51st Annual

AORS

ARMY OPERATIONS RESEARCH SYMPOSIUM

Army Analysis in a Fiscally Challenging Environment

14-15 November 2012

Book of Abstracts

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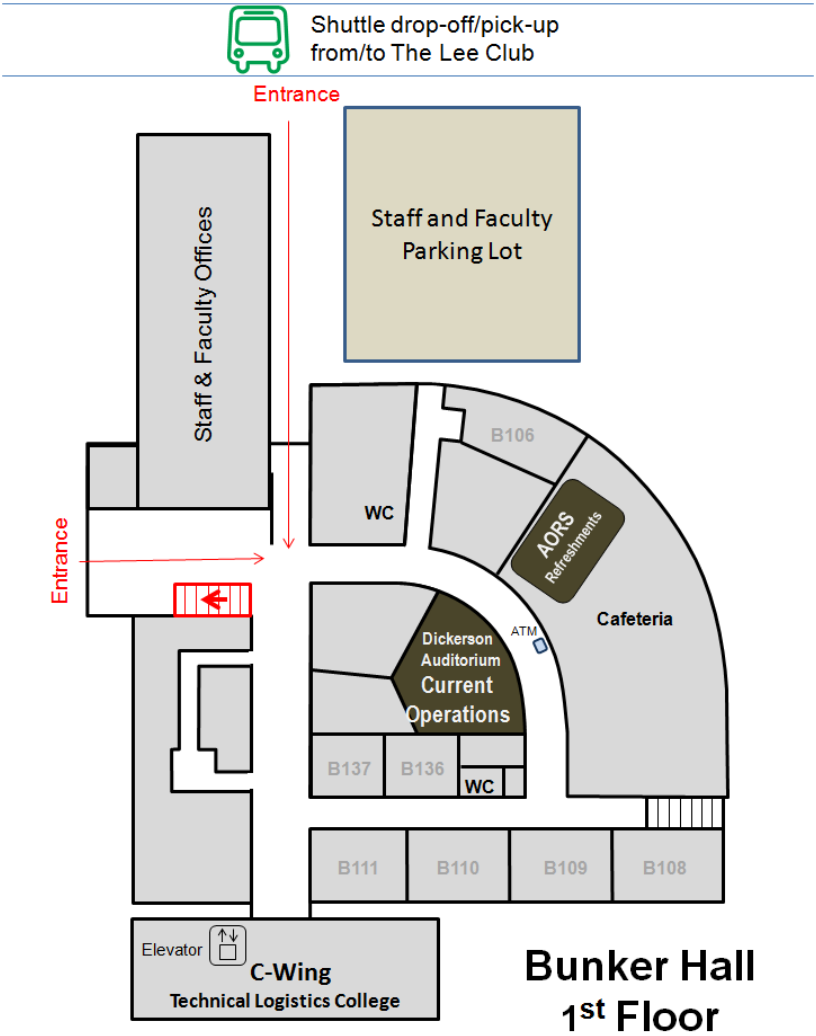
Program Agenda – 14 November 2012

14 November 2012	Start	End	Event
	0730	0830	Registration
	0830	0845	Call to Order / Announcements / Welcome By ATEC co-host
	0845	0855	Welcome by CASCOM
	0855	0905	Welcome by ALU co-host
	0905	1000	Keynote Speaker - LTG David Halverson, U.S. Army Training and Doctrine Command Deputy Commanding General/Chief of Staff
	1000	1015	Break
	1015	1030	Wilbur B. Payne Award Presentations
	1030	1100	Payne Award Winner (Small Group) Air and Missile Defense Investment Analysis Center for Army Analysis
	1100	1130	Payne Award Winner (Large Group) Randomly Generated Requirements Informed by Past Operational Deployments Center for Army Analysis
	1130	1145	USAREUR Rotational Analyst Opportunities
	1145	1215	Resilience Toolbox
	1215	1330	Lunch
	1330	1500	Concurrent Special Sessions
	1500	1515	Break
	1515	1715	Concurrent Special Sessions
	1800	2030	Social, The Lee Club

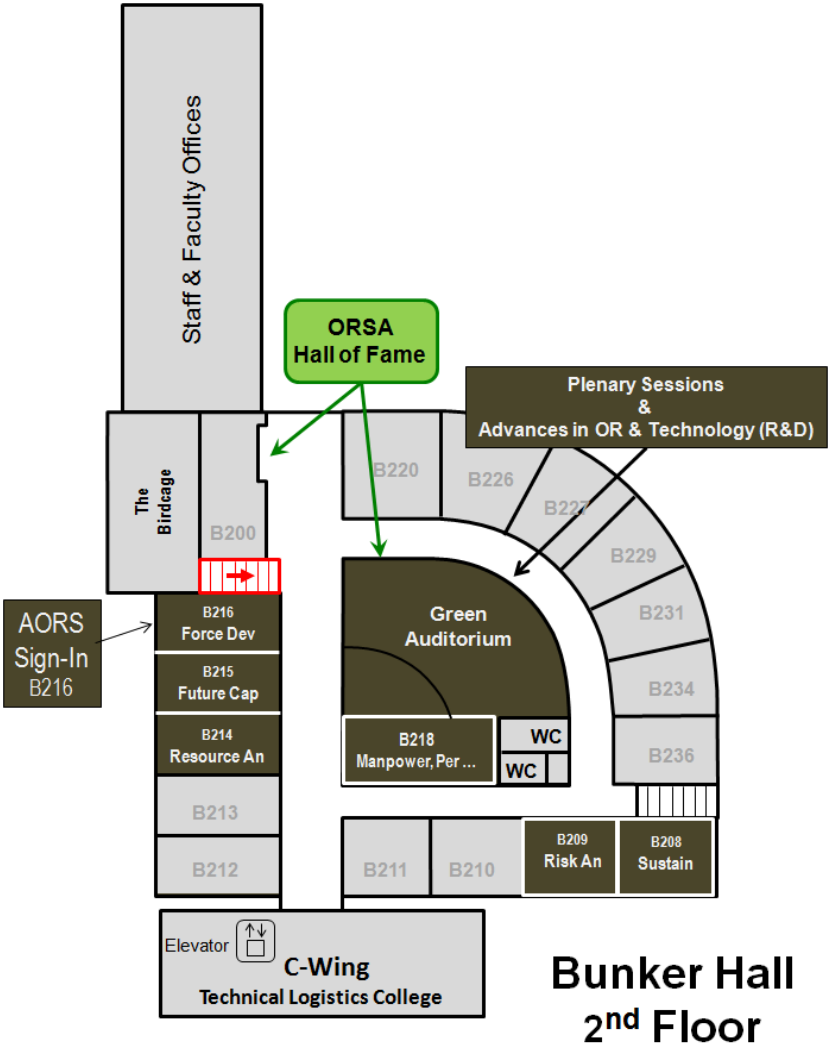
Program Agenda – 15 November 2012

	Start	End	Event
15 November 2012	0800	0815	Call to Order/Announcements/Recognition of AORS Team
	0815	0835	HQDA Study Plan Update
	0835	0855	FA49 Proponency Office Update
	0855	0915	CP36 Functional Office Update
	0915	1000	Invited Presentation - Dr. Thomas L. Allen Deputy Director for Studies and Analysis, J-8
	1000	1015	Break
	1015	1145	Senior Leaders Panel - Mr. Simmons, Executive Technical Director/Deputy to the Commander, US Army Test and Evaluation Command; Mr. Tison, Assistant Deputy Chief of Staff, G-8; Dr. Crain, Director, Center for Army Analysis; Ms. Blechinger, Director, TRADOC Analysis Center; Mr. Resnick, Director, Analysis and Integration, US Army Capabilities Integration Center, TRADOC; Mr. Jimenez, Director, US Army Evaluation Center; and Mr. O'Neill, Acting Director, US Army Materiel Systems Analysis Activity
	1145	1300	Lunch
	1300	1500	Concurrent Special Sessions
	1500	1515	Break
	1515	1715	Concurrent Special Sessions
	1800	1900	Cocktail Hour, The Lee Club
	1900	2100	Banquet and Hall of Fame Induction Ceremony, The Lee Club

Army Logistics University – Bunker Hall
First Floor



Army Logistics University – Bunker Hall
Second Floor



Concurrent Special Sessions – 14 November 2012

14 November 2012

Time	Advances in OR & Technology (R&D)	Current Operations	Force Development	Future Capabilities	Manpower, Personnel & Training Analysis	Resource Analysis	Risk Analysis	Sustainment
	Green Auditorium	**Dickerson Auditorium**	**B216**	**B215**	**B218**	**B214**	**B209**	**B208**
1330 - 1400	A 5-Step Approach to Test Design	Development Activities Locator and Assessment Method		Unmanned Systems Methods, Model and Tool (MMT) Gap Assessment	USAR Civil Affairs Analytical Support to a Capabilities-Based Assessment	Biometrics Identity Management Agency (BIMA) Resource Analysis Study	Risk Assessment Methodology to Support Army Acquisition Studies: An Update	Achieving Value For Condition Based Maintenance Programs
1400 - 1430	African Knowledge, Data, and Analytic Effort Exploration	Afghan National Army Planning Tool	Armored Multi-Purpose Vehicle Requirements Analysis	Optimizing the Army's Aerial Reconnaissance and Surveillance Asset Mix	CP-32 Personnel Requirements Estimation Model	Army 2020 Tactical Wheeled Vehicle (TWV) Strategy: Cost Benefit Analysis (C-BA) of TWV Pooling	Schedule Risk Data Decision Methodology	Development of Vehicle-Level Fuel Map and Its Applications in Fuel Economy
1430 - 1500	Are Performance Data Errors in the Noise?	AMSAA Materiel Lessons Learned Analysis (AMLLA) Program	Trades Analysis: Exploring Trades for the Indirect Fire Protection Capability (IFPC) Analysis of Alternatives (AoA)	Aerial Intelligence, Reconnaissance, and Surveillance Study	USAR Public Affairs Units and Personnel Organizational Structure Study	Cost Support to Decision Analysis	Operational Risk Analysis - A New Approach	
1500 - 1515	BREAK							
1515 - 1545	Calibrating SME Judgments of Mission Success	Current Operations Analytic Support to the Warfighter	Defensive Aid Suite Contribution to Force protection	Squad: Foundation of the Decisive Force Measures of Effectiveness (2 versions)	Army Acquisition Corps: Force Structure Analysis to meet Current and Future Operational Contracting Demands	A Framework for Understanding Security Sector Reconstruction for Army Operations and Planning	Deployable Force Protection (DFP) Radar Study	Army Expeditionary Warrior Experiment (AEWE) Technology Capabilities and Limitations (C&L) Assessment
1545 - 1615	Chemical Agent Permeation Analysis with Bayesian Methods	Precision Munitions Influence New Approaches to Indirect Fire Modeling	Understanding and Verifying OneSAF's Environment Runtime Component (ERC)	Analysis of Relative Performance of Visual Camouflage through Magnitude Estimation	Analytical Approach for the Center for Army Acquisition and Material Lessons Learned	Special Installations CBA	Technology Readiness Assessment for the Assembled Chemical Weapons Alternative Program	II PEG Requirements Determination Analysis
1615 - 1645	Computational Fluid Dynamics Particulate Modeling Methodology	Database Development and Implementation Afghanistan	Verification and Validation (V&V) of IWARS version 2.6	Control & Violence Support to Irregular Warfare Wargame Enhancement		Adding the Cost Element to Decisions Made in a TRADOC-RDECOM M&S Decision Support Environment Event	Using Historical Reliability Data to Influence Future Reliability Test Design	Gray Eagle Operational Availability Modeling and Simulation
1645 - 1715	Lessons Learned Porting an Application from Laboratory Project Development to a Microprocessor	Evaluating Company Intelligence Support Team Impacts in TRAC's Irregular Warfare Tactical Wargame				Unserviceable Excess Study	Vehicle Simulator Validation Initiative	

Concurrent Special Sessions – 15 November 2012

15 November 2012	Time	Advances in OR & Technology (R&D)	Current Operations	Force Development	Future Capabilities	Manpower, Personnel & Training Analysis	Resource Analysis	Risk Analysis	Sustainment
		Green Auditorium	**Dickerson Auditorium**	**B216**	**B215**	**B218**	**B214**	**B209**	**B208**
	1300 - 1330	Paperless Data Collection (Evolving Data Collection Methods)	ACK-SYS Polling Analysis Tool	IFV Soldier Capacity Analysis	Producing Timely High-Quality Data for Operational Effectiveness Modeling	Irregular Warfare Wargame Enhancement	Army Force Generation (ARFORGEN) Training Event Cost Model Prototype Demo	Occupant-focused rotorcraft Impact Survivability Modeling	Whole System Live Agent Test Chamber Verification and Validation
	1330 - 1400	The Evolution of Chemical Detector Analysis	Joint Special Operations Task Force - Philippines (JSOT-P) Quarterly Assessment Support (JQAS)	Air Defense System Analysis using the One Semi-Automated Forces (OneSAF) Simulation	Modeling of Digital Radio Frequency Memory (DRFM) in Extended Air Defense Simulation (EADSIM) Model	Comparison of the Combat Effectiveness of the XM25 and M320 Grenade Launchers using the Infantry Warrior Simulation (IWARS)	Stated Preference Economic Development (SPED) Framework	Modeling and Analyzing Mobile Network Connectivity in the Presence of Jamming	OneSAF in Support of the Optimal Allocation of Training Land Project
	1400 - 1430	When There Is Never Enough Time to Plan Your Next Event Use Executable Architecture Systems Engineering (EASE)	Leveraging NRMM and ArcGIS to Evaluate the MEDEVAC Performance of AMPV ME Variants within the "Golden Hour"	The Role of General Purpose Forces in Focused and Village Stability Operations	Approach to Holistic Survivability and Visualization Tool	Electronic Warfare Planning and Management Tool Analysis of Alternatives: Reintroducing Electronic Warfare into the Army	Impact of Weight Aggravated Suspension-Related Failures n Life Cycle Operations and Support Costs for Armored Fighting Vehicle	Cyber Warfare and Network Attack Operational Assessment	Bayesian Data Fusion for Assessing System Reliability
	1430 - 1500	Normalizing Subjective Criteria in Multi-attribute Decision Making	Current Operations Challenges of Conducting Assessments in Theater (Forward Operational Assessment – FOA)	Using Epidemic Theory to Forecast Violence		Performance Measurement as Managed by the U.S. Army	Off Line Demand Forecaster Analyzer		AMSAA BCA Update FOR Abrams Auxiliary Power Unit
	1500 - 1515	BREAK							
	1515 - 1545	Evaluating Maintenance Procedures Using Hypergeometric Sampling in Order to Reduce Resources Required for Logistics Demonstrations	Social/Cultural (SC) Methods, models, and Analysis Working Group (Mm AWG)	Using the Power Law Distribution to Measure Stability in a Conflict	Target Acquisition Sensor Parametric Analysis	Representation of Non-Lethal Weapons and Escalation of Force in Constructive Simulations	Leveraging GIS to Calculate the Minimum Number of Entities Required for Maximum Coverage	Integrated Electronic Warfare System (IEWS) EW Planning and management Tool (EWPMT) Analysis of Alternatives (AoA) Performance and Risk Results	
	1545 - 1615		Theater Security Cooperation Assessments	Analytic Support to Joint Special Operations Task Force - Philippines (JSOTF-P): Applications of the Southern Philippines Public Perception Survey (SPPPS)	Application of Novel Geospatial Analysis Tools to Assess Urban Maneuverability in Operational Environments		Aerial Reconnaissance and Surveillance Integrated Capabilities Development Mix Study	Assessing Counter-radicalization Programs	Operationally Relevant Fuel Prediction Modeling For Ground Vehicles
	1615 - 1645		Noncombatant Evacuation Operations - Rough Order of Magnitude		Multi-Function Electronic Warfare Analysis of Alternatives: Offensive EW for the Army		Interagency Data Sharing and Collaboration		Lessons Learned during the Test and Evaluation of Reliability Growth Programs

Special Session
Advances in OR & Technology (R&D)

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* * * * * *

14 Nov 12 - 1330-1400

A 5-Step Approach to Test Design

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Keywords: Design of Experiments, Test Design, Efficiency, Software

ABSTRACT: The U.S. Army Operational Test Command (USAOTC) is increasingly incorporating formal Design of Experiment (DOE) techniques into the design of operational tests (OT). In a cost conscious environment, designing test events that are both efficient and rigorous enough to evaluate the system under test is a challenge; however, it is one that is

made easier by using DOE principles. USAOTC has come up with a simple five step approach that is grounded in scientific principles in order for our testers and analysts to design their tests systematically, using SAS JMP® software to assist them in the process.

This AORS presentation will provide the necessary background to highlight the increased emphasis on use of DOE principles in operational test design, and primarily focuses on the five steps used for operational testers and analysts to design a rigorous and efficient test. The five steps are: 1) develop the test objective, in terms of comparing the performance of the system under test to something; 2) identify the primary measure of effectiveness, which is an important quantitative variable affecting system performance; 3) identify factors and conditions which impact the performance of the system in an operational environment; 4) develop a test design matrix, which determines the appropriate combination of conditions needed in order to assess system performance; and 5) develop a test run matrix, which provides the appropriate randomized sequence of trials needed for rigorous DOE analysis. This presentation also highlights the use of SAS JMP® software to easily execute the process of producing the required deliverables for test design.

14 Nov 12 - 1400-1430

Africa Knowledge, Data, and Analytic Effort Exploration

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Keywords: Metric assessment framework, factor analysis, generalized linear models

ABSTRACT: The TRADOC Analysis Center (TRAC), Naval Postgraduate School (NPS), and other Department of Defense (DOD) organizations are currently conducting large data capture and analysis efforts on areas all around the world. As efforts in the US Central Command (CENTCOM) Area of Responsibility (AOR), particularly in both Iraq and Afghanistan draw down, the US African Command (AFRICOM) AOR becomes an increased focus for current efforts. NPS has collaborated with AFRICOM on multiple activities including collecting and analyzing polling data in the Sahel region of sub-Saharan Africa.

This effort is the first step for the analytic community to gain a firm grasp of what data is available in the AFRICOM AOR and to analyze that data. This effort also enhances software within the DaViTo (Data Visualization Tool), an analysis tool capable of displaying 100,000+ data points simultaneously from multiple data sets with multiple data types. This enhancement allows the end user to construct an assessment framework using a customized weighting scheme and multi-attribute utility theory. Finally, this project develops a scenario methodology and a proof of principle use case in Nigeria to predict future issue stance scores and observed attitudes and behaviors of the population. This methodology

will directly support TRAC's Irregular Warfare Tactical Wargame (IW TWG).

14 Nov 12 - 1430-1500

Are Performance Data Errors in the Noise?

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Keywords: Performance data, combat models

ABSTRACT: As processing capability increases, so does the fidelity of combat models. This in turn drives the need for larger and more complex performance data sets. Despite the best efforts of item-level subject matter experts and data analysts, numerous internal performance data anomalies are inherent, begging the question "what data issues are relevant and which are in the noise?" Determining the answers ultimately entails collaboration by both performance data and combat model subject matter experts, and undoubtedly varies depending on the battlefield phenomenology under review. The ultimate goal is to determine whether data provided

within the time and resource constraint windows are sufficient to provide for accurate assessments of comparative capability approaches. This paper will address the impact of burst accuracy data in relationship to combat effectiveness. A range of burst accuracy data will be used as inputs to COMBATXXI and the resulting operational effectiveness impact will be contrasted across the input spectrum to assess whether variances in that specific data are relevant or not.

14 Nov 12 - 1515-1545

Calibrating SME Judgments of Mission Success

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Keywords: Subject Matter Expert (SME), Mission Success, Qualitative Data

ABSTRACT: Mission success has begun to receive increased emphasis during test concept briefings to the Director, Operational Test and Evaluation (DOT&E). When mission success cannot be quantitatively defined, the Army Test and Evaluation Command (ATEC), and specifically the Operational Test Command (OTC), is increasingly incorporating the use of subject matter expert (SME) judgments of system performance in operational testing. In order for results to be "defendable," these SMEs must be calibrated – the SMEs must apply the rubric in a consistent manner.

This AORS presentation will illustrate the differences between quantitative and qualitative measures of mission success, detail the qualifications necessary to be designated as an SME

for an operational test, provide an overview of the types of SME judgment measurement errors, and describe methods for potentially minimizing those errors.

14 Nov 12 - 1545-1615

Chemical Agent Permeation Analysis with Bayesian Methods

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Keywords: Bayesian analysis, Swatch, Multiple Comparison, Analysis of Variance, ANOVA

ABSTRACT: Swatch testing is a process that involves contaminating materials with chemical warfare agents and measuring the amount of agent that breaks through on the other side. There are not universally accepted criteria for the breakthrough levels, so evaluation is largely based on comparative testing. Historically, analysis of variance (ANOVA) techniques have been used to compare the performance of different materials. Typically, candidate materials are compared with a standard and the criterion is that the candidate cannot be worse than the standard.

Some limitations of the historical analysis are that the standard assumptions of an ANOVA are not always met; a log-

transformation is almost always necessary and variances may not always be the same for different materials. Also, the comparisons result in p-values that are difficult to understand and frequently misinterpreted as a probability of two items "being the same".

Bayesian methods were used to analyze a set of swatch data from past testing. Hierarchical models were used in order to model material performance and variability over a range of factors (different laboratories, fixtures, and trials). Comparisons were performed using posterior predictive distributions which resulted in the ability to give probabilities of differences between items. Answers from Bayesian analyses are more intuitive and "user-friendly" than answers from a classical analysis.

14 Nov 12 - 1615-1645

Computational Fluid Dynamics Particulate Modeling Methodology

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Keywords: CBRN, CFD, Computational Fluid Dynamics, FLUENT, Particulate Dispersion

ABSTRACT: The US Army Materiel Systems Analysis Activity (AMSAA) developed a computational fluid dynamics (CFD) particulate-modeling methodology to support current and future projects and to expand extant CFD capabilities. This methodology was used to simulate and analyze the flow of particulate materials in a controlled indoor environment with conditions matching a series of real-world experiments. The results of the experiments and models were compared.

Simulating the effects of biological, radiological, and other particulate releases with CFD requires the use of flow models that are not regularly included for fluid-only flows. AMSAA's methodology details the process of using FLUENT's discrete phase model to simulate the flow of particulates through an indoor environment and describes the other necessary models and settings. It also includes recommendations on CFD best practices and information on the means to add further capabilities to CFD models.

This methodology was applied to the testing of novel smokes. Experiments were performed to analyze the dispersion and deposition of particulate smoke materials. The test parameters and environment were simulated using this methodology, and the results were compared. This comparison was used to test the methodology's effectiveness, and the simulation was used to generate high-resolution data and reduce the need for further testing.

We present an overview of our particulate-modeling methodology, including an overview of the research involved in its development and a comparison of the simulation and experiment results. Follow-on efforts will be to apply this methodology to other problems and to extend this work to

support heat transfer and particulate effects such as erosion and reaction.

14 Nov 12 - 1645-1715

Lessons Learned Porting an Application from Laboratory Project Development to a Microprocessor

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Keywords: Micro Processor, Software Adaptation, Portability

ABSTRACT: A system was developed on a laboratory desktop computer to evaluate armor health. The system uses sensors embedded in the armor which cause the armor to vibrate. There are subtle changes in the vibrational resonance pattern if the armor has been damaged. The system uses these changes to diagnose armor health. The goal of the team was to take this application and transfer it to the field where it would be embedded in a portable system that could be readily used by soldiers.

The original application was developed on a desktop development computer that had a powerful processor, 4 GB of memory and a standard operating system. The challenge was to take this application that had essentially unlimited resources (disk, memory and processor) and modify it to run on a microcontroller which has rather limited resources including no disk, no operating system, very little memory, and a much slower processor. There is no explicit general method that will work for every application, however it is hoped that the steps described below will provide a general framework for the process and some insight as to how to approach the task.

* * * * * *

15 Nov 12 - 1300-1330

Paperless Data Collection
(Evolving Data Collection Methods)

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Keywords: Manual Data Collection, Tablets, Compact Computers

ABSTRACT: In the past, the U.S. Army Test and Evaluation (ATEC) Operational Test Command (OTC) has collected "manual" data on paper forms and manually entered it into a computer system. This approach is inefficient because it requires the tester to capture or enter the data twice, once on paper and then again when it is transferred to a computer. The manual re-entry of data is tedious, costly, time consuming, and prone to errors. The recent availability of

smaller, lighter, and more compact computers and tablets now enables testers to conduct surveys in an electronic format and avoid dual data entry. Additionally, by eliminating paper collection and manual re-entry, data can be available for further processing in near-real time, thereby increasing efficiency and effectiveness by expediting quality control and enhancing timeliness of data delivery to the customer for ensuing data analysis.

OTC is increasingly incorporating the use of compact computers and tablets into their manual data collection efforts as a result of the advancements and efficiencies provided by developing technology. This AORS presentation focuses on advantages and disadvantages of the use of paper forms versus the use of compact computers and tablets for manual data collection. It will also provide an overview and background of OTC's evolving manual data collection methods.

15 Nov 12 - 1330-1400

The Evolution of Chemical Detector Analysis

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Keywords: Chemical Detectors, Bayesian Analysis, Design of Experiments (DOE), Binomial Reliability, Logistic Regression, Response Surface Methodology

ABSTRACT: Chemical detector testing has been going on for decades. This includes testing basic detectors such as M8 paper to the sophisticated chemical detectors being tested today. Just as the technology of chemical detectors has advanced, so have the analytical methods used to evaluate these systems.

This presentation will take a historical review of the evolution of chemical detector testing within the Department of the Army's acquisition framework. The review will begin with a look at the foundation of detector methodology, binomial reliability, through analytical methods of the future, using Bayesian statistics. The presentation will also discuss the role that design of experiments (DOE) has played in advancing the evaluation of chemical detectors.

15 Nov 12 - 1400-1430

When There Is Never Enough Time to Plan Your Next Event Use Executable Architecture Systems Engineering (EASE)

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Keywords: Distributed Modeling & Simulation (M&S), Executable Architectures, Systems Engineering

ABSTRACT: Virtually every analyst will agree that there never seems to be enough time when preparing for an experiment, test, analysis initiative or simulation-based event. A long planning cycle is a luxury for which they cannot afford. Moreover, if complex simulations, including distributed simulations, are to be used, they must be implemented efficiently and effectively. Recent research conducted by the US Army Research Laboratory (ARL) Human Research & Engineering Directorate (HRED) Simulation & Training Technology Center (STTC) has focused on developing a systems engineering-based approach of simulation execution to meet this need. Executable Architecture Systems Engineering (EASE) enables analysts to quickly execute

simulation with more accuracy, easy configuration, and receive automated data collection and analysis artifacts.

STTC has successfully captured the technical specification from requirements through design to execution information (including configuration) in a database-driven and linked manner. The system interface includes an electronic interview process that determines which of the many possible implementation choices (models, scenarios and system designs) to use from the users' requirements. Based on the strategy used for capturing the system design and a Government-owned set of tools, the system can also create and rapidly generate surrogate applications to substitute for late, faulty or unavailable models.

In this presentation, we will:

- Describe our solutions for systems engineering and automating a distributed M&S implementation and how these capabilities come together within our EASE research;
- Explain how to examine high level simulation requirements and their linkage to low level model specifications;
- Demonstrate how to capture metadata about the models, scenarios and the execution environment and ultimately how to deploy and execute the specified models using virtual machines; and,
- Discuss how the community could benefit from these methodologies and our future research areas.

15 Nov 12 - 1430-1500

Normalizing Subjective Criteria in Multi-attribute Decision Making

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Keywords: Prioritization, Decision Making

ABSTRACT: Too often, subjectivity inadvertently skews decision making. When faced with several subjective attributes, decision makers are frequently unable to rank order those attributes in order to determine their importance. They assign weights to the attributes based on subject matter expertise. But without a comprehensive understanding of statistical properties, the weights assigned do not match their intentions. For example, say there are only two attributes; one with a wide range of values (A – F), and one with a very narrow range of values (B^+ – B). It can easily be argued that the wide range attribute is "more important" because the value assigned can vary greatly from the top value possible. If a decision maker does not intuitively see this possibility, the algorithm created may not assign weights correctly. What is needed is a way to normalize all subjective attributes prior to assigning weights, so that the weights accurately portray what is required.

The Quantile Normalization method was developed by Ben Bolstad, Ph.D. from UC-Berkley. Although he developed this method for standardizing measurements used in cDNA mapping, this algorithm could provide data collectors and analysts the ability to scale and score data in a way that

minimizes variance and skewing found in other normalization techniques. This method would, essentially, reduce systemic bias that has been inadvertently and erroneously attributed to the subjectivity of the data. Through the use of a simple spreadsheet model, an analyst can follow through with a series of steps that ends with a normalized multi-attribute decision making matrix. From there, weights are assigned, the model is run, and output is analyzed. The product of this methodology is a solution set based on attributes weighted more closely to the interests and perceptions of those seeking the solution.

15 Nov 12 - 1515-1545

Evaluating Maintenance Procedures Using Hypergeometric Sampling in Order to Reduce Resources Required for Logistics Demonstrations

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ABSTRACT: When an Army system is developed, procedures for system maintenance are developed as well, which must be evaluated. The typical Army system is sufficiently complex that many failure modes are possible, each potentially necessitating a unique procedure. The standard practice in a logistics demonstration is to verify correctness before an operation test and/or fielding by having maintainers perform all procedures according to the instructions. This standard practice usually puts the evaluator in a “test-fix” mode rather than in an evaluation of how well the system is designed, maintainable and ready for the next phase of testing.

A logistic demonstration (LD) is the nondestructive disassembly and reassembly of a system using its related peculiar/specific Test Measurement Diagnostic Equipment (TMDE), training devices, and support equipment. The system, its peculiar tools and TMDE, associated support items of equipment (ASIOE), and its System Support Package (SSP) will be evaluated as a system.

The resources required to check all of the maintenance procedures, in terms of people, funding, calendar time, and system availability can be prohibitive. The application of hypergeometric sampling provides a statistical basis for successfully concluding the demonstration of the maintenance procedures, based on a sample, provided the results meet specific criteria.

This methodology takes into account the known population size or total number of procedures to be tested, and determines the risk associated with each sample size (i.e. out of the total number of procedures) for both contractor and government. For example, a system having a total number of 38 procedures to test would produce two balanced plans using Hypergeometric Sampling. One plan would identify a sample size of 8 out of 38 procedures as a high risk plan, and another as a low risk plan of sample size 20. The objective is to select the best low-risk plan that shares risks equably, which in this example would be a sample size of 20. This methodology can also be applied to a much higher number population size.

Sampling does introduce decision risk which in this case is the risk that one or more of the unevaluated procedures is incorrect. However, the amount of risk can be quantified and traded off against the benefits. Hypergeometric sampling of

maintenance procedures has been used on a few systems already resulting in substantially shorter and less expensive logistics demonstrations.

Special Session
Current Operations

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* * * * * *

14 Nov 12 - 1330-1400

Development Activities Locator and Assessment Method

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ABSTRACT: Recent literature highlights many problems with Department of Defense-funded development projects in actual or potential conflict zones. This may be a problem merely of assessment—we do not know how to document properly the progress we are making—or the problem may be more fundamental, in that the design of our projects is flawed. This study, Development Activities Locator and Assessment Method (DALAM), seeks to determine and address this problem, by integrating assessment into all facets of project planning—before, during and after execution—to maximize

the likelihood that projects achieve their desired effects—for the local national populace and for US military organizations.

14 Nov 12 - 1400-1430

Afghan National Army Planning Tool

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Keywords: Force Management, Strength Projection, Budget Impact

ABSTRACT: During a culture of transition, Coalition Forces (CF) are working with Afghan partners to ensure that the Government of the Islamic Republic of Afghanistan (GIRoA) is capable of self sustainment. The requirement to appropriately manage the 195,000 personnel which comprise the Afghan National Army (ANA) falls to GIRoA's Ministry of Defense (MoD). Combined Security Transition Command – Afghanistan developed an ANA planning tool to help inform the MoD's decisions regarding monthly accessions, promotions by rank/grade, and training fill rates for job/occupation "families" at various strength levels. Since manpower is a primary contributor to the ANA's budgetary requirements, the planning tool also estimates costs associated with various force characteristics.

Afghans working at the MoD have adopted the use of Microsoft products; thus, the ANA Planning Tool (ANA-PT) was created as a macro-enabled Microsoft Excel file. When populated with monthly data on personnel ebb rates, fill and strength goals for specified dates, the ANA-PT will project force levels by rank and job family, as well as suggesting the number of soldiers who need specific training or should be

separated or reallocated to different specialties. This initiative is meant to fill a near-term gap as the Afghan Human Resources Information Management System (AHRIMS) is being fielded.

14 Nov 12 - 1430-1500

AMSAA Materiel Lessons Learned Analysis (AMLLA) Program

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ABSTRACT: The U.S. Army Materiel Systems Analysis Activity (AMSAA) has initiated a Materiel Lessons Learned Analysis Program with the mission of identifying systemic materiel issues, investigating their root cause, and influencing the development of mitigating and corrective measures using data-driven analysis. The AMSAA Materiel Lessons Learned Analysis (AMLLA) program was instituted to fill the materiel lessons learned gap in the doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) framework. AMLLA uses the infrastructure of AMSAA's Sample Data Collection (SDC) program in order to collect data at the field-level and at various Army Depots to identify and investigate systemic materiel and maintenance issues. The program utilizes highly qualified analysts working closely with the Soldiers, other AMSAA entities, and the Weapon System Managers. AMLLA's Field Studies Analysts (FSAs) are all Lean Six Sigma (LSS) Green Belt certified and located at various Army installations and Depots across the continental United States (CONUS) and southwest Asia (SWA) to identify possible materiel issues. These issues are investigated thoroughly through a stringent process which examines the causes of

these issues and provides insights into potential solutions. The resulting reports summarize the results of the investigation including issue encountered, factors contributing to the failure, and any possible fixes to remedy the issue. AMLLA products can result in increased readiness and decreased repair costs for the Soldiers and their units. AMLLA also conducts a number of comprehensive special studies which help identify issues and potential solutions which may have a large impact on the Army in terms of readiness, safety, and cost avoidance. Once completed and reviewed, AMLLA's reports and special studies are published on the AMLLA Materiel Lessons Learned Portal (MLLP) which is accessible to the entire Army and DoD community. The AMLLA program is a valuable asset to the Army's program managers, the Army Materiel Command, and to operational forces. Other than AMLLA, there is currently no organization devoted to product/process improvement of fielded systems and the collection of lessons learned in the areas of materiel and maintenance.

14 Nov 12 - 1515-1545

Current Operations Analytic Support to the Warfighter

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Keywords: Current Operations, Reachback, deployed analyst, ORSA development, IW modeling

ABSTRACT: CAA's current operations support includes deployment of analysts to Corps, Combined Joint Special Operations Task Force, and Theater level commands in OEF, to include both Afghanistan and the Philippines. Additionally, CAA has ORSAs supporting US Army Africa (USARAF) in Vicenza, Italy and Combined Joint Task Force – Horn of Africa (CJTF-HOA). CAA has recently added deployed analyst support to commands that have analytical requirements, but no organic ORSA capability. CAA's support also includes analytical reach-back support for deployed commands, development of Irregular Warfare analysis methods, data, models, and tools, as well as institutional development of the OR community in order to better support wartime commanders. Over the past year, CAA has conducted a number of studies using various OR techniques which have informed theater commanders as strategic level decisions have been made. This presentation will discuss the nature and challenges of support CAA has provided to new customers, reachback projects conducted by the agency,

analytic coordination and collaboration, and data collection efforts.

14 Nov 12 - 1545-1615

Precision Munitions Influence New Approaches to Indirect Fire Modeling

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Keywords: Precision Munitions, Combat Modeling, Weapons Effectiveness

ABSTRACT: The Army's expanding use of precision munitions on today's battlefield is indicative of their capability to maximize effects on target while minimizing damage to collateral concerns. These capabilities are an improvement over conventional, unguided munitions typically employed by indirect fire weapons such as mortars and artillery. As the type and pace of precision munitions development increases, so has the need for conducting munitions portfolio reviews and force mix analyses. Combat models in use today typically use aggregated lethality data and simplified damage algorithms to compute personnel casualty and materiel target kill levels resulting from a given number of artillery volleys delivered over a large area. This damage function methodology sacrifices precise distribution of the warhead Probability of Kill

(Pk) matrix for the convenience of a compact algorithm. Recent analysis has demonstrated that the precise delivery of ordnance places additional significance on the distribution of Pk close to the target and that modeling precision munitions with current methods can yield misleading results. Because of differences in employment techniques and effectiveness, an evolutionary change in the methods used to model and analyze indirect fire munitions is occurring in the Army analytical community. This presentation discusses: (1) a more accurate portrayal of weapon lethality becoming increasingly necessary with the advent of small, precision delivered munitions and (2) new efforts to develop empirical, data-driven effectiveness functions for targets located in urban environments with restrictive rules of engagement.

14 Nov 12 - 1615-1645

Database Development and Implementation Afghanistan

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Keywords: Current Operations, CJSOTF- Afghanistan, Database Development and Implementation, DDIA

ABSTRACT: Combined Joint Special Operations Task Force - Afghanistan is executing “Village Stability Operations” (VSO), which put special operations units in Afghan villages to facilitate security, governance, and development at the local level. CJSOTF-A requires assessments in order to gauge the progress of VSOs across the area of responsibility. We developed a database to catalogue events based on CJSOTF-

A's Lines of Operations (LOOs), desired effects, observables, and information requirements. This included a thorough review of CJSOTF-A daily reports and Village Stability Coordination Center (VSCC) reports to extract events that met the LOO criteria and desired effects. Finally, events were analyzed to determine if they contained sufficient data to answer CJSOTF-A's Priority Information Requirements (PIR), Commanders critical Information Requirements (CCIR) or observables (indicators). Using the DDIA database, analysts can now provide accurate, standardized, and usable data to assist in the assessment of the Afghan Local Police and VSO. Recommendations include the establishment of reporting standards that support accurate and timely data collection suitable for analysis. The implementation of reporting standards will minimize analytical gaps and enable CJSOTF-As ability to conduct assessments on Village Stability Operations.

14 Nov 12 - 1645-1715

Evaluating Company Intelligence Support Team Impacts in TRAC's Irregular Warfare Tactical Wargame

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Keywords: Irregular Warfare, Tactical Wargame, Company Intelligence Support Team

ABSTRACT: In 2008, the TRADOC Analysis Center (TRAC) launched the Irregular Warfare (IW) Tactical Wargame (TWG) to fill a void in the Department of Defense (DOD) and Army's early efforts to model IW at the tactical level. The wargame represents ground forces (and other role players) conducting operations focusing on the relevant relationships and interactions with the population and the environment. It incorporates methods, models and tools (MMT) with human-in-the-loop wargaming and social theory to inform decisions concerning operations with the IW environment. Aligned to the concepts addressed in Field Manual 3-24, the models and game constructs focus on the counterinsurgency doctrinal lines of effort, e.g. security operation, host nation support, governance, infrastructure support, and information operations. In November 2011, TRAC conducted a prototype exercise focused on examining how the addition of Company Intelligence Support Team (CoIST) at the company level impacts the ability of the battalion commander to influence the local population and achieve the desired endstate. The wargame served as both a mechanism to assess CoIST impacts and to evaluate MMT functionality development and improvements, data development, analysis methods and to advance representation of the complex operational environment.

This presentation will provide a description of the 2011 prototype wargame and key components, outline the CoIST study and summary results, present lessons learned and discuss areas identified for future wargame improvement.

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15 Nov 12 - 1300-1330

ACK-SYS Polling Analysis Tool (ASPAT)

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Keywords: ACK-SYS, ASPAT, Assessment Tool, Survey Tool

ABSTRACT: The Afghanistan Consolidated Knowledge System (ACK-SYS) was developed as a data repository system for Afghanistan operational data so that analysts can provide timely and well-informed analysis. The establishment of ACK-SYS as a single data source for ISAF surveys and maintenance of well-structured data was the first comprehensive effort in support of longitudinal and cross-sectional surveys analysis. To facilitate analysis using ACK-SYS, the ACK-SYS Polling Analysis Tool (ASPAT) was developed. This Excel-based tool allows analysts to conduct general trend analyses on myriad survey questions and compute responses, to include margins of error by geographic resolution (e.g., National, Regional, Provincial). User options for portrayal of results include charts (line graphs/percentages), Geo Map Tool graphics, and color-coded maps based on response types.

15 Nov 12 - 1330-1400

Joint Special Operations Task Force-Philippines (JSOTF-P) Quarterly Assessment Support (JQAS)

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ABSTRACT: The Center for Army Analysis (CAA) has deployed analysts to Iraq and Afghanistan on a continuous basis since 2002. Forward analysts have contributed at the theater, joint, and combined levels. Now, CAA has deployed analysts in support of the Joint Special Operations Task Force-Philippines (JSOTF-P).

CAA's first analyst deployed to the Philippines in July 2011 to implement an assessments framework to provide the JSOTF-P Commander with an operational overview of the Task Force efforts and effects. To better support the new assessment framework, CAA assisted JSOTF-P to establish a Combined Information Data Network Exchange (CIDNE) database to record various significant activities and engagement reports.

CAA has since supported JSOTF-P with various reachback projects to include populating CIDNE with back-logged reports, data pulls for JSOTF-P, and exploratory data analysis to identify trends of significant activities and the effects of target engagements with the Filipino population and security forces. This briefing displays different data exploration products which highlight trends and examines the effects of target engagements on significant activities (SIGACTs).

15 Nov 12 - 1400-1430

Leveraging NRMM and ArcGIS to Evaluate the MEDEVAC Performance of AMPV ME Variants within the "Golden Hour"

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Keywords: Casualties, MEDEVAC, AoA, ArcGIS, NRMM, Path Modeling, Mission Planning

ABSTRACT: In support of the Armored Multi-Purpose Vehicle (AMPV) AoA, the Army Materiel Systems Analysis Activity (AMSAA) was asked to help identify the most capable AMPV variant for Medical Evacuation (ME) missions. To assess the operational effectiveness of each alternative, Time to Complete (TIC) mission estimates were developed to quantify the time required to evacuate casualties across a broad spectrum of terrains and scenario conditions within the "golden hour". In emergency medicine, the "golden hour" refers to the span of time following a traumatic injury sustained by a casualty, during which there is the highest likelihood that prompt medical treatment will produce the most positive patient outcomes. The TRADOC Analysis Center at Fort Leavenworth (TRAC-FLVN) used AMSAA geospatial terrain data to develop casualty scenarios for multiple casualty point locations / missions. In order to determine the path (and time) it would take for each vehicle to accomplish the mission,

AMSAA developed new geospatial optimal path modeling tools and methodologies. These tools enabled AMSAA analysts to import existing NATO Reference Mobility Model (NRMM) terrains and results into a spatial context. To generate the optimal path for each AMPV ME variant, AMSAA used ArcGIS raster and spatial analysis tools to develop cost distance algorithms using the on road and cross country speed predictions generated through NRMM. AMSAA's new methodology significantly extends the capability of NRMM by using its speed predictions to assess the operational effectiveness of alternatives spatially and temporally. The utility of this approach is not limited to MEDEVAC missions, but can be employed to explore route selection options in any mission context. These new tools and methodologies will enable Army leaders to quantify the differences in performance of medical evacuation vehicles in Heavy Brigade Combat Teams (HBCT) conducting MEDEVAC operations across a range of realistic operational situations.

15 Nov 12 - 1430-1500

Current Operations Challenges of Conducting Assessments in Theater (Forward Operational Assessment – FOA)

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Keywords: Army Acquisition, Rapid Initiatives, FOA, Agile Process

ABSTRACT: The acquisition process dictated to the U.S. Army Test and Evaluation Command (ATEC) by policy and regulation is a rigorous and coordinated process that requires years to accomplish, following an acquisition strategy developed by the Program Manager which is staffed and approved by the appropriate service. The lengthy timelines required for this process are acceptable for some systems; however, a more agile acquisition process is required to provide timely support to Warfighters when fielding rapid initiatives to theater in non-traditional conflicts such as those in Iraq and Afghanistan. The rigorous coordination required for a typical acquisition process does not always occur in the fielding of rapid initiatives in theater. In fact, ATEC does not have oversight of all rapid initiatives fielded to theater because there is no central entry point or repository for tracking rapidly fielded and equipped materiel Army wide.

This AORS presentation focuses on the challenges encountered by the FOA team in their assessment of rapid initiatives in Iraq and Afghanistan.

15 Nov 12 - 1515-1545

Social / Cultural (SC)
Methods, models, and Analysis Working Group (MmAWG)

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Keywords: Irregular Warfare, Social Theory, Model Evaluation

ABSTRACT: Accepted methods for validating and verifying physics-based models break down when used on models based on social science theories. This is due to the specific challenges faced as social science struggles to describe human behavior, including data availability and theory design. The Social / Cultural (SC) Methods, models, and Analysis Working Group (MmAWG) began with efforts in early 2011 to review theories within existing social/population models; examine the range of theories in such models; consider if such theories can reasonably coexist within a single model; and evaluate the representation of each theory in software design and implementation. The mission of the SC MmAWG has evolved into development of a social theory-based model evaluation process in order to increase decision maker confidence in those models.

To date, the SC MmAWG has created an evaluation process for social theory-based models, and is executing two test case evaluations of existing Irregular Warfare models in order to mature the evaluation process and provide an initial "V & V" of those models. The models being evaluated are Athena (TRADOC G2 Intelligence Support Activity (TRISA)) and the Cultural Geography (CG) model (TRADOC Analysis Center at Monterey (TRAC-MTRY). By the end of FY12, the SC MmAWG will deliver the evaluation process and results of the two test cases to the analytic community. This framework will help analysts identify strengths and weaknesses of social theory-based models available for analysis.

The SC MmAWG is co-chaired by TRADOC Analysis Center (TRAC), Marine Corps Combat Development Command (MCCDC), and National Defense University (NDU) with participation by Office of the Secretary Of Defense (OSD) Cost Assessment and Program Evaluation (CAPE), Center for Army Analysis (CAA), TRADOC G2 Intelligence Support Activity (TRISA), Army Capabilities Integration Center (ARCIC), Army Materiel Systems Analysis Activity (AMSAA), and Center for Advanced Operational Culture Learning (CAOCL).

This presentation describes the social theory-based model evaluation process developed by the working group, how it was implemented for the test cases, and how it can be implemented in the future on other models.

15 Nov 12 - 1545-1615

Theater Security Cooperation Assessments

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Keywords: Theater Security Cooperation, County Assessment, Assessment

ABSTRACT: For many years the US Army Europe (USAREUR) has been conducting theater security cooperation activities focused on strengthening and sustaining capability, capacity, and interoperability; ensuring access; and developing relationships. A significant challenge to theater security cooperation lies in the necessity to properly assess and evaluate program effectiveness. As defense resources decline, it will be critical to evaluate theater security cooperation programs to establish priorities, defend funding, and apply resources where most needed. No assessment guidance has been published by the DoD and the subjective nature of theater security cooperation has made it very difficult to measure. In addition, it is particularly challenging when the effect resides in our partner's army, not our own. This is a common challenge across all of the US Army Service Component Commands (ASCC) and the catalyst for the ASCC Analyst Exchange conference hosted by the Center for Army Analysis (CAA) in March 2012.

USAREUR developed a methodology to assess the effect USAREUR's activities have on the land forces in USAREUR's area of responsibility. This methodology assesses the individual countries in accordance with the USAREUR

Commanding General's objectives for the USAREUR Campaign Plan. Desired effects were derived from each objective, with matrices identifying Measures of Effectiveness (MOE) and defined criteria to establish a framework when assessing such subjective data. The population for input into these assessments comprises subject matter experts (SME) from USAREUR staff, USAREUR subordinate units, and the respective country Defense Attaché and Security Assistance Teams that reside in the US Embassies. These SMEs use the effect matrices to develop a "Scorecard" for each country that includes an assessed value for each MOE along with relevant narrative for each desired effect. Over time the "Scorecards" will be used to track and identify indicators of progress in any of the respective areas assessed. These indicators are important to identify the most effective and efficient activities for the respective country and provide rationale for what activities to add, delete, and/or modify when USAREUR plans future activities with the respective country.

This assessment methodology and the development of the "Scorecards" will be used to provide input to the USAREUR Country Support Plans (CSP), support the development of USAREUR Campaign Plan assessments, and support US European Command quarterly Line of Activity Progress Reports. USAREUR provided this methodology to CAA and continues to work with CAA to help develop a standard for assessing progress in our Allied and Partner Land Forces.

15 Nov 12 - 1545-1615

Noncombatant Evacuation Operations – Rough Order of Magnitude Model

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Keywords: Noncombatant, evacuation, evacuee, safe haven, repatriation, NEO, model

ABSTRACT: Department of Defense directives designate the responsibility to plan and conduct Noncombatant Evacuation Operations (NEO) to the geographic combatant commanders (COCOMs). An evacuation can be ordered due to regional violence or natural disasters that create an unsafe environment for American and allied citizens. COCOMs are responsible for dozens of countries that each requires development and analysis of NEO plans. The Center for Army Analysis (CAA) has developed a methodology for rapid development and analysis of NEO plans on a rough order of magnitude (ROM). In the past, CAA has performed detailed analysis of NEO plans for COCOMs. However, detailed analysis will not be possible such a large number of scenarios. An easy to use ROM model makes it possible for the planners to quickly conduct analysis of NEO plans.

The first component of the methodology is modeling the NEO plan. It is necessary to determine which locations will be used as Assembly Areas, Evacuation Control Centers, and Temporary Safe Havens. In addition, the NEO planners must determine the type and quantity of lift assets available for the operation and where they will operate.

CAA has developed a rough order of magnitude NEO model that can be used to quickly analyze a NEO plan. The model is intended for use by planners to determine overall time to evacuate key locations, processing times, throughputs, fuel requirements, and limiting factors. The model allows for parametric variation of inputs such as MOG and the number of assets available for the operation. During the preliminary planning stages, exact numbers are not known, so parametric variation is useful to help determine the range of possibilities.

The quantitative model allows planners to rapidly determine manning and support requirements for each location and to select transportation nodes and temporary safe-haven locations. In addition, the results can help planners to negotiate with host nation governments for transportation infrastructure and to request lift assets from the Department of Defense.

Special Session
Force Development

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14 Nov 12 - 1330-1400

14 Nov 12 - 1400-1430

Armored Multi-Purpose Vehicle Requirements Analysis

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Keywords: M113, analysis of alternatives, requirements development

ABSTRACT: The M113 family of vehicles (FoV) has been in service for more than 50 years and has undergone several

alterations and updates. In 2007, the M113 program was terminated because of poor force protection and size, weight, power and cooling constraints. This left the M113 FoV vulnerable in the areas of force protection, mobility, sustainment, and the ability to support future networks. Currently, the M113 FoV fulfills several mission roles within armored brigade combat teams (ABCTs), including general purpose, mission command, mortar carrier, medical treatment, and medical evacuation. These mission roles comprise 33 percent of the tracked vehicle fleet in an ABCT. Given the size and scope of this problem, the U.S. Army faces a significant investment decision to replace the M113 FoV.

In Februrary 2012, the Office of the Secretary of Defense initiated the Armored Multi-Purpose Vehicle (AMPV) Analysis of Alternatives (AoA) to replace the M113 FoV. Although an AoA typically requires a year or more to complete, the study team had just five months to conduct the analysis and submit the final report. A key piece of the analysis, the Mission Role Requirements Analysis, focused on identifying the levels of force protection and mobility that each mission role required. The study team used combat models, data from current operations, and a seminar wargame to calculate the likelihood of encountering threats and to develop maneuver profiles across a range of operational environments. The results from the Mission Role Requirements Analysis informed the draft AMPV Capability Development Document and shaped the U.S. Army's acquisition strategy.

This presentation describes the Mission Role Requirements Analysis methodology, the tools used, and the lessons learned.

14 Nov 12 - 1430-1500

Trades Analysis: Exploring Trades for the Indirect Fire Protection Capability (IFPC) Analysis of Alternatives (AoA)

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Keywords: CDD attributes, trade-space, trade-offs, AoA, IFPC

ABSTRACT: The Weapon Systems Acquisition Reform Act (WSARA) of 2009 directed several new acquisition policies and processes, including a requirement that Analyses of Alternatives (AoA) give full consideration to possible trade-offs among cost, schedule, and performance objectives for each alternative considered. For a Milestone A decision, this requires evaluating competing technologies and identifying cost, performance and technical readiness.

In the Indirect Fire Protection Capability (IFPC) AoA, the U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) evaluated three different material approaches (and specifically, the associated trade-space) to mitigate the risk of indirect fire attacks on critical U.S. sites. The approaches included traditional air defense guns with improved ammunition, short-range missiles and directed energy weapons.

The analysis was a first of its kind implementing the WSARA guidance. The trade-space, both within and across alternatives, included program cost, program schedule, and performance factors. These seemingly disparate factors were linked by critical technologies that enabled the intercept

tracking, engagement, and kill subtasks. Each critical technology was characterized by an associated cost, schedule, and risk element. Additionally, the intercept performance of each approach informed the IFPC Capabilities Development Document (CDD) development.

The presentation addresses the overall methodology and provides a "cost-schedule-performance" trades example. The results highlight the balance between desired capabilities and achievable performance.

14 Nov 12 - 1515-1545

Defensive Aid Suite Contribution to Force Protection

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Keywords: Modeling & Simulation, Active Protection Systems, OneSAF

ABSTRACT: The National Defense Authorization Act (NDAA) of 2008 required a Live Fire Test and Evaluation (LFT&E) study of Active Protection Systems (APS). Along with the LFT&E, the Joint Improvised Explosive Device Defeat Organization (JIEDDO) created a complementary program focused on the Modeling & Simulation (M&S) of APS survivability technologies. AMSAA conducted the Defensive Aid Suite (DAS) Contribution to Force Protection study, which was one of the focus areas of the DoD APS M&S program. This focus area demonstrated the capability to model DAS, technologies designed to prevent a munition, once launched, from impacting a target platform or to reduce the resulting

penetration when a munition impact does occur, in an operational context. Several DAS were modeled in One Semi-Automated Forces (OneSAF), a force-on-force level simulation, with an operationally relevant scenario.

The DAS Contribution to Force Protection study was broken into two major pieces. The first piece was the development of the systems performance data for all of the DAS technologies to support the force level modeling. The second piece was the visualization of the systems performance data at the system level and the execution of the data in OneSAF to provide operational context. The system performance data provided by AMSAA was developed using a variety of sources that included live fire data, research, vendor information and M&S tools. The system performance data was integrated into OneSAF, a next generation, entity-level simulation that supports live, virtual and constructive applications.

This presentation will provide an overview of the DAS Contribution to Force Protection effort, the systems performance data development process and notional metrics this study examined to prove the capability to model DAS in an operational environment.

14 Nov 12 - 1545-1615

Understanding and Verifying OneSAF's Environment Runtime Component (ERC)

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Keywords: Verification, Environment Runtime Component (ERC), OneSAF, M&S

ABSTRACT: AMSAA is supporting the OneSAF Pre-Planned Product Improvement (P3I) development and V&V activities for the new combat physical models to include regression testing of the core combat physical models. The V&V efforts include testing, submission of problems found and providing feedback to the OneSAF Product Manager office for OneSAF baseline release v5.5 and any other interim releases. The most recent V&V efforts focused on a component of OneSAF's Environment Runtime Component (ERC).

The OneSAF ERC includes many services, to include terrain line-of-sight, dynamic terrain modification, and obscuration. This V&V effort focused on understanding the ERC as it pertains to atmospherics and weather. Physical models within OneSAF depend on the ERC to provide atmospheric transmittance. Specifically, the target acquisition models require the transmittance for their calculations of probabilities of acquisition. This effort enhanced AMSAA's knowledge of

the calculations and data used by the ERC. The weather palette allows the user to change some components of the weather to be saved as part of a scenario; this effort attempted to document the use of the palette for future efforts. This presentation will cover process and findings from this verification effort.

14 Nov 12 - 1615-1645

Verification and Validation (V&V) of IWARS version 2.06

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Keywords: Combat Simulation, Verification and Validation, Dismounted Soldier

ABSTRACT: The Infantry Warrior Simulation (IWARS) was developed by AMSAA, Natick Soldier Research, Development, and Engineering Center (NSRDEC), and Human Research and Engineering Directorate (HRED) to address the Army analysis community's need for a constructive simulation of dismounted Soldiers. Version 1.0, released in 2006, underwent an extensive verification and validation (V&V). Although IWARS version 1.0 provided the analytical community with a much needed analysis tool, it was always seen as a foundation on which greater dismounted Soldier representation and analysis capabilities would be built. IWARS version 2.06 was developed by building on this foundation.

The improvements and capabilities to IWARS 2.06 were guided by projected Army analytical needs and the V&V testing can be categorized into the following functional areas:

Equipment (common operational picture, airbursting munitions), Methods and Algorithms (partial exposure, stochastic shields, suppression, casualty assessment, collision avoidance, search and target acquisition, mid-identification, heat stress), Infrastructure (terrain, vehicles, behavior engine), Tools (Batch Run Analysis and Simulation Studio) and Integration (Pilot Study). This consisted of ensuring that the capabilities worked properly within the IWARS, and that the integration of these capabilities into IWARS did not have any unintended effects on other parts of the simulation. Results were continuously monitored to ensure that the changes incorporated had not affected the performance of the capabilities in IWARS 1.0. In addition, the McCabe QA software was used to assess IWARS 2.06 software complexity.

The V&V of IWARS version 2.06 demonstrated that the development of enhanced and new capabilities has been successfully integrated into IWARS and that the simulation is appropriate for Army analysis.

14 Nov 12 - 1645-1715

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15 Nov 12 - 1300-1330

IFV Soldier Capacity Analysis

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Keywords: Infantry Fighting Vehicle, Ground Combat Vehicle, Capacity, Field Experiment, Force Simulation

ABSTRACT: During the Ground Combat Vehicle (GCV) Milestone (MS) A Analysis of Alternatives (AoA), the Army needed to determine whether the IFV requirement to carry a crew plus nine Soldiers provided operational advantages sufficient to retain the requirement. The Army Capabilities Integration Center (ARCIC) Director tasked the Maneuver Center of Excellence (MCOE) to conduct a field experiment to compare the carrying capacity requirement with the current IFV with a seven Soldier carrying capacity. The U.S. Army TRADOC Analysis Center (TRAC) was tasked to lead the experiment and conduct a supporting analysis. TRAC, in partnership with the Maneuver Battle Lab (MBL), developed and conducted the experiment in December 2010. The experiment specifically examined the operational impact that Soldier carrying capacity has on an IFV-equipped mechanized infantry platoon.

The GCV AoA Dynamic Update Guidance (4 October 2011) directed additional Soldier capacity assessments for GCV

alternatives. For this follow-on effort, TRAC used force modeling to assess the operational impact of IFV Soldier carrying capacity in a mechanized infantry company when augmented with higher echelon and Joint enablers. Key force modeling enhancements informed by the 2010 field experiment enabled a quantitative look at the effects of Soldier carrying capacity on operational effectiveness and highlighted factors not addressed during the field experiment (e.g. mission outcomes). Specific modeling enhancements enabled shared situational awareness, dynamic decision-making affecting actions on the objective, consolidation and reorganization, and evacuation, as well as integration of habitual attachments or enablers (e.g. radio-telephone operator).

This briefing will review the field experiment, discuss the force modeling conducted to inform the operational effectiveness analysis and present emerging insights.

15 Nov 12 - 1330-1400

Air Defense System Analysis using the One Semi-Automated Forces (OneSAF) Simulation

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Keywords: Air Defense System Analysis, OneSAF, AoA, M&S

ABSTRACT: In support of a major air defense system AoA, the US Army Materiel Systems Analysis Activity (AMSAA) conducted an operational effectiveness analysis using OneSAF version 5.1. Utilizing data generated by the Extended Air Defense Simulation (EADSIM) OneSAF examined damage effects caused by indirect fire threats to personnel operating within a Forward Operating Base (FOB) in an Operation Enduring Freedom (OEF) scenario.

OneSAF is a next generation Computer Generated Forces that can represent a full range of operations, systems, and control processes from the individual combatant and platform level up to brigade level. The development of OneSAF is based on requirements provided by all three of the Army Modeling and Simulation (M&S) domains: Advanced Concepts and Requirements (ACR), Research, Development and Acquisition (RDA), and Training, Exercises and Military Operations (TEMO).

The analysis focused on damage inflicted on individual combatants and other critical FOB assets caused by indirect fire threat systems not being acquired and defeated by the air defense system(s). This presentation will discuss the approach AMSAA used to assess the air defense systems in OneSAF to include methodology enhancements. These enhancements include physical models, behaviors and weapons system performance data.

15 Nov 12 - 1400-1430

The Role of General Purpose Forces in Focused and Village Stability Operations

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Keywords: Village Stability Operations (VSO), Focused Operations (FO), General Purpose Force enablers

ABSTRACT: More than a decade of war and stability operations across multiple regions has placed unprecedented demands upon the Army's special operations forces. The special operations forces have traditionally been the primary executors of focused operations and village stability operations. In fact, the screening and training that special operations forces receive is in line with precisely this mission set. Due to the continuing high demand for these operations, however, general purpose forces have begun to assist in these mission sets in Operation Enduring Freedom.

Given the shift from purely special operations forces to a blend of general purpose and special operations forces, it is

important to analyze what has been effective with regard to both operations and training. This work looks to provide insights that may help shape best practices for this shift as well as to ensure that our future force is enabled to continue meeting the high demands of our current operational environment.

In this work we develop a brigade level case study and conduct a primarily qualitative analysis of the effectiveness of general purpose forces in conducting VSO and a combination of qualitative and quantitative analysis of the effectiveness of general purpose forces in conducting FO. The qualitative analysis focuses on the results of structured interviews with returning leaders of the brigade under study. The quantitative analysis focuses on longitudinal data analysis of available incident and blue force tracker data from the brigade under study.

15 Nov 12 - 1430-1500

Using Epidemic Theory to Forecast Violence

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ABSTRACT: Current methods increase violence within models and wargames using either force density ratios or random number sampling. Force density ratios model increases violence linearly when appropriate ratios are not achieved. In reality, violence does not change linearly. Random sampling is effective, but many runs are required to insure a sufficient number of outcomes to arrive at a legitimate estimate. A method needs to be developed to systematically model

changes in violence based on changes in coalition force size and actions. Some behaviors, including some types of violence, may spread in ways analogous to the contagious spread of infectious diseases, a process that has been characterized as "behavioral contagion". Behavioral contagion is based on the Mass Action Principle. The Mass Action Principle states that the number of future cases is regarded as a function of the number of current cases and the number of persons susceptible to the infection in the population.

This work attempts to show that an epidemic model can be used to forecast future violence. The Irregular Warfare database allows us to calculate year-to-year changes in violence. These changes are then shown to behave in a manner consistent with the spread of behavioral contagion. There is also a discussion of how the factors that make up the violence equation affect the strategies used to control violence within the irregular warfare environment.

15 Nov 12 - 1515-1545

Using the Power Law Distribution to Measure Stability in a Conflict

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ABSTRACT: A power law is a special kind of mathematical relationship between two qualities. When the frequency of an event varies as a power of some attribute of the event, the frequency is said to follow the power law. Many collective human activities, including violence, have been shown to exhibit universal patterns. There is evidence that the

distributions of a wide variety of physical, biological, and man-made phenomena follow a power law, including the sizes of earthquakes, craters on the moon and of solar flares, the foraging pattern of various species, the sizes of activity patterns of neuronal populations, the frequencies of words in most languages, frequencies of family names, the sizes of power outages and wars. The size distributions of casualties in whole wars 1816-1980 and terrorist attacks have separately been shown to follow approximate power-law distributions. Further investigation of this phenomenon has shown that certain casualty rates during a stable phase of an irregular war seem to also follow approximate power-law distributions. If there is enough evidence that this phenomenon is true, then it may be possible to develop a metric to describe the stability of an irregular war. For our case we will take a given violence distribution and see how close that distribution is to the power law. The coefficient of determination will provide the metric and the closer it is to 1, the more stable the violence.

15 Nov 12 - 1545-1615

Analytic Support to Joint Special Operations Task Force - Philippines (JSOTF-P): Applications of the Southern Philippines Public Perception Survey (SPPPS)

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ABSTRACT: In 2011, 1st Special Forces Group (Airborne) brought in analysts from CAA to provide analytic support to JSOTF-P. The initial request for support was for the development of a task force assessment framework. It was soon determined that the assessment would benefit from the

inclusion of polling data, and the result was the Southern Philippines Public Perception Survey (SPPPS). After the first two iterations of the survey, new applications for the data became apparent. In addition to providing insights for the JSOTF-P Quarterly Assessment, SPPPS data are used to inform JSOTF-P and Philippine Security Forces operational decisions, as well as decisions made by the Mindanao Working Group, USAID, the Philippine Counterterrorism Task Force, and the Philippine Internal Peace and Security Plan Working Group, the body charged with the transition of responsibility for security in conflict-afflicted areas from the Philippine military to local police control. The SPPPS serves as a model for the use of polling data in Phase V operations, and has generated related efforts at SOCPAC and in the Philippine national government.

Special Session
Future Capabilities

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14 Nov 12 - 1330-1400

Unmanned Systems Method, Model, and Tool (MMT) Gap Assessment

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Keywords: Modeling and simulation, unmanned ground vehicles, unmanned aircraft systems

ABSTRACT: During Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) the number of, and the missions executed by, unmanned systems have proliferated. Increased technological functionality and decreased component size has enabled extensive use of unmanned ground and aircraft systems by smaller echelon units, and has increased payload functionality, and enabled extended time-on-station. These systems provide advantages over manned systems when performing certain tasks, but are not (currently) well suited for others. The use of unmanned systems is

expected to exponentially increase over the next two decades. Major doctrine, organization, training, materiel, and leadership (DOTML) decision analyses will take place regarding unmanned system numbers, tactics, techniques, and procedures (TTP), and mission application. In order to prepare for the expected Department of Defense (DoD) and Army decision issues, the U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) conducted an unmanned systems methods, models, and tools (MMT) gap assessment. This MMT gap assessment evaluated the current capabilities of TRAC MMT to robustly and relevantly represent unmanned systems, identified representational knowledge, data, and algorithm (KDA) gaps within those MMT, and developed mitigation recommendations.

This presentation will describe the overall methodology, the gaps in knowledge, data, and algorithms, and recommended solutions for mitigating those gaps.

14 Nov 12 - 1400-1430

Optimizing the Army's Aerial Reconnaissance and Surveillance Asset Mix

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Keywords: Mix Analysis, Aerial Asset Allocation, Scheduling

ABSTRACT: In an effort to preserve the Army's unmatched capabilities in Aerial Reconnaissance and Surveillance (R&S) (ARS), the Integrated Capabilities Development Team (ICDT) is supporting a large-scale study to determine in which R&S platforms and sensors the Army should invest. As part of this effort, the team developed a math program to determine the preferred portfolio strategy that considers both programmed and existing systems.

The math program, coined the Joint Platform Allocation Tool (JPAT), evaluates cost, performance, and production timelines over a 12-year prioritized mission demand signal. It compares the availability and fielding schedules of aerial intelligence assets against a set of R&S mission demands throughout the world. Spanning forecasted scenarios and functional activities, the JPAT looks across all echelons and intelligence requirements. Based on a mission demand signal generated by SMEs and R&S experts, the JPAT pairs platform/sensor configurations with distinct mission demands that have a

specific set of time, intelligence, and performance requirements. The overall objective is to find the preferred mix of systems that maximizes mission demand satisfaction, performance, and priority. Coded in the Generic Algebraic Modeling System (GAMS), JPAT is a linear mixed-integer program that aims to inform some of the Army's key questions by identifying ARS systems that provide the most cost benefit, which systems to retain, and which to divest.

This presentation will discuss the methodology employed; key constraints, limitations, and assumptions; the challenges overcome in developing the JPAT; key findings; and lessons learned which will be inculcated in a math programming code of best practices.

14 Nov 12 - 1430-1500

Aerial Intelligence, Reconnaissance, and Surveillance Study

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Keywords: Coefficient, Configuration, Electro/Optical (EO/IR), Intelligence, Surveillance, Reconnaissance (ISR), Mission Intent, Performance, Program of Record (POR), Radar, SIGINT, Size, Weight and Power (SWaP), Quick Reaction Capabilities (QRC)

ABSTRACT: The U.S. Army Materiel Systems Analysis Activity (AMSAA) is supporting the Aerial Reconnaissance and Surveillance study efforts. The objective of this effort is to determine the types and quantities of Army aerial ISR systems that the Army should resource in POM 15-19. AMSAA has developed a process to create configurations that account for any platform/sensor combination that is reasonable given the Size, Weight and Power (SWaP) information and platform mission intent. AMSAA also created a rule set for configuration evaluation which was reviewed and agreed to by all ICDT participants. Four configuration lists have been provided: (1) the program of record (POR) platforms as configured today; (2) 1 plus the QRC platforms as configured today; (3) POR platforms considering all programmed and reasonable configurations plus QRC platforms as configured today; and (4) all platforms considering all programmed and reasonable configurations.

AMSAA has also developed performance coefficients for each sensor type: Radar, Electro-Optical/Infrared (EO/IR), and SIGINT. The Radar and EO/IR coefficients are calculated using the probability of acquisition, the Target Location Error (TLE) and the feasibility of the configuration to cover a mission demand. These coefficients represent the “credit” that a configuration will receive for covering a mission demand as well as the performance of the sensors within that configuration. The SIGINT coefficients are generated using a comparative analysis between relevant receivers; the coefficients calculated are not performance probabilities, but rather a comparative relationship among the sensors themselves. These coefficients will be used as input into TRAC’s optimization modeling as well as for gap and performance analysis.

We shall provide an overview of AMSAA’s methodology and approach utilized for the AR&S Study.

14 Nov 12 - 1515-1545

Squad: Foundation of the Decisive Force Measures of Effectiveness

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Keywords: Training, Human Dimension, Experiment

ABSTRACT: Historically, the Army Expeditionary Warrior Experiments (AEWE) have served as a venue to provide Capability Developers, the Science and Technology community and Industry, a credible, rigorous and validated operational experiment venue to support Doctrine, Organization, Training, Leadership and Materiel development efforts. The next AEWE, Spiral H will take place in JAN/FEB 13. However, this year a new precursor event, AEWE-Bold Quest 12 (BQ12), will occur in SEP/OCT 12.

This paper discusses the AEWE-BQ12 experiment. This event is a teaming effort between the Joint Staff, Joint Fires Division and MCoE Maneuver Battle Lab (MBL). Efficiencies gained through collaboration have facilitated maximum resource utilization by leveraging ongoing, preplanned events to address multiple stakeholder issues. The venue will provide a live, prototype experiment designed to inform the Joint and Coalition capability development community and the Army Chief of Staff initiative – Squad: Foundation of the Decisive Force (SFDF). The event is focused on the Human Dimension and will spotlight systems or methods that: (1) enhance small unit training, mission planning and rehearsals; (2) enhance training and leader development; and/or (3) reduce the cognitive load on leaders.

The capabilities of ten various technologies will be evaluated; including: small unit close combat tactical trainers, marksmanship trainers, a virtual mission planning and rehearsal tool, human behavior pattern recognition and analysis instruction, a counter IED trainer, and a Soldier Avatar. ATEC will lead an analysis team comprised of analysts from the MCoE/MBL, MCoE/DOTD, TRAC, ARI, Joint Staff J8, and AMSAA Squads from the US Army, Canadian Army and USMC will participate in the experiment.

14 Nov 12 - 1545-1615

Analysis of Relative Performance of Visual Camouflage through Magnitude Estimation

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Keywords: Camouflage, Magnitude Estimation, Friedman Test

ABSTRACT: The US Army is in the process of developing a long-term, Army-wide, visual camouflage uniform solution. An initial step in the process was testing of a large collection of camouflage concepts to identify the most promising approaches for further study. This paper describes the analysis conducted to support the down select process. The

Aberdeen Test Center conducted a magnitude estimation, pattern-in-picture perception experiment that included 18 three-pattern camouflage families and 8 reference government patterns. Each observer had to rate the performance of all the camouflage patterns in 3 of 45 background scenes.

The Friedman non-parametric analysis-of-variance test, multiple-comparison procedure was applied by AMSAA to evaluate the blending performance of each candidate camouflage family with respect to a reference baseline pattern family. One of the challenges of the analysis was to credibly combine the results of the individual Friedman tests of camouflage pattern performance in the 45 background scenes while applying the operationally relevant phenological scene weighting. A new metric, called the significance score, was developed to address this challenge.

The combination of the magnitude estimation and Friedman-based analysis techniques provide an efficient means of evaluating the relative effectiveness of numerous camouflage patterns. The results can be used to select a subset of patterns for further testing. These techniques should be equally effective in the analysis of camouflage nets and camouflage patterns for vehicles.

14 Nov 12 - 1615-1645

Control & Violence Support to Irregular Warfare Wargame Enhancement

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Keywords: Wargame, insurgency, counterinsurgency, control, violence

ABSTRACT: CAA uses an Irregular Warfare (IW) strategic wargame to support current operations and future planning analysis. CVS IWWE aims to improve certain aspects of the IW Wargame by analyzing current data from Iraq and Afghanistan and incorporating those findings into the wargame. This study uses Stathis Kalyvas' theory of violence from the Logic of Violence in Civil War (2006) to model control over eight cities in Iraq and Afghanistan. The primary goal of the study is to understand the time needed for an incumbent force to control an area once forces reach the suggested troop to population ratio and new operations begin. This research draws on city violence levels and intelligence reporting to examine the relationships between insurgents, incumbents, access to the population through control, and access to intelligence. The conclusion of this study will ground changes to the IW Wargame with empirical justification.

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15 Nov 12 - 1300-1330

Producing Timely High-Quality Data for Operational Effectiveness Modeling

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Keywords: database, simulation data, data transformation

ABSTRACT: In the operations research community, many research and analysis efforts leverage combat models such as One Semi-Automated Force (OneSAF), Advanced Warfighting Simulation (AWARS), and COMBATXXI. The U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) employs these models for a full range of future capabilities studies, including requirements evaluation and acquisition decision support. AWARS uses a large amount of characteristic and performance (C&P) data and operational data that require an extensive data infrastructure. The data infrastructure stores, sorts, and pre-processes data for use in AWARS. Although the data infrastructure has a behind-the-scenes role in analysis, the resulting data are instrumental to sound analysis.

As the diverse software for processing simulation-ready data ages, it becomes increasingly challenging to modify, maintain, and expand. Complex maintenance requirements and lengthy lag times for expanding the data infrastructure can negatively

impact responsive analysis support to critical Army and Department of Defense (DOD) decisions. A legacy data infrastructure can be expensive to maintain; therefore, TRAC began a transformation of C&P data processes to increase responsiveness and exponentially decrease cost and complexity.

This presentation provides a summary of the TRAC data process transformation and useful metrics for rating the present and future cost of data processing infrastructure. This presentation also shows how updated data methods, software, and infrastructure can enhance analysis by improving the quality and timeliness of data while minimizing the cost of maintaining the associated software.

15 Nov 12 - 1330-1400

Modeling of Digital Radio Frequency Memory (DRFM) in Extended Air Defense Simulation (EADSIM) Model

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Keywords: Electronic warfare, electronic attack, probability of negation, masking, false targets, EADSIM, radar, missile, false targets, radar cross section, pulse-repetition frequency, effective radiated power, digital radio frequency memory, and interceptors

ABSTRACT: Threat radar systems have continued to increase in sophistication within recent years. This is especially noticeable in the electronic warfare (EW) arena where there has been a wide proliferation of digital radio frequency memory (DRFM) technology. With this new set of threats against air and missile defense systems, a need to properly simulate this type of threat within a popular model like the Extended Air Defense Simulation (EADSIM) has grown in urgency. The DRFM modeling must address real capabilities such as frequency hopping, effect of Pulse Width (PW), Pulse-Repetition Frequency (PRF), and Effective Radiated Power (ERP) to be useful for the air and missile defense analytical community. In this paper, the newly-designed DRFM module within the EADSIM model was tested using several key variables such as radar cross section (RCS), false target generation, masking ability, and number of targeted radars. A total of 25 different cases were run and analyzed to determine the accuracy of the DRFM modeling within EADSIM.

15 Nov 12 - 1400-1430

Approach to Holistic Survivability and Visualization Tool

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Keywords: Survivability, Simulation

ABSTRACT: Typical vehicle survivability and force protection analysis has focused on armor protection. However, due to weigh and size constraints, it is becoming increasingly clear that armor solutions alone cannot provide adequate protection against the vast array of threats that may be encountered. Therefore, the Army requires a more holistic approach to survivability analysis that considers contributions from other aspects of an engagement sequence. This engagement sequence, also referred to as the survivability kill chain, includes: avoid detection, avoid acquisition, avoid hit, threat defeat, avoid penetration, and avoid kill. This holistic approach presents two challenges to survivability analysis. First, existing tools independently examine each layer of the kill chain but ignore the combined effects of the holistic approach. And second, this method generates vast amount of data that need to be presented in a concise yet understandable format.

This paper presents the approach AMSAA has developed to address both of these issues. AMSAA is taking a two-step approach. First is an expansion of our traditional platform-level analysis to include the contributions of avoiding hit, acquisition, threat defeat, and detection. Then the second step involved the development of a visualization tool to portray the results for each layer of the engagement sequence

as well as the holistic (i.e., overall) results. These results can be generated for various metrics depending upon the user's requirements. AMSAA has included results from this two step process in several Ground Combat Systems studies.

15 Nov 12 - 1430-1500

15 Nov 12 - 1515-1545

Target Acquisition Sensor Parametric Analysis

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Keywords: Target Acquisition Sensor

ABSTRACT: AMSAA performed a parametric analysis of target acquisition technologies in support of a ground vehicle Analysis of Alternatives (AoA). The purpose of the analysis was to characterize performance of the technologies in a wide-range of conditions. A variation of parameters was performed singly off of a base case to determine the relative effect of each parameter. The base case consisted of a specific target, environment, and time of day/light level. The Acquire Target Task Performance Metric (TTPM) model was used to calculate the R70 (range at which 70% of the population can perform the task) values for probability of detection and identification for the Blue technologies under consideration and Red technologies associated with threat systems. The R70s of the Blue and Red technologies were compared for each case to determine the standoff distance each Blue technology provided.

15 Nov 12 - 1545-1615

Application of Novel Geospatial Analysis Tools to Assess Urban Maneuverability in Operational Environments

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Keywords: Urban, Maneuverability, Infrastructure, ArcGIS, AoAs, Ground Mobility

ABSTRACT: Due to the increase in Irregular Warfare (IW) operations, the US military must contend with adversaries who engage US forces asymmetrically in urban environments. To combat this threat, the US military must be able to effectively conduct operations and maneuver within these urban and restrictive environments thus minimizing the risk to our forces. The Army Materiel Systems Analysis Activity (AMSAA) is developing new methodologies and tools to assess the capabilities of tactical and combat vehicles within these constrictive environments. AMSAA's analytical approach leverages ArcGIS geospatial software / tools, high resolution satellite imagery and vehicle characteristic data to determine the route selection options available for each vehicle alternative. Initially developed in response to the following question posed by the Army Capabilities Integration Center (ARCIC): Why are soldiers choosing to take less survivable vehicle alternatives into areas of Sadr City when more survivable vehicle alternatives are available to them? AMSAA

and the US Army Corps of Engineers Engineer Research and Development Center (USACE ERDC) developed a methodology to quantify the number of routes available using vehicle data and the physical geometry / construction of the road network infrastructure. AMSAA has refined and matured the urban maneuver methodology to accommodate geospecific route selection / mission planning options and used it to quantify adverse maneuverability effects when adding armor to the vehicles in theater. Currently, AMSAA is characterizing the performance of ground vehicle platforms in a set of countries where U.S. forces may be called to operate due to the potential for future conflict to breakout – an area known as the "Arc of Instability" for the ARCIC. Working together with developers and analysts from the USACE ERDC, the Army Geospatial Center (AGC) and the Training and Doctrine Command (TRADOC) Capability Manager-Geospatial (TCM-G), AMSAA is modeling the urban maneuverability performance of fifteen wheeled and tracked vehicles in seven operationally relevant urban environments. These efforts will be used to inform Army ground vehicle acquisition / modernization programs, requirements development and Analysis of Alternatives (AoA) studies.

15 Nov 12 - 1615-1645

Multi-Function Electronic Warfare Analysis of Alternatives: Offensive Electronic Warfare for the Army

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Keywords: analysis of alternatives, electronic warfare, Integrated Electronic Warfare System, offensive EW, trades analysis, risk analysis, software

ABSTRACT: The Army, lacking a current electronic warfare (EW) capability, conducted a series of studies leading to a reinstatement of an Integrated EW System (IEWS) within the force. The IEWS concept contains both offensive and defensive EW components that are controlled and integrated by an EW Planning and Management Tool. The offensive concept, termed Multi-Function EW (MFEW), is composed of aerial, fixed site, vehicle-mounted, and dismounted variants, each evaluated on its technological promise and operational benefit. The purpose of the MFEW Analysis of Alternatives (AoA) was to identify the MFEW technologies that affordably mitigate the capability gaps, and inform the threshold requirements of the evolving capability development document (CDD) for an acquisition category II Milestone A decision.

The study team evaluated numerous technologies from industry and government for performance, cost, schedule risk, operational benefit and gap mitigation. Trades of key attributes informed senior decision makers on the most cost-effective technologies for each variant, while operational benefit analysis highlighted the benefits and employment risks

associated with each variant. The study leveraged EW expertise across the Department of Defense and made significant contributions towards informing employment concepts, key operational attributes and threshold values, and critical targets for EW to support brigade combat team (BCT) operations. The study team executed several warfighter exercises to employ EW in an operational context and establish the demand for EW missions at the BCT through platoon echelons in a range of scenarios. Detailed performance modeling informed the effective ranges for each technology and the targets it could affect, as well as key technical trades to improve system performance and reduce size, weight, and power.

This presentation describes the context, methodology, analytic methods, and results of the study, highlighting the unique challenges associated with assessing alternatives across a family of systems.

Special Session
Manpower, Personnel & Training Analysis

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14 Nov 12 - 1330-1400

US Army Reserve (USAR) Civil Affairs Analytical Support to a Capabilities Based Assessment (CBA)

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Keywords: Civil Affairs, CA, Capabilities Based Assessment, CBA, Force Modernization, US Army Reserve, USAR

ABSTRACT: As current Defense Strategic Guidance alters resourcing priorities, senior military leaders continue to emphasize an explicit Department of Defense (DOD) capability requirement to "secure territory and populations, and facilitate a transition to a stable government … using standing forces and, if necessary, for an extended period with mobilized forces." Despite recent growth in active Army CA capability, a majority of DOD CA capability continues to reside in United States AR units. While these AR CA units are funded under General Purpose Forces (GPF) dollars, the Special

Operations Command (SOCOM)-funded John F. Kennedy Special Warfare Center and School (USAJFKSWCS) serves as the formal TRADOC Army Regulation 5-22 force modernization proponent.

In 2011, based on prior CA gap analysis work, the Office of the Chief of the Army Reserve (OCAR) asked that the TRAC-LEE study team assist the CA proponent in the conduct of the "first-ever" Army CA CBA. The study team faced many unique challenges in this study, including compressed timelines, emerging military government roles for CA, and a pending transition to a new TRADOC CA proponent. The study team used the Army Capabilities Integration Center (ARCIC) CBA guide to develop and execute a methodology for completing the CBA within the time constraints. The study team conducted Functional Area Assessment (FAA), Functional Needs Assessment (FNA), and Functional Solutions Assessment (FSA) workshops, and generated analytical products for each. The study team also refined interim products through surveys and senior level reviews. This presentation will cover high-level CBA results along with insights into methodological dilemmas and challenges faced by the study team.

14 Nov 12 - 1400-1430

Career Program 32 (CP-32) Personnel Requirements Estimation Model

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Keywords: Estimation, Forecasting, Personnel, Resource Management

ABSTRACT: Each year, TRADOC must estimate how many civilian interns it must hire as Training, Capability, and Doctrine War-fighting Developers (CP-32). In the past, the TRADOC CP-32 Career Management Office submitted requests based on the number of intern hires authorized by HQDA from previous year. However, there was often a significant mismatch between the requested numbers from TRADOC and authorizations approved by HQDA. More recently, the CP-32 Career Management Office asked for a tool it could use to close the gap in this mismatch. In support of this effort, the TRADOC DCS G-3/5/7 PA&ED developed a linear spreadsheet model based on the number of eligible retirees over time. Even though this model closed the gap somewhat, there was still a noticeable difference in the requested number of interns and the HQDA authorizations.

The CP-32 Personnel Requirements Estimation Model is a spreadsheet model built in MS Office Excel. Unlike its predecessor, this model applies both linear and non-linear estimation techniques. Using data from the Total Army Personnel database, this model takes into account current & future authorizations, workforce distribution by location, total time in service, retirement eligibility, and age. The model

manipulates this data using linear and non-linear regression to estimate CP-32 attrition rates and quantities. This model can provide installation civilian personnel directors the ability to not only estimate CP-32 intern hires, but forecast the bulk of their future CP-32 manpower requirements as well. This model could potentially underpin the personnel strength management for the CP-32 program in support of TAA. The TRADOC CP-32 Career Management Office has forwarded this model to installations and organizations that manage CP-32 personnel and awaits their feedback.

14 Nov 12 - 1430-1500

United States Army Reserve (USAR) Public Affairs Units and Personnel Organizational Structure Study

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Keywords: ARFORGEN, MTOE, TDA, Army Reserve, USAR, public affairs, PA

ABSTRACT: Since 2001, the Army has directed that the Army Reserve transform to an operational force that features operational and functional commands that are responsible for the training and readiness of Army Reserve Soldiers and units. However, the Army has not reorganized the Army Reserve PA units into a functional structure to better reflect the current

long term mission requirements and to align with the Army Force Generation (ARFORGEN) training, mobilization, and deployment model. The Army Reserve considers peacetime mission command for USAR PA Modified Table of Organization and Equipment (MTOE) units problematic, and continues to be concerned about PA unit manning, training, and equipping across the commands.

In view of these circumstances, the Office of the Chief of the Army Reserve (OCAR) called on TRAC-LEE for analysis to help to determine proper manning, as well as PA mission command relationships. The objectives of the study effort were to (1) determine whether the USAR had the manpower to meet PA mission requirements; (2) evaluate and recommend potential organizational changes to PA MTOE units and Tables of Distribution and Allowances (TDA) assets; and (3) determine the recommended peacetime mission command for all PA assets and units. OCAR also asked the team to conduct a PA stakeholder review to determine stakeholder knowledge of PA, and to determine stakeholder use of PA units and personnel in theater. OCAR directed TRAC-LEE to focus the study on Army Reserve PA personnel and units, and restricted the team to a twelve-month timeline in order to provide necessary information to key USAR decision makers. In order to meet study requirements, the study team conducted an extensive literature review, database analysis, in-person interviews, a PA personnel survey, a Mission Command Cell survey, a Users' of PA services survey, and a study sponsor review panel. This presentation will provide the final results of the analytical effort.

14 Nov 12 - 1515-1545

The Army Acquisition Corps: Force Structure Analysis to meet Current and Future Operational Contracting Demands

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ABSTRACT: Army operations are, and will continue to be, heavily reliant upon contracting in all operational phases. The current manning of the Army contracting workforce, especially the expeditionary capability, is out of balance with the demands placed upon our contracting workforce to effectively manage the Army's contracting requirements. The current acquisition career model does not allow officers to gain sufficient breadth and depth of contracting technical experience to fully support unified land operations. The United States Army Acquisition Support Center (USAASC) developed four courses of action (COAs) to address the gaps in the current and future size and structure of Army Contracting. Army G1 conducts a feasibility analysis to determine the force structure impacts with each COA.

This presentation will describe the force structure model used to analyze the effects of each COA on accessions, operating strength deviation, and the mix of acquisition versus non-acquisition experience. The analysis determined the feasibility of each different officer career management tracks, spanning from the current dual track, functional area driven model with entry at seven years of service to acquisition as a separate branch, assessing lieutenants with zero years of service. The study results find that while a complete change in the structure of the career development track is feasible, it is not

necessary. In fact, our findings recommend widening the accession window in the voluntary transfer incentive program (VTIP) to more year groups will best allow the Acquisition Corps, as a functional area, the greatest amount of freedom over managing the programmed growth and shaping their officer talent pool in a way that provide the balanced mix of experienced field grade officers.

14 Nov 12 - 1545-1615

Analytical Approach for the Center for Army Acquisition and Materiel Lessons Learned

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Keywords: Acquisition, Lessons Learned, AAR, Risk Metrics

ABSTRACT: Many different entities across the Army have acquisition-like lessons learned, but the lack of a centralized hub specifically for the Army materiel acquisition enterprise provides no realistic way to "track successes, analyze failures, and develop 'best practices' and 'lessons learned" from past acquisition programs. On January 8th, 2012 the Army Acquisition Executive (AAE), in response to the 2010 Army Acquisition Review recommendation, signed a memo directing the Army Materiel Systems Analysis Activity (AMSAA) to "create a web-enabled database for acquisition lessons learned (ALL) and provide analytical capability to conduct the analysis." In response to the AAE's directive, AMSAA immediately initiated an effort to establish a Center for Army Acquisition and Materiel Lessons Learned (CAAMLL). The Center will facilitate the collection, archiving, and

dissemination of acquisition lessons and provide a formal means and capacity to analyze these inputs.

Data mining of existing sources of information will allow AMSAA to populate CAAMLL with historical lessons learned, best practices, and risk metrics. In addition, After Action Reviews (AARs) and future lessons learned will be populated with the assistance of the Program Management community, with program health metrics being drawn from the HQDA Executive Dashboard. Both qualitative and quantitative ALL data will be used to support trend analysis across the Army program portfolio and to build cases to influence policy and procedure. With the development of future lessons learned and a consolidated collection of acquisition best practices, the CAAMLL will ultimately help train and support the Army materiel acquisition enterprise.

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15 Nov 12 - 1300-1330

Irregular Warfare Wargame Enhancement

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Keywords: Wargame, insurgency, counterinsurgency, process improvement.

ABSTRACT: For a number of years, CAA has used a manual tabletop Irregular Warfare (IW) wargame as an analytical tool to support both current operations and future planning. We are improving the wargame by incorporating new data, new

research, and automation tools. The new research draws on city- and national-level data in Afghanistan and Iraq to examine the relationships between insurgent violence, counterinsurgent troop levels, control of the population, the availability of intelligence, and other factors. We expect the inclusion of this work to make the wargame more realistic and insightful without significantly sacrificing ease of use, and we hope to use the automation tools to actually improve ease of use.

15 Nov 12 - 1330-1400

Comparison of the Combat Effectiveness of the XM25 and M320 Grenade Launchers using the Infantry Warrior Simulation (IWARS)

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Keywords: Combat Simulation, XM25, M320, IWARS

ABSTRACT: The Infantry Warrior Simulation (IWARS) was used to conduct a Proof-of-Principle study for the Maneuver Battle Lab (MBL) and TRADOC Capability Manager – Soldier (TCM-Soldier) in order to provide quantitative results in support of the Squad: Foundation of the Decisive Force (SFDF) effort. IWARS was jointly developed by AMSAA and the Natick Soldier Research, Development, and Engineering Center (NSRDEC) to assess the impact of new technologies on mission accomplishment. It is a constructive, closed-form, agent-based, high resolution combat simulation that can be used to assess the military worth of individual and small-unit dismounted war-fighter equipment. Features include

traditional target engagement / lethality / survivability methodology as well as intelligent agent modeling to represent Soldier cognitive abilities (e.g., situational awareness, impact of information, etc.) and technologies that impact decision making.

The SFDF effort is focused on identifying materiel, leadership and training solutions needed to provide the squad with overmatch capabilities. For the Proof-of-Principle study AMSAA, in cooperation with the Maneuver Center of Excellence (MCoE), modified the React to Contact Use Case originally developed by the NSRDEC in order to focus on two potential materiel solutions: XM25 Counter Defilade Target Engagement System and the M320 Grenade Launcher. IWARS was used to compare these two materiel solutions using quantitative Measures of Effectiveness (MOEs).

MOEs provided as part of this study include means and distributions for incapacitations by force, Blue grenades fired, Threat incapacitations by grenade type, and grenade bursts within 2 meters of the target. An additional MOE used was the Force Ratio Index (FRI) which is defined as the percent of the Blue Force surviving minus the percent of the Threat Force surviving.

15 Nov 12 - 1400-1430

Electronic Warfare Planning and Management Tool Analysis of Alternatives: Reintroducing Electronic Warfare into the Army

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Keywords: analysis of alternatives, brigade combat team operations, electronic warfare, mission command, Integrated Electronic Warfare System, trades analysis, CDD Attributes, software development

ABSTRACT: In 2009 and 2010 the U.S. Army and Joint community conducted capability-based assessments of Electronic Warfare (EW), finding significant capability gaps existed for Brigade Combat Team (BCT) operations. The Army conducted studies to reinstate an Integrated EW System (IEWS) within the force. The IEWS concept contains both an offensive and defensive EW component that is controlled and integrated into the mission command system by an EW Planning and Management Tool (EWPMT). The purpose of this analysis of alternatives was to identify EWPMT materiel solutions that affordably mitigate the capability gaps; inform the threshold attributes of the evolving capability development document (CDD); and inform an acquisition category III Milestone B decision.

This study identified the desired functions of the EWPMT necessary to integrate EW planning and management into mission command. Cost informed trades are challenging but in this particular software application, they presented unique implications. Using various operations research techniques,

the study team assessed alternatives' cost, schedule, and performance. The team developed EWPMT functions' associated attributes through measurement space workshops. Warfighters assessed the relative importance of the functions in different operational settings. The study team conducted cost, schedule and performance trades analysis along with relative operational benefits, and assessed best of breed government and commercial-off-the-shelf technology (GOTS and COTS respectively), determining several interesting aspects unique to those solutions. Specifically, limitations of software production and integration directly affect schedule as a driving force within the trades' analysis.

This presentation describes the context, methodology, and results of the study, highlighting the unique challenges associated with a software solution. The presentation also describes the challenges that the study team faced and the methods the team used to overcome those challenges.

15 Nov 12 - 1430-1500

Performance Measurement as Managed by the US Army

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Keywords: Strategic Management System, SMS, GPRA

ABSTRACT: Performance management is not new to the US Government. Even before the Congress enacted the Government Performance and Results Act of 1993 (GPRA) to improve program performance and provide greater accountability for results, and the GPRA Modernization Act of 2010 requiring federal agencies to move further toward effective performance management, previous administrations in the last 55 years attempted to measure performance by linking budget levels with expected results. The US Army, in 2006, without a mandate from Department of Defense, deployed an Army Enterprise performance management methodology and software tool to enable Army leaders at all levels to manage and measure strategic goals against outputs and outcomes to determine if their Title 10 functions were met. The framework and methodology of the Strategic Management System (SMS) will be discussed and where the Army is today with refinements of the system to include automation and how the system currently supports the Active

Army, Army Reserve Component, and National Guard. A demonstration will be provided on how various organizations are using SMS to manage their programs to maximize performance, while minimizing costs, and enabling resource-informed decisions. SMS is well positioned to be the Army Office of Business Transformation's enduring strategic assessment capability to support the Secretary of the Army.

15 Nov 12 - 1515-1545

Representation of Non-Lethal Weapons and Escalation of Force in Constructive Simulations

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Keywords: non-lethal, escalation of force, secure site, cordon and search

ABSTRACT: AMSAA's Non-Lethal and Soldier Simulation Teams are working to develop representative escalation of force (EoF) scenarios in the Army's Infantry Warrior Simulation (IWARS) to assess the operational utility of non-lethal weapons (NLW). NLWs provide the Soldier the ability to employ sufficient force needed to accomplish an objective while minimizing casualties, permanent injury of personnel, and undesired damage to property and the environment. EoF and NLW simulation methodology development includes identification of relevant operating environments, terrain definition, weapon performance, agent behavior (civilians and combatants), and data structures for representing NLW effects. Two IWARS EoF scenarios under development by AMSAA are "Secure a Site" and "Cordon and Search." NLWs

used in these scenarios include blunt impact munitions, flash bang grenades and directed energy (dazzling laser) systems. An initial “Secure a Site” scenario has been demonstrated and current efforts are focused on civilian target responses. Representation of NLW and EoF in IWARS will enable the analyst to assess materiel, tactics, etc., in support of Army studies.

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Special Session
Resource Analysis

Co-Chair: Mr. Touggy Orgeron / Ms. Renee Carlucci
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14 Nov 12 - 1330-1400

Biometrics Identity Management Agency (BIMA) Resource Analysis Study

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Keywords: Biometrics, Process Flow Modeling, Resource Analysis

ABSTRACT: The U.S. Army Materiel Systems Analysis Activity (AMSAA) performed a quick turnaround resource analysis study for BIMA with the Biometrics Process Model (BPM). BPM is a detailed process flow model of biometrics processes over the world. This effort involved learning the model, performing a high level validation of BIMA West processes within the model, running the model, and generating results from the model.

Results from this model provided insights into how many staff is necessary to perform duties at BIMA West, which is located in Clarksburg, WV. AMSAA's results supported a POM 14 – 18 proposal for BIMA resource requirements.

We shall provide an overview of AMSAA's involvement in the study, an overview of the biometrics process, as well as sample results from the study.

14 Nov 12 - 1400-1430

Army 2020 Tactical Wheeled Vehicle (TWV) Strategy: Cost Benefit Analysis (C-BA) of TWV Pooling

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Keywords: Army 2020, Tactical Wheeled Vehicle, TWV, Cost Benefit Analysis, C-BA, Pooling

ABSTRACT: The Chief of Staff of the Army directed U.S. Army Training and Doctrine Command (TRADOC) to develop a

strategy to reduce the number of Tactical Wheeled Vehicles (TWV) for the Army of 2020 to 170,000 across all components and to show the impact and associated risk. As one avenue for reduction, the Army Capabilities Integration Center (ARCIC) proposed the concept of pooling TWVs required for deployments at the Army level. The analysis presented in this abstract focuses on the benefits and costs of TWV pooling. TRADOC Analysis Center at Ft. Lee (TRAC-LEE) used a value-focused approach to determine benefits and a rough order of magnitude to estimate costs. The team facilitated a series of workshops with subject matter experts from the Integrated Process Team established by ARCIC to support this study. The workshops led the IPT though problem definition and decomposition; value measure description and weighting; alternative generation; and solution design and evaluation. The result was a solution framework that allowed the team to identify what choices make TWV pooling acceptable or unacceptable, and to develop a trade space between cost and value that would allow TWV pooling to proceed according to the Army's priorities. This presentation will cover high-level C-BA results along with insight into the methodological challenges faced by the study team.

14 Nov 12 - 1430-1500

Cost Support to Decision Analysis

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Keywords: Decision support, cost-benefit analysis, business case analysis, analysis of alternatives, portfolio analysis, cost

ABSTRACT: This presentation outlines the methodologies of recent cost analyses conducted by the Training and Doctrine Command (TRADOC) Analysis Center (TRAC) – White Sands Missile Range. Cost analyses enable resource-informed decisions as a part of cost-benefit analyses (C-BAs), business case assessments (BCAs), and analysis of alternatives (AoAs).

In addition to these traditional decision analyses, TRAC studies are increasingly supporting decisions regarding portfolios of programs (e.g. Combat Vehicle Portfolio and Precision Munitions Portfolio). This will occur more frequently as the Army implements recommendations from the Decker-Wagner Army Acquisition Review and program affordability is scrutinized earlier in the acquisition process.

In each case, cost is a key component of the overall study methodology in determining an appropriate alternative within a broader mix of solutions. Due to the range of decision analyses conducted, cost analysis methods must be adaptive to varying methods, models, and tools.

This presentation details the evolving approaches that TRAC has used to leverage cost data and build life cycle cost estimates for studies and the decisions informed. Cost analysis methodologies from recently conducted studies in support of resource-informed decisions will also be presented.

14 Nov 12 - 1515-1545

A Framework for Understanding Security Sector Reconstruction for Army Operations and Planning

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Keywords: interagency, security force assistance, partnering, reconstruction

ABSTRACT: In both post-conflict scenarios and shaping operations in the last decade, decision makers across the Department of Defense (DOD) and interagency partners have struggled to understand the relationship between security sector reconstruction and rule of law (SSR/RoL). Policy goals speak to the importance of a functioning security sector, but the diverse number of interagency partners, international actors, and non-governmental organizations make it difficult to understand the SSR/RoL connection. In order to prepare for expected DOD and Army decision issues, the U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC), working in conjunction with RAND, established a data collection and modeling effort to create a conceptual model and decision analysis tool to represent the SSR/RoL nexus. This effort is intended to be of utility to existing models in development at TRAC, such as the Irregular Warfare Tactical Wargame and Cultural Geography, and also has potential to serve as a tool for the larger interagency and international community to enable informed decisions that enhance security and RoL in overseas environments.

This presentation describes the overall methodology, data collection plan, phases for delivery of the SSR/RoL conceptual

model and decision analysis tool, and potential implications to DOD and Interagency Partners. Further, the presentation highlights the challenges of collecting accurate data from diverse governmental and non-governmental databases and provides interim results from continental United States (CONUS)-based data collection efforts. It concludes with a summary of data collection methodologies and an outline of the outside-CONUS data collection plan for this effort.

14 Nov 12 - 1545-1615

Special Installations Cost Benefit Analysis (CBA)

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Keywords: Real Property Accountability, Installation Support Services, GOGO, GOCO

ABSTRACT: Currently, AMC manages both Real Property and Installation Support Services of its 21 Special Installations located across the US. These installations consist of 13 Government-Owned Government-Operated (GOGO) installations and 8 Government-Owned Contractor-Operated (GOCO) installations.

AMSAA was tasked by AMC G4 to conduct a CBA to determine the feasibility, costs and benefits of transferring Real Property Accountability (RPA) and Installation Support Services (ISS) of AMC SIs from AMC to the Installation Management Command (IMCOM).

The primary study issues include: identifying costs and benefits of reassigning RPA at the GOCO and GOGO installations; and identifying the costs and benefits of transferring Installation Support Services at the GOCO and GOGO installations. The GOCO alternatives were split into three cases due to the unique nature of two sites (Joint Services Manufacturing Center (JSMC) Lima and Hawthorne Army Depot (HWAD)) and the similarities of the Army Ammunition Plants (AAPs). Each case contained multiple alternatives that addressed changes to both RPA and ISS management and performance. The GOGO alternatives considered seven alternatives that addressed changes to RPA, ISS and funding. Funding alternatives were considered due to the restrictive nature of the Army Working Capital Fund laws and regulations.

14 Nov 12 - 1615-1645

Adding the Cost Element to Decisions Made in a TRADOC-RDECOM M&S Decision Support Environment Event

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Keywords: Distributed Modeling & Simulation (M&S), Systems of Systems (SoS) Analysis, Integrated Base Defense (IBD), Cost Analysis

ABSTRACT: The development of an Integrated Base Defense (IBD) is a significant challenge for the Army with many analytical gaps. The IBD problem space is complex, with evolving requirements and a large stakeholder base. In order to evaluate and analyze IBD decisions, the Training & Doctrine Command (TRADOC) Maneuver Support Center of Excellence (MSCoE) led and continues to lead a series of IBD focused experiments and wargames. Modeling and Simulation (M&S) significantly contributes to this effort. To improve IBD M&S capabilities, a collaborative demonstration with the Research, Development and Engineering Command's (RDECOM's) M&S

Decision Support Environment (MSDSE) was held in September 2011. The results of this demonstration provided key input to MSCoE IBD related concepts and technologies. Moreover, it established an initial M&S toolset that will significantly improve force protection in combat zones and Army installations worldwide by providing leaders a capability to conduct analysis of defense and mission rehearsals. Of special interest was the addition of cost modeling to the post processed data. This presentation focuses on the emerging results from adding this dimension.

The demonstration was executed with a “human in the loop” Battle Captain, aided by simulated mission command assets. The Common Operating Picture was populated and stimulated using Science & Technology (S&T) M&S, allowing for a realistic representation of physical phenomena without the need for real systems. During the course of the exercise, a red force chemical attack was simulated. The monetary cost to the blue force was calculated, to include equipment replacement and personnel costs, which provided additional context to the impact of the decisions made by each Battle Captain. This provides an initial step in integrating cost modeling into analysis of operational exercises.

14 Nov 12 - 1645-1715

Unserviceable Excess Study

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ABSTRACT: AMSAA evaluated the Army Materiel Command’s asset position for Unserviceable Class IX, Army-managed,

national stock. The intent of the study was to: 1) Evaluate assets against planned Depot and National Maintenance programs, National Maintenance Contracts and those without existing repair programs; 2) Quantify annual storage costs for assets stored at Defense Logistics Agency (DLA) warehouses; and 3) Provide a recommendation for potential excess.

AMSAA performed an analysis to provide a recommendation of Life Cycle Management Command (LCMC) segregated assets with potential excess. The analysis involved utilization of multiple data sources to include the Logistics Modernization Program (LMP), Logistics Information Warehouse, Depot Maintenance Ops Planning System Requirements (FY12-17), FY12 National Maintenance Program requirements, National Maintenance Contract Requirements (FY12-17) and 24-month historical demand data of assets. AMSAA estimated an overall AMC asset position of $10B in Unserviceable, Class IX assets with an annual storage cost of $7M. Of the $10.0B identified, $3.7B required LCMC validation and disposition as potential excess.

By conducting this study, AMC was able to confirm and initiate disposal transactions for $1.4B in excess materiel.

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15 Nov 12 - 1300-1330

Army Force Generation (ARFORGEN) Training Event Cost Model Prototype Demo

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Keywords: ARFOREGN, ATECM, Aim Points, Event Menu Matrices, Cost Analysis, Cost Metrics

ABSTRACT: In the fall of 2010, then Deputy Chief Staff G3/5/7, LTG Thurmond, developed the concept of ARFORGEN Metrics called Aim Points. The Army uses the Aim Points to prescribe the desired readiness level of unit types as they progress through the ARFORGEN Cycle (Reset, Train/Ready, Available Pools). The Army then uses these corresponding Unit Status Report (USR) Metrics for Personnel on Hand, Equipment On Hand, Equipment Readiness, and Training level of units to develop Training Templates and Event Menu Matrices for unit types. FORSCOM with the aid of TRADOC and DA G3 developed Active Component (AC) and Reserve Component (RC) Templates and Event Menu Matrices that describe the training of Army Combat Arms, Combat Support and Combat Service Support units from Corps to Individual level. Over the past year the Deputy Assistant Secretary of the Army for Cost and Economics (DASA-CE) worked with

FORSCOM and DA Staff to develop methodology to use the AIM Points, Training Templates, and Event Menu Matrices, as a framework to cost the Army Operational Rotational Force as it progresses through the ARFORGEN Cycle.

This presentation is a follow-on to last year's presentation of the methodology used to design the ATECM. This year's presentation will consist of a short n Executive Brief followed by a a live demonstration of the prototype model. The ATECM Costing Tool is scheduled for delivery to RAND-Arroyo for validation in March 2013. DASA-CE design for the tool will give a base cost for units as they progress through the ARFORGEN Cycle with added features of costing training events and adjusting three main parameters for training events within the tool: Air and Ground Direct OPTEMPO, Ammunition usage, and the use of Training Aid Devices, Simulators, and Simulations (TADSS) with live training events or as an alternative to a live event. The added feature to the ATECM is its ability to give Exercise Cost as well as Deployment/Operational cost of Deployment Expeditionary Forces.

15 Nov 12 - 1330-1400

Stated Preference Economic Development (SPED) Framework

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Keywords: Contingent Valuation, Stated Preference, Cost Benefit Analysis, Economic Development, CERP, Afghanistan

ABSTRACT: The United States government has provided over $51 billion in aid to Afghanistan since 2002. There are a lack of data and methods to determine the net social benefit of this aid. Additionally, currently available data are insufficient to properly prioritize the usage and award of this aid. SPED involved the creation of tools that estimate the net social benefit of projects using cost-benefit techniques referred to as contingent valuation methods (CVM). Additionally, SPED estimated the net social benefit of several different types of development projects in Afghanistan.

CVM is a survey-based economic technique for the valuation of resources where market prices do not exist. This method has been used in numerous developed and developing countries to determine the net social benefit of publicly-funded projects such as environmental cleanup, parks, sanitation services, and water supply services. The SPED project is the first application of this technique to development projects in an irregular warfare environment.

SPED was a joint effort with the Human Terrain System (HTS) and involved a significant survey effort in Afghanistan that produced an empirical dataset showing how different population groups value several different classes of development projects. However, the study's methodology can be tailored to value any set of non-kinetic actions. SPED can help strategic, operational, and tactical commanders to prioritize development aid; estimate the impact of non-kinetic actions on civilian attitudes; determine the net social benefit of projects or programs; and validate subjective information on population priorities that is obtained through existing channels.

NOTE: The methodology was briefed in 2011 before the survey was completed; this new presentation closes the loop and provides results.

15 Nov 12 - 1400-1430

Impact of Weight Aggravated Suspension-Related Failures on Life Cycle Operations and Support Costs for Armored Fighting Vehicles

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Keywords: Suspension, O&S Costs, Reliability, COHORT

ABSTRACT: Realizing that reliability issues will arise from proposed weight being added to the an Armored Fighting Vehicle platform**,** Army Materiel Systems Analysis Activity's attempts to evaluate service supply chain life cycle costs for two courses of action with respect to program.

- COA 1: No change to driveline related components within the vehicle. This alternative will result in additional failures of driveline components, i.e. additional life-cycle O&S costs.

- COA 2: Purchase new suspensions, at $300k per copy, and alleviate a portion of the additional failures that would be otherwise attributed to the added weight.

Weapon systems that fail to meet reliability requirements not only degrade performance but can dramatically increase operating and support life-cycle costs of the system. System reliability directly impacts over 58% of program Life Cycle Costs (LCC). The Selected Essential Stocks for Availability Methodology (SESAME) based Consumption, Holding, Repair, and Transportation (COHORT) cost model can be used to estimate these costs. SESAME is a multi-echelon, multi-indenture inventory model that determines the optimal range

and depth of spare/repair parts required to meet a budget constraint or operational availability (Ao) target. SESAME input consists of the system support structure, system density, OPTEMPO, stock levels, and system RAM characteristics. In addition, the COHORT model takes as input SESAME's initial issue stock lists, depot repair pipeline requirements, end item deployment schedules, and part reliability and maintenance input data along with system useful life, part holding costs, repair costs, and transportation costs. COHORT output consists of stock related costs, initial issue procurement costs, depot repair pipeline costs, costs to replace washouts, inventory holding costs, and transportation costs.

This analysis attempts to evaluate if it is more cost beneficial to have a sunk cost of $300k per vehicle or to experience additional failures and O&S costs associated with a heavier vehicle. The analysis is done at the Class IX part level, meaning that individual line replaceable units have been modeled evaluated. It is a first of its kind application of AMSAA's SESAME based COHORT Methodology. In addition, since failures are experienced over the life cycle of the system and the new purchase suspensions are a one-time cost, the time value of money provides an interesting backdrop to the analysis.

15 Nov 12 - 1430-1500

Off Line Demand Forecast Analyzer

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ABSTRACT: The Logistics Modernization Program (LMP) affords the Army Materiel Command (AMC) Inventory Control Points (ICPs) alternative forecast methods for use in forecasting future demand of class 9 repair parts. These forecasts are critical to the management of inventory in support of future field requirements.

The "Off Line Demand Forecast Analyzer" developed by AMSAA is an Excel application developed to help demand planners choose the appropriate forecast method or algorithm based on characteristics of the demand (historical time series). It is broken into three parts or levels. Each level utilizes graphical analysis. Level one focuses on the parameter choices for the moving average and three levels of exponential smoothing (the methods currently used by the ARMY). Level two provides analytic tools to evaluate the causal patterns in the historical demand stream such as trends and seasonality. Level three replicates and evaluates many of the LMP forecast options. These tools provide statistical support for the demand planner's forecast projections.

15 Nov 12 - 1515-1545

Leveraging GIS to Calculate the Minimum Number of Entities Required for Maximum Coverage

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Keywords: GIS, coverage

ABSTRACT: This is a methodology that leverages native geospatial information systems (GIS) functions and data using basic scripts to automate the selection, organization, and analysis of the data. It calculates the minimum number of circular shaped entities required to obtain complete coverage of a protected area, while taking into account cost layers such terrain/slope, landuse/landcover, zoning, etc. While brute force in origin, the methodology has evolved to incorporate proximity, cost, and coverage to eliminate unnecessary computations improving overall performance.

Although this tool was developed to produce repeatable results of a given criteria that could be further analyzed specifically for radar coverage, the methodology can use any combination of linear and area type assets with an infinite number of combinations. This methodology can be applied to any problem where resources are applied in a circular pattern (e.g., chemical alarms, disaster teams, air-ambulances).

This is a much better alternative than manually estimating potential resource build-sites since a relative cost of each potential combination is calculated alongside its coverage area.

15 Nov 12 - 1545-1615

Aerial Reconnaissance and Surveillance Integrated Capabilities Development Team Mix Study

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Keywords: intelligence, surveillance and reconnaissance (ISR), aerial layer, mix analysis

ABSTRACT: The Aerial Reconnaissance and Surveillance Integrated Capabilities Development Team (ARS ICDT) Mix Study is an ongoing U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) analytic effort to assist the Army in deciding which elements of the Army aerial intelligence layer, both programs of record and quick reaction capabilities (QRC), should be sustained or divested.

The ARS ICDT is a multi-phased analytic effort. The first phase was conducted September-December 2011 and examined the ability of three cost-informed mixes of Army aerial intelligence layer programs of record and QRCs to satisfy intelligence mission demands, using the Assignment Scheduling Capability for Unmanned Aircraft Systems (UAS) (ASC-U) model. This phase also addressed resulting costs and doctrine, organization, training, leadership and education, materiel, personnel, and facilities implications of the various mixes. The second phase began in January 2012 and identifies the required manned and unmanned aerial capabilities to satisfy brigade combat team and higher echelon intelligence demands, and recommends which QRCs the Army should sustain or divest to inform Program Objective Memorandum (POM) 15-19.

This presentation provides an overview of the ARS ICDT study, discusses results of the initial phase, highlights emerging results from the second phase, and recommends ways to apply the lessons learned to future Army aerial intelligence layer analyses.

15 Nov 12 - 1615-1645

Interagency Data Sharing and Collaboration

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Keywords: Interagency, Public Perception, Polling, Data Sharing

ABSTRACT: In a fiscally challenging environment, finding efficiencies can become a quick way to do “more with less”. This presentation will discuss the experiences of an operations research analyst working with an analyst from the US Department of State (Intelligence and Research, Office of Opinion Research) in the Philippines in support of the US Country team and the Joint Special Operations Task Force – Philippines. This collaboration was continued following return – where world-wide public perception data were shared in an effort to inform analysis in both the Department of State and

Department of Defense roles. Topics of discussion will include potential for shared data sources, analytical skills overlap, and tangible ways to collaborate with our diplomatic counterparts.

Special Session
Risk Analysis

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14 Nov 12 - 1330-1400

Risk Assessment Methodology to Support Army Acquisition Studies: An Update

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Keywords: Methodology, Risk Assessment, Trade Space Analysis, Analysis of Alternatives

ABSTRACT: AMSAA is developing a methodology for conducting independent risk assessments for Army acquisition studies. With the need for accelerated acquisition schedules and in the face of tightening budgets, leadership needs an early, independent, and agile approach for assessing risk and for making difficult program decisions. AMSAA is the lead for an Army Risk Assessment Integrated Product Team (IPT), which was established at the direction of Army leadership, to develop a standard methodology for assessing technical, schedule, and cost risk as part of the Analysis of Alternatives

(AoA) for acquisition programs. The methodology informs decision makers of the potential risks associated with each alternative in the AoA. The results also will inform the trade space analysis and requirements development.

The developing methodology continues to be socialized throughout the analytical community and has been applied to several AoAs throughout Fiscal Year 2012. In the process of conducting risk assessments for the several AoAs conducted during FY12, several concepts have been added to improve upon the developing methodology. These concepts include a) building a confidence interval around a probability to determine uncertainty and determine if enough data is present to conduct a risk assessment, b) using the CIM4RM statistical tool to allocate data from one acquisition phase to another, c) performing sensitivity analysis for risk mitigation strategies, and d) developing the framework for linking the three areas of risk into the trade space analysis.

The AMSAA Risk Team is also in the process of working with the Army analytical community to develop a Trade Space Methodology. This methodology will be used to perform a Trade Space Analysis which will provide decision makers with a way of understanding the tradeoffs between Risk and Performance. This presentation will include background, methodology details, and some applications.

14 Nov 12 - 1400-1430

Schedule Risk Data Decision Methodology (SRDDM)

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Keywords: Schedule Risk Assessment, SRDDM, Analysis of Alternatives

ABSTRACT: One of the top priorities of the US Army is to make decisions regarding acquisition programs that will best serve the Warfighter. Providing an accurate and precise schedule risk assessment for a set of alternatives is one of the key goals to making a good decision.

AMSAA conducts independent schedule risk assessments to support Analysis of Alternatives (AoA) and other major Army acquisition studies. A probability is assessed for completing a given phase within the schedule developed by the Program Manager (PM). The probabilities are based upon historical data for analogous programs.

AMSAA developed a Schedule Risk Data Decision Methodology (SRDDM) that determines if enough historical data exists to utilize quantitative techniques to conduct the schedule risk assessment. This methodology lays the mathematical and decisioning foundation for all future schedule risk assessments. SRDDM uses Monte Carlo simulations and mathematical models to build a confidence interval (CI) for the

probability of meeting the PM's schedule. If this CI width is within tolerance then we have enough analogous programs to build risk distributions.

AMSAA has applied SRDDM to the Indirect Fire Protection Capability and the Armored Multi-Purpose Vehicle AoAs. Future work includes risk mitigation, trade space analysis, and developing event driven models.

14 Nov 12 - 1430-1500

Operational Risk Analysis – A New Approach

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Keywords: risk, gap analysis, assessment tool, analysis of alternatives

ABSTRACT: Operational risk assessment for decision making has become too complicated for the basic Army risk doctrine. Current operations research delves into non-numerical areas where solid data do not exist. Categories such as "consequence" or "severity" no longer have a single answer; instead, these factors are characterized by ranges of responses.

To assist with this assessment, a new tool that leverages mathematical and analytical techniques was developed to analyze the ranges of each consequence. This new approach to risk analysis provides a solid mathematical foundation to conduct sensitivity analysis and to inform decision makers. Because of its mathematical foundation, gaps and the

mitigation of gaps may be assessed with analytical rigor, providing numerical information as to how well an alternative fulfills a gap.

This presentation highlights the new risk assessment method, and describes how to collect and process the data. The presentation also discusses the implementation of the gap assessment tool and an example within a current analysis of alternatives study by the U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC).

14 Nov 12 - 1515-1545

Deployable Force Protection (DFP) Radar Study

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Keywords: Force Protection, Radar, Deployable, Risk Analysis, Reliability Scorecard, Performance, Rockets, Artillery, Mortars, Detection, Tracking

ABSTRACT: The U.S. Army Materiel Systems Analysis Activity (AMSAA) performed a radar study for the Deployable Force Protection (DFP) Technology Focus Team (TFT). The purpose of this study was to perform an analysis of candidate radar systems for fulfilling the gaps identified by the DFP TFT. A Decision Analysis (DA) methodology was developed and implemented to compare the candidate radar systems identified for this study.

A technical risk assessment was performed and used to bin the candidate radar systems into three categories: existing, 2014 and beyond 2014 systems. A combination of performance attributes along with user and logistics attributes were identified to be used as a basis for comparing the candidate radar systems. Due to declining resources, the user and logistics attributes focused on characteristics related to the additional burdens of fuel consumption, transportation, and manpower requirements. The DA methodology was used to combine all attributes and produce a score for comparing each candidate radar system. These scores were then used in conjunction with independent variables (e.g., such as reliability risk and average unit cost) to further summarize and compare the candidate systems.

Due to declining resources, it was recommended that a more detailed analysis be performed on a few viable candidate systems based on results of this study. The results from this study were provided to the DFP TFT chair who is located in the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology ASA(ALT). This briefing contains a brief study background, an overview of the DA methodology, a description of study results and how they were summarized.

14 Nov 12 - 1545-1615

Technology Readiness Assessment for the Assembled Chemical Weapons Alternatives Program

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Keywords: Technology Readiness Assessment, Technology Readiness Level, Test and Evaluation

ABSTRACT: The Assembled Chemical Weapons Alternatives (ACWA) Program requested the US Army Material Systems Analysis Activity (AMSAA) to complete a technology readiness assessment (TRA) for the critical technologies planned for use in two chemical demilitarization facilities. The ACWA program elected to use a First-of-a-Kind (FOAK) equipment test program which developed and tested new equipment in several iterations in order to minimize risk to the program. AMSAA identified critical technical elements to be evaluated and also developed more applicable definitions for the technology readiness levels (TRLs) based on the DoD TRA Deskbook. AMSAA continues to observe testing of technologies and equipment and assigns TRLs based on technical maturity and relevance of the test environment.

We present our TRA methodology with a focus on the evaluation of a unique system that does not fit the standard DoD definitions for Hardware or Manufacturing TRLs.

Additionally, the evaluation of an iterated, FOAK equipment test program is presented with emphasis on minimizing risk by testing equipment prior to shipment to the facility for full systemization. The TRA was submitted as part of the Milestone B review completed by the ACWA program in March 2012. AMSAA will continue to evaluate the readiness of the technologies used by the ACWA program throughout the entire lifecycle of the program.

14 Nov 12 - 1615-1645

Using Historical Reliability Data to Influence Future Reliability Test Design

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Keywords: Reliability Analysis, Test and Evaluation, Data Visualization, Equipment Analysis and T&E

ABSTRACT: Developing techniques to employ the use of historical data to design efficient test and evaluation plans is vitally important given today's military budget constraints. The methodology presented will demonstrate analysis techniques used to determine reliability characteristics of historical systems, the reliability differences found between historical and current configuration wheeled vehicles (nominal vs. up-weighted), and how these data influence future reliability test planning. By implementing these analysis techniques, we are able to design an efficient reliability test program. While this process promotes an efficient reliability test and evaluation program design, the ultimate goal is to ensure that the program includes sufficient opportunities to

exercise the system in such a manner as to investigate anticipated critical operational failure modes. Through the application of such an approach to test planning, execution, and evaluation, we can reduce the level of uncertainty regarding our characterization of a system's reliability behavior in the operational environment.

14 Nov 12 - 1645-1715

Vehicle Simulator Validation Initiative

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Keywords: Reliability Growth, Test and Evaluation, Vehicle Simulator, Root Cause Analysis

ABSTRACT: The majority of Army acquisition programs are failing to demonstrate their reliability requirements during operational testing. Ideally, through the execution of a robust developmental test program, it is possible to identify the critical failure modes for a given system, investigate the root cause of each failure mode, and devise and implement corrective actions to mitigate the impact of each failure mode. Furthermore, by following design-for-reliability best practices, it is possible to achieve a higher level of reliability at the beginning of a reliability growth program and reduce the risk of failing to demonstrate system-level reliability requirements.

The U.S. Army Aberdeen Test Center (ATC) and the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) have several test facilities that are designed to physically simulate various types of loads and stresses on vehicles. Vehicle developers can visit these test facilities to surface certain failure modes prior to the start of the formal reliability growth test program, thus improving the system's initial reliability. As well, the test and evaluation community can leverage the capabilities of such facilities to conduct analytical excursions, expediting root cause analyses for failure modes observed during traditional testing on vehicle courses. Through a combination of these activities, an opportunity exists to improve system reliability at a faster rate, increasing the likelihood that a system will demonstrate its reliability requirements. We will discuss our current effort to characterize the capabilities of each vehicle simulator facility as a risk reduction apparatus along with the development of a pilot program to validate our initial findings.

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15 Nov 12 - 1300-1330

Occupant-Focused Rotorcraft Impact Survivability Modeling

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Keywords: helicopter, autorotation, modeling, optimization

ABSTRACT: A core mission of the Army Research Laboratory, Survivability/Lethality Analysis Directorate (ARL/SLAD), is to assess the survivability (i.e., susceptibility and vulnerability) of Army air vehicles, predominantly rotorcraft, to various threat systems. Rotorcraft vulnerability analysis relies on accurate modeling of the vehicle's ability to autorotate after loss of engine power and determining to what degree the ground impact is damaging to the helicopter and those aboard. For that purpose, ARL/SLAD has developed an iterative optimization model for predicting "best case" impact conditions called DESCENT. Traditionally, rotorcraft flight parameters were optimized in DESCENT to minimize structural damage to the vehicle on touchdown. This approach is seen as sufficient for broadly characterizing the vehicle's system-level vulnerability to ground impact but does not address more specific concerns about sensitive components or individual occupants.

A new approach in development at ARL/SLAD couples autorotation data from DESCENT with structural analysis from a finite-element code to model load transmission throughout the vehicle under various impact conditions. This approach yields better information about the vulnerability of critical components in specific locations and orientations than was previously available, and is useful for creating a feedback loop in which DESCENT's optimization algorithm is perturbed to encourage better outcomes for specific components or subsystems. The primary application of this approach is addressing force-protection key performance parameters in rotorcraft systems. Occupant injury mitigation is a high priority for ARL/SLAD, but the correlation between impact conditions and occupant outcomes can be poorly or incompletely understood, and globally optimal outcomes are not necessarily available. It can be shown, however, that optimal impact conditions from an occupant-survivability perspective may differ from those derived from vehicle

structure considerations. This approach makes it possible to prioritize occupant outcome above other goals as DESCENT calculates the autorotation path.

This presentation discusses the flow of information from flight models to impact models (and back); how vehicle structural models are created and verified/validated; how occupant injury predictions are created from loading predictions; and lessons learned about modeling process development in an environment where test data is haphazard or unreliable.

15 Nov 12 - 1330-1400

Modeling and Analyzing Mobile Network Connectivity in the Presence of Jamming

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Keywords: Network Connectivity, Wireless Network, Model and Simulation, Analysis, Physical Layer, Jamming.

ABSTRACT: Short of an actual field test, a detailed simulation provides the best insight as to why a communication system works or fails in a given situation. Most simulators concentrate on the algorithms used in communication

protocols and make simplifying assumptions about how the physical layer works. The Network Connectivity Analysis Model (NCAM) is a general purpose, radio frequency (RF), event-based simulator that focuses on the physical layer of the International Organization for Standards Open System Interconnect seven-layer model for wireless communication systems. NCAM provides the U.S. Army with an extremely flexible modeling and simulation environment that can handle any number of mobile terrestrial radio platforms targeted by one or more jammers to study the impact of RF interference on mobile tactical communication networks.

NCAM's modular design is hierarchically organized to emulate an actual field test. Simulation results for all modules are stored in a relational database, making it easy to extract and analyze data on a holistic or modular level. In addition to the relational database, NCAM generates a detailed- more focused- simulation report, with the flexibility to choose the level of detail in each report. This presentation describes the capabilities, features, and flexibility of NCAM, which include, but are not limited to, dynamic state changes such as antenna swap, antenna height adjustment, radio on/off, report generation, etc. NCAM can also pause, save, and resume simulation at a later time, which makes it useful for classified runs.

NCAM underwent an independent validation and verification by the Communication Electronics Research, Development and Engineering Center and has been used in the analysis of tactical communication networks. Upgrades to NCAM in 2013 will include airborne and space platforms, allowing the simulation of a mix of terrestrial, airborne, and space platforms in a single scenario.

15 Nov 12 - 1400-1430

Cyber Warfare and Network Attack Operational Assessment

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Keywords: Modeling and simulation, cyber warfare, network attack

ABSTRACT: In 2011, McAfee reported over 20,000 newly identified malware programs, exemplifying the hyperbolic increase in cyber attacks. It is widely known that many countries are developing robust strategic, operational, and tactical capabilities to attack networks and conduct cyber warfare operations. As the Department of Defense (DOD) bluntly remarks, “The Department [of Defense] and the nation have vulnerabilities in cyberspace.” General Keith Alexander, Director, National Security Agency (NSA) and head of U.S. Cyber Command (USCYBERCOM) states, “while cyber security is a critical first step in securing computer networks, the military should also be prepared to launch counter cyber attacks.” Alexander suggests that cyber war targets include “traditional battlefield prizes – command-and-control systems at military headquarters, air defense networks and weapons systems that require computers to operate."

The U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) expects that the DOD will attempt to examine operational and tactical cyber warfare/network attack operations in the near future. The TRAC Methods and Research Office is executing a research analysis, building upon previous related study work, to investigate and catalogue the

types of cyber attacks that may have impacts on operational and tactical ground units. The research will focus on cyber/network attack objectives, and their operational effects, in addition to the techniques employed. TRAC intends to use this research as the requirements development process to execute a cyber warfare/network attack methods, models, and tools (MMT) gap assessment, that will evaluate the current capabilities of TRAC MMT to robustly and relevantly represent cyber warfare/network attack, identify representational knowledge, data, and algorithm (KDA) gaps within those MMT, and develop prioritized mitigation recommendations.

This presentation will describe the overall research methodology, current research findings, and anticipated MMT KDA impacts.

15 Nov 12 - 1430-1500

15 Nov 12 - 1515-1545

Integrated Electronic Warfare System (IEWS) EW Planning and Management Tool (EWPMT) Analysis of Alternatives (AoA) Performance and Risk Results

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Keywords: Electronic Warfare, Electronic Warfare Planning and Management Tool, EW, EWPMT, AoA, Risk Analysis, Software

ABSTRACT: The Army Materiel Systems Analysis Activity (AMSAA) conducted a performance and risk assessments for the Army's IEWS EWPMT AoA. The AoA was led by the TRADOC Analysis Center (TRAC) at Fort Leavenworth and supported a Milestone B (MS B) decision, with an Initial Operational Capability (IOC) set for 2014. AMSAA used the data gathered from two separate Requests For Information (RFIs) to assess the performance of the proposed EWPMT solutions, which were strictly software solutions. In conjunction with the Communications and Electronics Research, Development and Engineering Center (CERDEC) and the Project Manager Electronic Warfare (PM EW), AMSAA rated the candidates on a scale from zero to five, with zero as no functionality and five as near full to full functionality, against 22 subfunctions developed by the AoA team. These subfunctions were grouped into three functional areas, EW Mission Planning, Electromagnetic Operational Environment, and Managing EW Assets. The candidates were grouped into either Commercial Off The Shelf (COTS) or Government Off The Shelf (GOTS) solutions.

The risk assessment consisted of mainly schedule risk. What is the risk to getting a given candidate from current functionality to full functionality? Technical risk was looked at and since the candidates were strictly software solutions, there was no technological risk with the exception of two subfunctions because the underlying methodology to perform them was unknown. AMSAA also produced feasibility packages that were based on five different Courses of Action (COAs) developed by AMSAA, TRAC, and PM EW. These packages prioritized the order of the subfunctions to determine the development sequence of the end product. AMSAA produced both low and moderate risk package for both the COTS and GOTS solutions for each of the five (5) COAs. These packages, along with the performance and risk assessments were delivered to TRAC to inform their trade space analysis.

15 Nov 12 - 1545-1615

Assessing Counter-radicalization Programs

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Keywords: Current Operations, Philippines, Radicalization, Survey, Assessment, OFW

ABSTRACT: The Republic of the Philippines has approximately 11 million citizens working abroad in jobs ranging from doctors and engineers to cooks and house servants. These citizens, known as Overseas Filipino Workers (OFWs), represent 11% of the total population and 28% of the Filipino labor force. The OFW program is sponsored by the Government of the Philippines and OFW generated remittances exceed 10% of the Filipino Gross Domestic Product. A majority of OFWs work in the Middle East. While working in the Middle East, many of the OFWs convert to Islam in order to obtain better jobs, higher wages, and improved living conditions. There are several governmental and private organizations that promote OFW conversion and some of these organizations have been tied to Violent Extremist Organizations (VEOs). There is also anecdotal evidence that some OFWs are being radicalized overseas. In order to reduce the risk of OFW radicalization, Joint Special Operations Task Force- Philippines, in partnership with the Philippines Overseas Employment Agency (POEA) and the Armed Forces of the Philippines Civil Relations Service (AFPCRS), have agreed to conduct a strategic level counter-radicalization program directed at OFWs. JSOTF-P has

requested help assessing the counter-radicalization program. Topics of discussion will include a review of the existing theory, assessment methodology and potential informing data sources.

Special Session
Sustainment

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14 Nov 12 - 1330-1400

Achieving Value for Condition Based Maintenance Programs

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ABSTRACT: This paper will describe how the U.S. Army Materiel Systems Analysis Activity (AMSAA) is supporting the U.S. Army's Condition-Based Maintenance (CBM) policy by researching and developing CBM tools and analysis techniques. AMSAA has implemented a global field instrumentation program on wheeled vehicles and generators in multiple terrains, climates, and usage scenarios utilizing various CBM tools that include: data loggers, software, and user feedback. AMSAA is using these tools to collect valuable CBM data for performing analyses of usage, diagnostic, and sensor data on various Army systems. The data is used to enhance diagnostics, prognostics algorithms, testing profiles and Operation Mode Summaries/Mission Profiles (OMS/MP),

training effectiveness, forecasting, readiness, maintenance, and system development. AMSAA also conducts analyses with the collected data to provide direct feedback to the user, maintainer, Program Manager, and decision makers by reporting actionable information in a timely manner. AMSAA has fielded over 200 data loggers on various materiel systems and is leading over 500 system installations over the next year in addition to the thousands of data files collected via software and laptops on a routine basis. AMSAA will also lead the technical aspects and analyses involved in the Tactical Wheeled Vehicle (TWV) Pilot Program scheduled to start this year. AMSAA has led the way for analysis techniques, processes, and tools to provide quick actionable information for the entire Army enterprise using a CBM Portal in addition to developing prognostics algorithms. This paper will show examples of the tools developed/used and analyses performed as well as the lessons learned about collecting and analyzing data for effective CBM programs.

14 Nov 12 - 1400-1430

Development of Vehicle-Level Fuel Map and Its Applications in Fuel Economy

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Keywords: Fuel Consumption Prediction, Fuel Economy, Vehicle-Level Fuel Map, Modeling and Simulation

ABSTRACT: On road vehicle fuel consumption predictions using modeling and simulation (M&S) have shown to be successful in civilian and military applications. Fuel

consumption predictions addressing soft and uneven off road terrain, however, remains a challenge as the applicability of on road methodologies have not been thoroughly vetted. AMSAA is developing an M&S fuel consumption prediction methodology to examine the soft and uneven terrain situation. The proposed technique would utilize a vehicle-level fuel map. A vehicle-level fuel map represents the relationship of the fuel consumption rate to the vehicle speed and traction forces. Like the engine fuel map, the vehicle-level fuel map reflects the overall fuel characteristics of the engine and can be used to predict the fuel economy during different driving scenarios. This paper describes AMSAA's direction in developing this methodology.

14 Nov 12 - 1430-1500

14 Nov 12 - 1515-1545

Army Expeditionary Warrior Experiment (AEWE) Technology Capabilities and Limitations (C&L) Assessment

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Keywords: Experiment, Data Collection, Capabilities and Limitations Assessments, Power, Resupply, UAS, SUGV, UGS, Communications, Cellular Technologies, Digital Applications

ABSTRACT: United States Army Materiel Systems Analysis Activity (AMSAA) was tasked by the Army Test & Evaluation Command (ATEC) to perform the capabilities and limitations (C&L) assessments of technologies for AEWE Spiral G. AEWE provides Capability Developers, the science and technology (S&T) community, and industry with a repeatable, credible, rigorous, and validated operational venue to support Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) concepts and materiel development efforts in a realistic live, prototype, force-on-force experiment. Focused on the dismounted Soldier and Small Unit, AEWE Spiral G examined concepts and capabilities for the current and future force across all warfighting functions. AEWE is hosted by Fort Benning and run by Maneuver Battle Lab (MBL). The Army Materiel Systems Analysis Activity (AMSAA) supported the Army Test and Evaluation Command (ATEC), the AEWE analysis lead.

Over the course of the experiment, AMSAA collected 1000+ observations. The observation database created for this effort catalogued and organized data from different sources including direct observation, interviews, and surveys. Queries on the database allowed Soldier feedback to become the main source of information for the final product. The results of our assessments directly feed into the 5 learning demands of AEWE Spiral G. We shall provide an overview of AMSAA's data collection methods implemented at AEWE Spiral G.

14 Nov 12 - 1545-1615

II PEG Requirements Determination Analysis

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Keywords: Standard Costing, Econometrics, Cost Drivers, Forecasting

ABSTRACT: The U.S. Army is responsible for adequately planning and budgeting for future use of public funds. Part of this planning includes estimating the future cost, or requirement, for the various services that support Army installations around the world. These services range from basic utilities to substance abuse programs, and directly support the Army mission. The Base Operations Support Requirement Model (BRM) provides estimated requirements for 61 services that support Army installations. These estimated requirements comprise more than 70% of total Base Operations Support (BOS) requirements. Currently, Standard Services Costing (SSC) uses historical execution data, installation data, linear regression statistical processes, and quality/funding association runes to forecast future "Should-cost" requirements at four distinct levels of service ("Green", "Amber", "Red", and "Black" service levels). This study analyzes the historical performance of these statistical processes and explores alternative methods for determining future service requirements at installations granularity.

14 Nov 12 - 1615-1645

Gray Eagle Operational Availability Modeling and Simulation

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Keywords: Gray Eagle, Operational Availability, Ao

ABSTRACT: The Gray Eagle performs various reconnaissance and attack missions in support of the Division Commander in theater. In performing these missions the system must meet specific availability requirements as defined in guidance documents.

In support of the Army Evaluation Center system evaluation mission, AMSAA developed a computer based simulation using Arena simulation software to estimate the Operational Availability (Ao) of a Gray Eagle company.

The model focused on the critical areas of availability analysis to include: Operational Tempo; Reliability; logistics delays, competition for resources; and time to repair. The model accounts for the system, mission and maintenance specific parameters in a tactical scenario for each mission type.

The simulation is used to develop Ao estimates of each platform and mission type. The values can be compared to requirements and updated with either test or real world data. Sensitivity analyses on key input variables were conducted to determine key system parameters and recommendations for variables requiring further analysis.

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15 Nov 12 - 1300-1330

Whole System Live Agent Test Chamber Verification and Validation

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Keywords: Verification, Validation, Test and Evaluation, Biological, CBDP, Design of Experiments

ABSTRACT: The Chemical and Biological Defense Program (CBDP) Test and Evaluation (T&E) Executive chartered the T&E Capabilities and Methodologies Integrated Process Team (TECMIPT) to provide technical recommendations to develop CBDP T&E capabilities and infrastructure needs. The CBDP T&E Executive established the requirement to conduct a robust verification and validation (V&V) process for major CBDP T&E infrastructure projects. The Whole System Live Agent Test (WSLAT) Chamber is a Bio-safety Level 3 (BSL-3) test chamber designed to provide biological challenges to biological agent point detectors, providing data to support system performance evaluations. AMSAA developed a comprehensive V&V plan to support initial CBDP accreditation of the WSLAT.

The primary focus of the V&V testing is the ability of the chamber to generate the range of conditions and challenges required to support the testing of current and future biological agent point detection systems. The unique design of the chamber compared to current biological agent testing capabilities required a multi-dimensional approach.

We present our V&V plan development methodology with a focus on the detailed Design of Experiments (DOE) approach used to optimize the number of tests necessary. Test matrices were created using DOE procedures to conserve resources. Not all combinations of conditions are tested; however, the design spans the inference space to reduce the total number of trials. We also present our efforts to ensure Joint-Service CBDP T&E community participation and consensus in the process. The V&V Test Plan was reviewed and revised through TECMIPT working groups by representatives of each Service's developmental and operational test agencies (OTAs). This collaborative approach produced a CBDP T&E community consensus plan.

15 Nov 12 - 1330-1400

OneSAF in Support of the Optimal Allocation of Training Land Project

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Keywords: OneSAF, CERL, OPAL

ABSTRACT: The TRADOC Analysis Center-White Sands Missile Range (TRAC-WSMR) is collaborating with the Engineering Research and Development Center – Construction Engineering

Research Laboratory (ERDC-CERL) to support ERDC-CERL's Optimal Allocation of Training Land (OPAL) Project. The primary objective of OPAL is to quantify the cumulative environmental impacts of Army training exercises and co-occurring land uses. This information will be used to develop a proactive land management capability to optimize training land use distribution at Army installations, and to identify environmental reconstruction costs accrued through Army training exercises and plan for land use impacts resulting from changes in Army training doctrine.

The objective will be achieved in part through the use of OneSAF and field collected data. Data to support the OPAL Project is currently gathered through vehicle tracking systems installed on a limited number of vehicles during training events. This method of data collection is labor intensive, time-consuming and expensive. ERDC-CERL believes that sufficient movement data can be generated more efficiently and economically through the OneSAF simulation software. In comparison to collecting data from individual training events, OneSAF allows for several instances of a training event to be executed virtually in compressed time, producing a data set with a more accurate representation of the mean impact on land from a specific training event in less time.

TRAC and ERDC-CERL are in the initial stages of this effort, to complete a successful proof-of-principle for Fiscal Year 2012. For the following Fiscal Year, TRAC will model training exercises, which represent maneuver training at Fort Riley, Kansas. TRAC-WSMR will work cooperatively with ERDC-CERL in developing a methodology to determine land use impacts resulting from military maneuvers on Army training areas using OneSAF. TRAC and ERDC-CERL believe this project has the potential to reduce costs associated with land impact analyses. This presentation will provide an overview of TRAC-WSMR's support to the OPAL Project.

15 Nov 12 - 14030-1430

Bayesian Data Fusion for Assessing System Reliability

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Keywords: Bayesian Statistics, Reliability

ABSTRACT: As budgetary constraints tighten and resources become limited, the Army is increasingly concerned about demonstrating systems' requirements with minimal testing prior to fielding. Multiple reliability related activities occur during the development of a product. Reliability demonstration occurs in a specific operational test environment. The system is in its final mature configuration and generally, operational testing requires massive amounts of calendar time and money. Hence, the Army strives to reduce test time to the minimum acceptable amount. Reliability demonstration testing with high statistical confidence has therefore become difficult to complete, and it has become necessary to supplement the traditional assessment techniques with other sources of reliability data.

Potential additional sources include developmental test results from throughout system development, historical reliability data on common components, and modeling and simulation of known failure modes and mechanisms in the system. Use of such data sources must also account for the

varying levels of uncertainty that are present in such an approach. The Bayesian framework provides a rigorous methodology for the fusion of these data sources while simultaneously handling the necessary uncertainties. An example application of the method has been developed to demonstrate the utility of the approach.

15 Nov 12 - 1430-1500

U.S. Army Material Systems Analysis Activity (AMSAA) Business Case Analysis (BCA) Update for Abrams under Armor Auxiliary Power Unit (UAAPU)

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Keywords: auxiliary power unit, business case analysis, fuel consumption, M1A1

ABSTRACT: This presentation provides details regarding an updated BCA addressing the potential cost benefits associated with the integration of an UAAPU into the Abrams M1A2 System Enhancement Package. The Tank and Automotive Research, Development and Engineering Center (TARDEC), supported by Project Manager Heavy Brigade Combat Team (PM HBCT), is developing a 10 kW rotary engine UAAPU. In 2008, Commanding General (CG), Army Materiel Command, requested AMSAA, through CG, Research, Development and Engineering Command, to perform a BCA to confirm or deny the cost benefit of the UAAPU if integrated into the Abrams and to identify development barriers. In 2011, due to several changes within the UAAPU project, AMSAA was requested to perform an update. System changes to be considered were as

follows: Abrams engine cost; engine mean time between replacement; usage profiles; electrical load; and the fully burden cost of fuel (FBCF). AMSAA coordinated with the Combat / Materiel Developers and TARDEC to identify barriers that included system integration with the thermal management system, no acquisition funding until FY13-14, and future power demand growth (TARDEC/PEO GCS studying all issues). AMSAA focused the BCA on key cost drivers to approximate bounds of potential cost benefits.

15 Nov 12 - 1515-1545

15 Nov 12 - 1545-1615

Operationally Relevant Fuel Prediction Modeling For Ground Vehicles

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Keywords: fuel consumption, requirements modeling, test course representation, operational environment representation

ABSTRACT: The amount of fuel consumed by ground vehicles in theaters of operation is often not captured at the individual vehicle level, nor does the Operational Mode Summary/ Mission Profile (OMS/MP) sufficiently address the comprehensive range of operations typically encountered to support a meaningful fuel consumption prediction. In an effort to more accurately represent archetypal theater driving

conditions, the Army Material Systems Analysis Activity (AMSAA) is developing modeling methods to predict fuel consumption for ground vehicles based on operationally relevant profiles. The current effort evolved from an initial request from combat developer representatives to address fuel efficiency metrics for the Joint Light Tactical Vehicle (JLTV) program; in response, a group was formed from various communities including combat developers, testing representatives, modeling and simulation groups, analysis organizations, and evaluators. As a result of the collaboration among stakeholders (Training and Doctrine Command (TRADOC), Army Test and Evaluation Command (ATEC), Tank Automotive Research, Development and Engineering Center (TARDEC), AMSAA, and Army Evaluation Center (AEC)), group efforts led to the selection of fuel efficiency metrics, associated metric values, and OMS/MP representative test courses to serve as a foundation for testing and evaluation. As an extension of the initial effort, AMSAA is pursuing initiatives to incorporate more operational relevance based on availability of logged condition based maintenance (CBM) data. To date, the abilities to accurately predict fuel consumption based on CBM data, Geospatial Information Systems (GIS) generated terrain profiles, and the AMSAA Fuel Consumption Prediction Model (FCPM) have been demonstrated for the Mine Resistant Ambush Protected (MRAP) All Terrain Vehicle (M-ATV). This evolving capability will ultimately enhance Army ground vehicle studies (e.g., Analysis of Alternatives, Cost Benefit Analyses, etc.) by providing operationally relevant fuel predictions with greater accuracy than allowed by current methods.

15 Nov 12 - 1615-1645

Lessons Learned during the Test and Evaluation of Reliability Growth Programs

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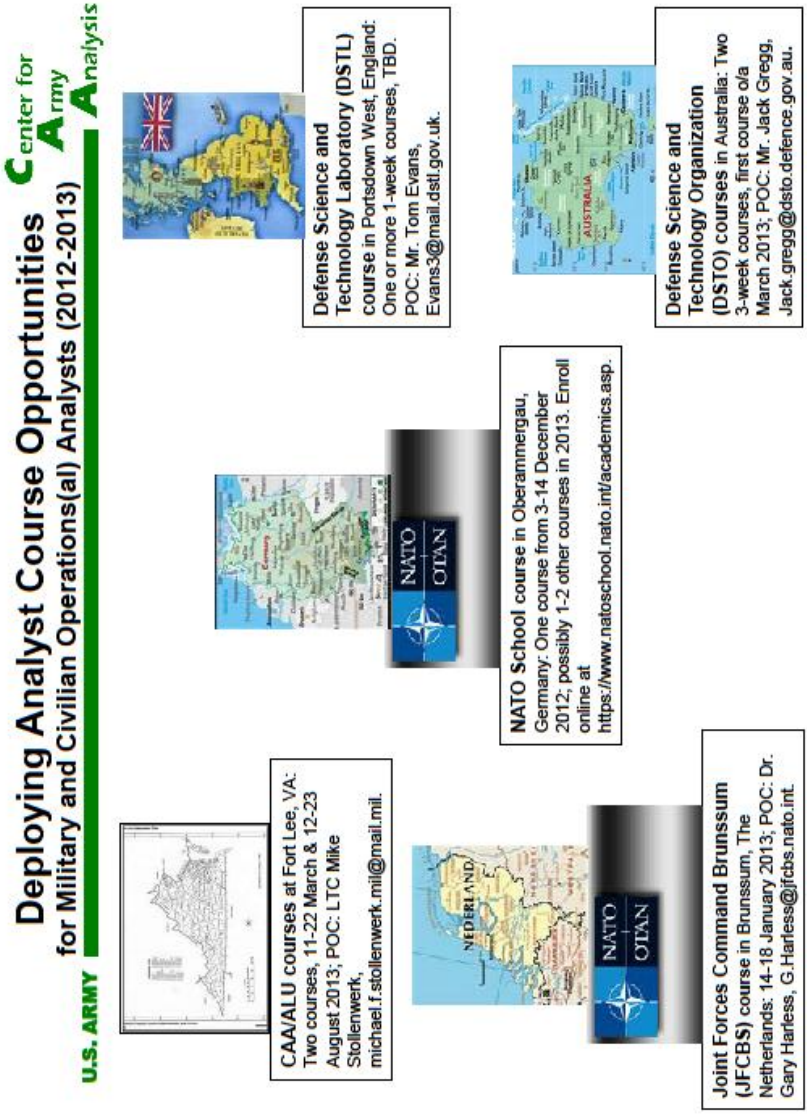
Keywords: Reliability Growth, Reliability Policy, Test and Evaluation, Design-for-Reliability

ABSTRACT: The U.S. Army implemented policy to improve reliability in December 2007 which required major U.S. Army programs to have a comprehensive reliability growth strategy with a reliability growth planning curve in the Test and Evaluation Master Plan (TEMP). The U.S. Department of Defense followed with a reliability policy in 2008 and an update in March 2011. As well, the U.S. Army updated its reliability policy in June 2011, which requires the reliability growth planning curve to also be included in the Systems Engineering Plan and the Engineering Manufacturing and Development contract in addition to the TEMP. The U.S. Army reliability policy directs each program manager to perform design-for-reliability activities prior to acquisition Milestone B in order to mitigate the risk of failing to demonstrate reliability requirements. These policies have driven a marked rise in the application of reliability growth principles to programs undergoing test and evaluation. Over time, the number of reliability growth programs has increased from just a handful

to about twenty currently in testing. Additionally, roughly twenty more reliability growth programs are in the planning stage. Early test results are in for many of the programs now undergoing reliability growth testing. In this presentation, we discuss the general trends observed in the reliability growth programs, including the reasons why many programs are struggling to achieve their goals. As well, we propose improvements to the engineering and acquisition processes to simultaneously manage government and developer risks and improve the likelihood that U.S. Army programs will achieve their reliability requirements.

Deploying Analyst Course Opportunities



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