the Benefits of Diversification," *Proceedings of the 2006 ED-MEDIA World Conference on Educational Multimedia, Hypermedia, & Telecommunications*, Orlando, FL, 26-30 June 2006. In press.

Wong, Ernest Y. "Using Simulation to Promote Undergraduate Learning: Going Beyond Simple Answers and Getting Students to Analyze, Synthesize, and Evaluate. *Proceedings of the 2006 Society for Information Technology and Teacher Education International Conference*, Orlando, FL, 20-24 March 2006.

### **Non-Refereed Publications**

Wong, Ernest Y. "Teaching the Practical so Students Can Do the Practicable II: Teaching Students to Proactively Manage their Federal Income Tax," *Proceedings of the 2006 Spring Middle-Atlantic Section of the American Society for Engineering Education Conference*, Brooklyn, NY, 28-29 April 2006.

Wong, Ernest Y. "Refocusing on the Operational Level of Pedagogy: A Military Analogy for Bridging Educational Strategy with Classroom Tactics," *Proceedings of the 2006 American Society for Engineering Education New England Regional Conference*, Worcester, MA, 17-18 March 2006.

Wong, Ernest Y. "Defining Appropriate Metrics for Operating Within a Condition-Based Maintenance Paradigm," Operations Research Center of Excellence white paper written on behalf of the United States Army Aviation and Missile Command, Redstone Arsenal, AL, 27 February 2006.

Wong, Ernest Y. "The Department of Systems Engineering Presentations at the INFORMS Conference," *Assembly Magazine*, West Point, NY, January/February 2006.

Wong, Ernest Y. "Engineers Attend INFORMS," *Pointer View Newspaper*, West Point, NY, 2 December 2005.

Wong, Ernest Y. "Teaching the Practical so Students Can Do the Practicable," *Proceedings of the 2005 Fall Middle-Atlantic Section of the American Society for Engineering Education Conference*, Stony Brook, NY, 28-29 October 2005.

Wong, Ernest Y. "Simulating Student Investment Ideas to Interactively Teach about Diversification," *Proceedings of the 2005 Huntsville Simulation Conference*, Huntsville, AL, 25- 27 October 2005.

Wong, Ernest Y. "How to Leverage Simulation in Condition-Based Maintenance," Operations Research Center of Excellence white paper written on behalf of the United States Army Aviation and Missile Command, Redstone Arsenal, AL, 17 August 2005.

### **Conference Presentations**

Wong, Ernest Y. "Seeing is Believing: Interactively Simulating A Financial Portfolio to Demonstrate the Benefits of Diversification," accepted for the 2006 ED-MEDIA World Conference on Educational Multimedia, Hypermedia, & Telecommunications, Orlando, FL, 26-30 June 2006.

Wong, Ernest Y. "Six Sigma and Simulation: A Yin and Yang Approach towards the Pursuit of Better," accepted for the 2006 Institute for Operations Research and the Management Sciences (INFORMS) International Conference, Hong Kong, China, 25-28 June 2006.

Wong, Ernest Y. "Deciding on Maintenance Paradigms--A Decision Analysis Tool for Categorizing Components for Condition-Based, Schedule-Based, or Run-To-Failure Maintenance," accepted for the 2006 Military Operations Research Society Symposium, Colorado Springs, CO, 13-15 June 2006.

Wong, Ernest Y. "Condition-Based Maintenance: A Six Sigma & Lean Paradigm that Enhances Combat Power for the U.S. Army," accepted for the 2006 Military Operations Research Society Symposium, Colorado Springs, CO, 13-15 June 2006.

Wong, Ernest Y. "The Armed Forces CARES—A Tool for Simplifying, Enhancing, and Improving the Military's Casualty Assistance Program," accepted for the 2006 Military Operations Research Society Symposium, Colorado Springs, CO, 13 June 2006.

Wong, Ernest Y. "Investing and Gambling for Active Learning," accepted for the 2006 Conference on Faculty-Student Partnerships in Teaching and Learning, Geneseo, NY, 16-19 May 2006.

Wong, Ernest Y. "Teaching the Practical so Students Can Do the Practicable II: Teaching Students to Proactively Manage their Federal Income Tax," accepted for the 2006 Spring Middle-Atlantic Section of the American Society for Engineering Education Conference, Brooklyn, NY, 28-29 April 2006.

Wong, Ernest Y. "Using Simulation to Promote Undergraduate Learning: Going Beyond Simple Answers and Getting Students to Analyze, Synthesize, and Evaluate," presented at the 2006 Society for Information Technology and Teacher Education International Conference, Orlando, FL, 23 March 2006.

- Wong, Ernest Y. “Refocusing on the Operational Level of Pedagogy: A Military Analogy for Bridging Educational Strategy and Classroom Tactics,” presented at the 2006 American Society for Engineering Education New England Regional Conference, Worcester, MA, 17 March 2006. Also served as Co-Chair for the Innovations in Engineering Education Track.
- Wong, Ernest Y., and Howard D. McInvale. “All Aboard the Lean and Six Sigma Bandwagon in DOD—Are We Monitoring the Most Appropriate Measures of Effectiveness?” presented at the 2006 Conference on Quantitative Methods and Statistical Applications in Defense and National Security, Santa Monica, CA, 15 February 2006.
- Wong, Ernest Y. “Leveraging Math & Simulation to Teach Students about Investing—the Good, the Bad, & the Ugly,” presented at the 2006 Society for Applied Learning Technology Conference, Orlando, FL, 9 February 2006.
- Wong, Ernest Y. “Simulation Modeling: A Socratic Method for Guiding College Students to Learn and Explore Uncertainties,” presented at the 2006 Hawaii International Conference on Education, Honolulu, HI, 7 January 2006.
- Wong, Ernest Y. “How to Leverage Simulation in Condition-Based Maintenance,” presented at the 2005 Winter Simulation Conference, Orlando, FL, 5 December 2005.
- Wong, Ernest Y. “Condition-Based Maintenance for U.S. Army Aviation—A Methodology for Selecting Components for CBM,” presented at the 2005 Institute for Operations Research and Management Sciences Conference, San Francisco, CA, 15 November 2005.
- Wong, Ernest Y. “Teaching the Practical so Students Can Do the Practicable,” presented at the 2005 Fall Middle-Atlantic American Society for Engineering Education Conference, Stony Brook, NY, 28 October 2005.
- Wong, Ernest Y. “Simulating Student Investment Ideas to Interactively Teach about Diversification,” presented at the 2005 Huntsville Simulation Conference, Huntsville, AL, 26 October 2005.
- Wong, Ernest Y. “Replacing Variance for Assessing Portfolio Risk,” presented at the 2005 Army Conference for Applied Statistics, Monterey, CA, 19 October 2005.

### **Client Presentations**

- Wong, Ernest Y, and Simon Goerger, “Armed Forces Casualty Assistance Readiness Enhancement Systems (CARES) Version 1.0,” to COL Mary Torgersen, Director, Casualty & Memorial Affairs Operations Center (CMAOC), U.S. Army Human Resources Command, United States Military Academy, West Point, NY, 2 March 2006.
- Wong, Ernest Y. “Armed Forces Casualty Assistance Readiness Enhancement System (CARES) Milestones,” to the Department of Defense Casualty Advisory Board and members of the Government Accounting Office, Randolph Air Force Base, TX, 24 January 2006.
- Wong, Ernest Y. “Armed Forces Casualty Assistance Readiness Enhancement System (CARES) Goals and Objectives,” to Mr. Mark Ward and Ms. Betsy Graham,

Office of the Deputy Under Secretary of Defense, Office of Family Policy, ,  
Alexandria, VA, 12 December 2005.

Wong, Ernest Y. “Condition-Based Maintenance for U.S. Army Aviation—A  
Methodology for Selecting Components for CBM,” to Mr. Robert Brown, G-3  
CBM Lead, U.S. Army Aviation and Missile Command (AMCOM), Redstone  
Arsenal, AL, 30 November 2005.

**Number of Refereed Conference Proceedings Publications you reviewed:** Five

**Professional Society Officer Positions**

Treasurer, West Point Chapter of the Phi Kappa Phi National Honor Society

Wolter, Jason, Burk, Roger, Ph.D., Foote, Bob Ph.D., Goerger, Niki, Ph.D., McFadden,  
Willie, Ph.D., Trainor, Timothy, Ph.D., “Development of an Acquisition  
Management Course,” Proceedings of the 2005 American Society for Engineering  
Education Annual Conference & Exposition, American Society for Engineering  
Education, June 2005.

## PART VII - Distribution List

| ORGANIZATION                                                                                              | ADDRESS                                                                            | COPIES |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------|
| Assistant Secretary of the Army (I&E)                                                                     | The Pentagon, Room 2E614<br>Washington, DC 20310                                   | 1      |
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| 14. ABSTRACT<br>The purpose of this document is to formally summarize and conclude the research program of the <i>U.S. Military Academy Department of Systems Engineering (DSE) and the Operations Research Center for Excellence (ORCEN)</i> for the Academic Year 2006. The annual research report includes a statement of purpose for research which supports DSE and the ORCEN, a description of the two organizations, a list of the key personnel responsible for executing the plan, and an overview of the annual research cycle.                                                                                                                                                                                                                                                                                                                                                                                                                 |              |                                 |                               |                                                    |                                                              |
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