63RD MORSS
6, 7, 8 June 1995
U. S. Naval Academy

Joint Analysis for Joint Operations

63rd MORSS Final Program and Book of Abstracts

Sponsored by:

The Deputy Under Secretary of the Army
(Operations Research)

The Director, Assessment Division
Office of the Chief of Naval Operations

Director of Modeling, Simulation and Analysis
Deputy Chief of Staff, Plans and Operations
Headquarters, USAF

Commanding General
Marine Corps Combat Development Command

The Director for Force Structure, Resource and Assessment
The Joint Staff

Director, Program Analysis and Evaluation
Office Secretary of Defense

Under the contractual sponsorship of:
The Office of Naval Research

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- Luncheon with Speaker .... **Dahlgren Hall**
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Special Session I

Special Sessions Coordinator
Susan M. Iwanski, Northrop Grumman

Tuesday, 6 June 1995 - 1530 - 1700

- **A Workshop Report:**
  SIMVAL '94 ..... Michelson 117

  CoChairs: **Jim Sikora,** BDM International
  Dr. **Marion Williams**, FS, AFOTEC

This briefing gives a summary of the unclassified workshop held in Albuquerque, September 28-30, 1994. The theme of the workshop was "How Much V&V is Enough? The theme was addressed through four major questions.

1. Accreditation Factors. What are they? What part does V&V play?
2. Accreditation Template. Is there such a thing? What could it look like? How is one developed?
3. V&V Status of an M&S. How is it presented? Are there V&V units?
4. Legacy M&S. What are they? Are they any different from a V&V perspective?

The workshop was organized by type of M&S. There were four working groups -- strategic/theater level, mission level, engagement level and distributed interactive simulation (DIS). Each working group addressed the four major questions from the perspective of their assigned model type. This briefing provides a summary of the integrated results of the working groups.

- **Combat ID ..... Rickover 102**

  Debbie Hall and **Chuck Sadowski**, VEDA Inc.
  Lt Col **Denny Lester**, Det 4 USAF TWC (TACCSF), Overview of Combat ID
  Jim Ralston, IDA, ISOC Model Overview and Applications
  Lt Col **John Carlile**, Det 4 USAF TWC (TACCSF), ID Signatures of Theater Missile Defense (TMD) Activity

Since the dawn of civilization, man has needed the ability to quickly and accurately identify the origin and intentions of pontential adversaries. Yesterday's warriors could rely on visual observations of flags, uniforms, and insignia for positive identification. But in the combat environment of today, tri-sonic closing speeds and distant kill capabilities mandate a dependence on a sophisticated array of sensors to differentiate between friend and foe. This piece of modern warfare, the identification (ID) of forces on the battlefield, is known as Combat ID (CID). Today's CID requires the application of technologies to extend the limits of human sensitivity for both sight and sound, leading to the positive, timely and accurate identification of possible combatants.

Many of the problems associated with identifying a friendly or enemy military force have not changed in centuries and apply to all Services. In recent years, the explosion of technology has provided us with a new vocabulary, but the problems and issues remain virtually unchanged. This Special Session will examine the problems and issues surrounding CID from the viewpoint of the operations analyst and modeler. The session will begin with an overview of CID including discussions on how each Service handles these issues. Several CID analysis efforts will also be examined to provide the conference attendee with an insight into the requirements for simulating and analyzing CID in both digital and pilot-in-the-loop environments.

- **Programming for Environmental Compliance Costs ..... Chauvenet 109/216**
  RADM **Luther Schriefer**, N45 CNO

Environmental compliance requirements for the Navy have increased dramatically over the past several years driven by enactment of environmental law and expanded regulations at the federal, state, and local level. The Navy has developed a systematic process for projecting compliance costs for use in building the Future Years Defense Plan (FYDP) funding profile. Since the FYDP looks forward 6 years, the challenge of forecasting requirements in this dynamic area is significant.

As assessment sponsor for all environmental programs, the Director of Environmental Protection, Safety and Occupational Health Division (OPNAV N45) developed a new process to capture and analyze environmental cost estimates in support of the construction of the Navy's Program Objective Memorandum for fiscal year 1996 (POM96). This effort achieved a major increase in funding programmed for environmental compliance for the 1996-2001 FYDP.

The process developed, tools used, and involvement of major claimants were all important to this success and will be discussed in this presentation.

- **Prize Paper Session ..... Michelson 103**

Prize Committee Chair
Charles E. Gettig, Gettig & Associates
Barchi Committee Chair:
LTC **James E. Armstrong**, USMA
Rist Prize Committee Chair:
Ms. **Kerry E. Kelley**, USSTRATCOM

The **Rist** and **Barchi Prizes** will be announced and awarded in the opening ceremonies of the 63rd MORSS. This special session will provide the opportunity for the prize winners to present their winning papers. The Committee Chairs will discuss the prize process and pertinent points from select non-winning papers.

Barchi Prize Recipients

Maj **Mark A. Gallagher**
Program Analysis and Evaluation
Office of the Secretary of Defense
1800 Defense, Pentagon
Washington, DC 20301-1800

David A. Lee
Logistics Management Institute
2000 Corporate Ridge Road
McLean, Virginia 22102-7805

Final-Cost Estimates for Research & Development Programs Conditioned on Realized Costs

We apply multiple model adaptive estimation (MMAE), a proven method of system identification widely used in engineering applications, to the problem of determining Bayesian probability distributions of the final cost and completion time of research and development (R&D) programs, conditioned on actual cost of work performed (ACWP) data. Modeling cumulative expenditures with Rayleigh distributions, we produce graphs of the results that give useful assessments of cost and schedule risks. The procedure is implemented in a convenient computer program. We give three examples of its application to actual data, and results of a Monte Carlo analysis verify the method.

Rist Prize Recipients

LTC **Michael L. McGinnis**
USMA, Operations Research Center
West Point NY 10996
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Emmanuel Fernández-Gaucherand
The University of Arizona
Systems and Industrial Engineering
Tucson AZ 85721
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Pitu B. Mirchandani
The University of Arizona
Systems and Industrial Engineering
Tucson AZ 85721

Military Training Resource Scheduling: System Model, Optimal and Heuristic Decision Processes

The United States Army trains thousands of new soldiers each year to fill vacancies in Army organizations. Initial entry training is conducted in two phases: Basic Combat Training followed by Advanced Individual Training. Currently, *manual* heuristic methods are used to schedule the hundreds of training companies required to support initial entry training, where training company scheduling also involves deciding how many recruits to assign to training companies each week. In this paper, we formulate a mathematical dynamic model of the Basic Combat Training phase of initial entry military training. Two approaches for scheduling training resources are also presented: (1) a mathematical decision model for optimally scheduling training resources that is based on dynamic programming, and (2) an improved heuristic procedure that is implemented in a fully operational decision support system (DSS) for managing the US Army's resources for initial entry training. Computational experiments reveal that the heuristic procedures developed are indeed computationally efficient and provide "good" solutions in terms of training "quality" and resource utilization.

Special Session II

Wednesday, 7 June 1995 - 1530 - 1700

- **Junior/Senior Analyst Session .. Rickover 103**

Junior/Senior Analyst Coordinator:
James N. Bexfield, FS, Institute for Defense Analyses

This is the sixth consecutive year that MORS has offered the popular Junior/Senior Analyst Session. Each participant meets with the senior analyst of his or her choice in an informal, small-group setting. The session usually begins with the senior analyst giving a short overview on his background, on his views on how to do good analysis, and how he sees the Military OR career field evolving over time. This is followed by a Q&A Session with "no holds barred." It is an opportunity to meet "up close and personal," and learn from the experiences of one who has "been there and done it." All symposium attendees are welcome - both mid level analysts and junior analysts will benefit from attending this session. (Registration form enclosed in application packet.)

The senior analysts for the 63rd MORSS are:

1. Col **Thomas Allen**, Commander, Air Force Studies and Analyses Agency (F-15 command pilot, Barchi Prize for paper on cruise missile defense (1984), air defense analysis) ..... **Rickover 203**

2. **E. B. Vandiver III**, Director, US Army Concepts Analysis Agency, (MORS: President (92-93), Wanner Award, US Army Force Structure, Wargaming and Cost Effectiveness Analyses. ..... **Rickover 206**

3. **Edward C. Brady**, FS, Managing Partner, Strategic Perspectives Inc. (MORS: President (89-90), Fellow; extensive experience in Army combat simulation, strategic and Tactical C3I analysis and information warfare, and advanced DIS; Army Science Board 1987 - Present.) ..... **Rickover 207**

4. **Walter W. Hollis**, Deputy Under Secretary of the Army (Operations Research) (Army MORS sponsor; MORS keynoter; Scientific Advisor to US Army OT&E Agency (1973-80)). ..... **Rickover 208**

5. Col **Gregory S. Parnell**, Chairman Dept. of Operational Sciences, AFIT, (MORS President (93-94), Led major analyses on force structure and budget issues for HQ USAF; R&D background in aircraft, missile, and space programs) ..... **Rickover 213**

6. **Wayne P. Hughes**, FS, on Naval Postgraduate School faculty since 1979, currently holds Chair of Applied Systems Analysis sponsored by N81; MORS President (85-86), Wanner Award Winner and Fellow. Commanded minesweeper *Hummingbird* and destroyer *Morton* and has held a major shore command ..... **Rickover 239**

7. RADM **Pat Tracy**, Director Personnel and Manpower, J-1, Joint Staff (System analyst and manpower analyst for CNO; Strategic Studies Group at NWC, Commander Naval Technical Training Center.) ..... **Rickover 235**

8. **John K. Walker**, FS, COL US Army retired (MORS: *PHALANX* editor 1979-1980, President, (74-75), Wanner Award, Fellow; RAND analyst with studies in joint operations and Air Force close air support.) ..... **Rickover 236**

■ **A Workshop Report: Joint Requirements Oversight Committee .... Chauvenet 109/216**

Chair: **Vince Roske**, The Joint Staff (J-8)

On 25 June 1994 the Vice Chairman of the Joint Chiefs of Staff (VCJCS) ADM William Owens requested that MORS conduct a workshop on the Joint Requirements Oversight Council (JROC) process. The JROC is a key forum in which senior military leaders develop information to support the Chairman, Joint Chiefs of Staff, to perform net assessments of the armed forces joint warfighting capabilities.

The goals of the workshop, which was held on 17-18 October 1994, were to:

- Educate military operations research analysts and decision makers about the purpose, organization and function of the JROC process.
- Identify military OR reviews, analyses, methods, and products that may support the JROC process.
- Provide insights on the JROC process for widespread dissemination.

The results of this workshop will be discussed in this session.

■ **Education Session ..... Michelson 117**

Education Session Coordinator:
Michael Bauman, US Army TRADOC Analysis Command

On April 19, the Education Committee sponsored a colloquium. The morning agenda focused on how the four services (Army, Marines, Air Force, and Navy) develop analysts. Representatives from these services made presentations from both the military and civilian perspectives. In the afternoon, speakers made presentations on the challenges analysts face in applying OR techniques to Advanced Warfighting Experiments, Synthetic Theater of War, and Artificial Intelligence. Discussion revolved around how the education community can prepare young officers to meet the demands of this changing environment. A summary of the colloquium will be discussed at this special session.

■ **Managing Readiness: Today and Tomorrow ..... Rickover 102**

Michael Parmentier, Director of Readiness and Training, OSD

This session will start with brief introductory remarks from each of the three flag-level panelists, who represent service, CINC, and OSD perspectives on managing readiness. Their remarks will be followed by a panel discussion which focuses on key issues as well as the direction that the Department of Defense is heading to ensure the continued readiness of its forces in the future. Topics of interest will include:

- readiness indicators (existing and new, "readiness baseline," "macro" indicators);
- readiness reporting systems (improving the old, inventing the new, SORTS/GSORTS, Joint Readiness Reporting System);
- analytical tools and simulations ("resources to readiness," Joint Simulations System [JSIMS]);
- projecting future readiness (Status Projection System, PPBS initiatives); and
- bringing jointness into the readiness equation (CINC perspectives, Joint Warfare Capability Analysis [JWCA]).

This panel will address the state of the art of readiness management, and will identify the managerial and technical challenges that the operations research community must address if we are to improve our capabilities for the future.

Special Session III

Thursday - 8 June 1995 - 1330 - 1500

■ **A Workshop Report: Simulation Data and Its Management (SIMDATAM 95) Rickover 103**

CoChairs: **Charles E. Gettig, Jr.**, Gettig & Associates, Mechanicsburg, PA
Col **Stephen D. Williams**, USAWC, Carlisle Barracks, PA

Technical Chair: **Dennis A. Konkel**, USAWC, Carlisle Barracks PA

The workshop was conducted at the USAWC on 28-29 March 1995. The primary goal of the unclassified workshop was to familiarize the military operations research community with the context, processes, and technology advances in developing and utilizing simulation data. A secondary goal was to identify issues for further exploration and resolution in the military operations research community. The workshop included keynote addresses on Simulation Data and the Need for Standardization, Selling Data and Information Standards and a tutorial on "data modeling." Working groups discussed a wide range of issues in six major areas: Verification, Validation and Certification/Accreditation in Databases; Standardization Of Data and Data Systems; Enabling Technologies; Data Security (Classification); Research, and The National Information Infostructure (NII).

In this special session a report of the findings and recommendations will be presented.

- **A NATO Symposium Report: Uncertainty in Defense Decision Making ..... Rickover 102**

  Col **Bruce Smith**, Geophysics Directorate, AF Phillips Laboratory

A NATO Symposium on *Coping with Uncertainty in Defense Decision Making* was held at the Shape Technical Center and TNO Netherlands Organization for Applied Scientific Research, The Hague, the Netherlands from 16-18 January 1995. The Symposium was sponsored by NATO Defense Research Group Panel 7 on Defense Applications of Operational Research from concern about political developments over the past five years which have increased the uncertainty which confront NATO decision makers and was conceived as an opportunity for NATO members to exchange views concerning the treatment of uncertainty.

The objectives of the symposium were to:

- Explore ways to identify, handle and reduce uncertainty
- Identify the limitations of various traditional types of operational research
- Assess the merits of recent approaches to cope with uncertainty
- Identify the need and opportunity for new approaches

The symposium was primarily conducted within the following working groups: 1) Uncertainty and the Military Decision Maker; 2) Uncertainty and Problem Solving; 3) Uncertainty in Information and Modeling; 4) Uncertainty and Study Results; 5) Uncertainty and Short Term Planning; 6) Uncertainty and Organizational Flexibility in Use of Existing Resources and 7) Uncertainty and Long Term Resource Allocation.

Two major themes resulted from this symposium. These were the treatment of scenarios in an uncertain environment and the need for continuous interaction between the decision maker and the operations analyst. Of course, these issues can be discussed in relation to specific methodologies available to the OR community. In this session we will present an overview of the symposium followed by reports from each of the working groups and a panel to field questions and answers. Don't miss this opportunity to broaden your perspectives on uncertainty and decision making both as it applies here in the US and by contrast and comparison to our NATO allies.

- **The Joint Korean Regional Arms Control Project ..... Michelson 117**

  John Elliot, US Army CAA and Dr. **Richard Darilek**, RAND

For almost four years now, three institutions dedicated to research and analysis of public policy issues in the field of international security have teamed together for a joint study of arms control on the Korean peninsula and in the surrounding North East Asia region. The three institutions are the Korea Institute for Defense Analysis (KIDA) in Seoul, which works primarily for South Korea's Ministry of National Defense, the US Army's Concepts Analysis Agency (CAA) in Bethesda, Maryland, and the Arroyo Center at RAND, whose staff are located in both Santa Monica, California and Washington, DC. Following various initial, pioneering studies conducted independently by CAA and RAND in 1990, all three institutions joined forces in 1991 to explore arms control possibilities involving North and South Korea, as well as the United States.

At the Seventh Biennial US-ROK Defense Analysis Seminar (DAS VII) in Seoul in 1993, the three institutions reported on their individual and combined results. Because their results proved to be timely, and because the joint nature of this particular effort was clearly unique, the project was not only continued but expanded in scope following DAS VII to include arms control possibilities in North East Asia as a whole, involving as this does China, Japan, and Russia, as well as the US and the two Koreas. When MORS meets in June 1995, the joint project will be well on its way to completing its fourth year of work, which will culminate with a report to the Eighth Biennial US-ROK Defense Analysis Seminar (DAS VIII) in Seoul later that year in October. This special session will involve participation by representatives of all three institutions (KIDA, CAA, and RAND) as well as a retrospective look at all of the results-methodological as well as substantive-achieved by the joint project since its inception.

- **Tutorials**

  Tutorial Coordinator:
  Maj **Maureen Harrington**, HQ USAFA/DFCS

Tuesday - 6 June 1995 - 1215 - 1315

Capt **Leemon Baird ..... Michelson 103**
HQ USAFA/DFCS

Neural Networks and Reinforcement Learning

Neural networks and reinforcement learning systems are rapidly being applied to a host of optimization and control problems, with surprising

success. This tutorial will describe what they are and how they work, with an emphasis on their relevance to operations research. Examples of real-world applications will be presented, and areas of current and future research will be discussed.

Mary H. Henry ..... Michelson 117
HQ USATRADOC, ODCST Cost Analyst

Wilbur C. Hogan, III, Consultant
Tidewater Associates

Practical Cost Analysis

Recognition by the authors that decisions were being based on life cycle costs when life cycle costs were not what was being spent, led to the development of a cost concept intended to help leadership make better informed decisions. Using this concept they worked with OASD (PA&E) to develop means of realistically integrating cost and effectiveness in acquisition comparative analyses with encouraging results. They have expanded the original work into a broader, more encompassing approach to cost analysis intended to help decision makers appreciate the full ramifications of their decisions on the costs of those decisions. This tutorial addresses the background, progress, current status, and implications of what they have chosen to call Practical Cost Analysis.

Michael W. Garrambone ..... Rickover 102
VEDA, Inc

Lanchester on Lanchester

It is true that over 75 years ago a British automobile and aeronautical engineer was bold enough to publish the results of his investigations on the military applications of aviation (at a time when flying had only just been proven possible.) And it is also true, that this individual's theories stand today as the cornerstone of "equations of combat," and are considered to be amongst the most valuable analytical contributions to the art of war. But for most of us who have been terrorized by his academic references or rely daily on his equations (or the algorithms which drive the attrition processes in our many-on-many combat simulation models) a description of Lanchester's actual thoughts have never really been presented. Despite the numerous references and devilish derivations based on his famous equations, we have perhaps lost out on the mindset and content of Lanchester's basic ideas residing dormant within his earliest work. And so to remedy this shortfall in information, and to answer the question, "What exactly did Lanchester have to say?," this paper examines in an interesting and enlightening tone the recorded thoughts of one of the most important contributors to the use of combat modeling and simulation in modern analysis. The paper discussed the then (1917) envisioned strategic and tactical uses of air power, weapon effectiveness analysis, and issues in reconnaissance, joint and combined arms operations. It discussed Lanchester's concept on aviation, command, control, and logistics; the national and political implications associated with air power development: a postwar concept of "Power Projection," and one man's vision on the importance of battle space dominance on the brink of a technologically expanding era.

Capt **Jeffrey Stonebraker ..... Rickover 103**
HQ USAFA/DFMS

Lt Col **James K. Lowe**
HQ USAFA/DFM

The Practicality of Decision Analysis

This tutorial will describe applications of multi-objective decision analysis (MODA) and single objective decision analysis (SODA). MODA applications tend to be public-policy type decisions, such as: ranking of research projects, contract proposals, candidates to hire, etc. On the other hand, SODA applications are typically found in business/financial decisions where a company is interested in maximizing profit or minimizing cost. The different paradigms resulting from these applications and how one puts the theory into practice will be highlighted during this tutorial.

Wednesday - 7 June 1995 - 1215 - 1315

Mr. **John Zauner ..... Michelson 117**
Associate Professor of Operations Research
School of Management cience
Army Logistics Management College

LTC **William Cleckner**
Department of Information Sciences
School of Management Science
Army Logistics Management College

Linking Operations Research and Artificial Intelligence

Mr. Zauner will demonstrate the creation of an intelligence interface for LINDO by creating an Expert System in EXSYS, a rule-based expert system shell. He will take a small optimization problem, optimize it with LINDO and then show how an Expert System can be used to create a flexible, intelligent, graphical user interface. The interface will also be used to interpret the LINDO output for the user.

LTC Cleckner will demonstrate a comparison of several statistical techniques with Neural Networks. He will use problems of forecasting, multiple regression and discriminate analysis. These problems will first be solved with a statistical package or Microsoft Excel and then solved using the Statistical Neural Network Application Package (SNNAP) from Armstrong Lab, Brooks Air Force Base. The neural

network package may be obtained by DOD organizations at no cost.

Maj **Matthew L. Durchholz ..... Rickover 103**
HQ USAFA/DFEG

Data Envelopment Analysis

Benchmarking--the search for best practices to improve an organization's products and process--has become a critical aspect of the process improvement movement. A new technique, known as Data Envelopment Analysis (DEA), determines the best practice organizations of a group by using linear programming techniques to identify those organizations that form the empirical "efficient frontier." This tutorial will introduce the fundamentals of Data Envelopment Analysis. Examples will be cited to illustrate how DEA can be used to measure process performance.

Mr. **Michael S. David ..... Rickover 102**
OR Analysts Course Director
School of Management Science
Army Logistics Management College

Presentation Techniques for Operations Research Analysis

OR analysts are known for producing good technical products that don't seem to reach all users because there is a gap of understanding between the analyst and the user. Although this gap has been created by lack of user knowledge of OR and suspect OR analyst communication skills, it is up to the analysts to reach out to the user community if they expect to bridge the gap. Oral briefing skills are key building blocks for this bridge. Good briefing techniques are acquired skills that involve understanding the translation of technical results to non-technical language; knowing your audience; establishing your briefing objective; organizing your thoughts and ideas that will reach the objectives; designing effective visuals; appropriate rehearsal techniques; and addressing the dynamics of the briefing delivery. These seven issues cover how to effectively communicate the conclusions of a technical study.

Mr. **Roy Reiss ..... Michelson 105**
USAFE/DON
Unit 3050, Box 15
APO AE 09094-5015

How to Run a Winning Working Group

This tutorial has evolved over the years as the answers to all the questions you have had (but were afraid to ask) about running a high quality MORS working group. This one's "a must" for MORS future or prospective working group chairs and co-chairs.

Maj **Glenn James**, USAF **..... Michelson 103**
DFMS
Phone: 401-841-3304; DSN 948
Fax: 401-841-4258
E-mail: JAMESGE@NPT.NUWC.NAVY.MIL

Chaos Theory: Who Needs It?

This tutorial distills those issues of Chaos Theory essential to military decision makers. The talk presents specific ways we can recognize and cope with chaotic dynamics in a wide range of military affairs. First, we'll build your intuition for chaotic dynamics and we'll survey the military technologies that are prone to Chaos. Then, we'll see how the UNIVERSAL properties of chaotic systems point to practical suggestions for applying Chaos results to strategic thinking and decision making. The practical applications are so extensive that every military decision maker needs to be familiar with Chaos Theory's key results and insights.

COMPOSITE GROUP I — STRATEGIC

Working Groups 1, 3, & 4
Chair: Ray Valek, USSTRATCOM/J533
Room: Rickover Hall - Room 103

Tuesday, 6 JUNE 1995, 1330 - 1500

Mr. Thomas Ramos
Counterproliferation Group Leader
Lawrence Livermore National Lab
Phone: 510-423-2515

Dr. Gene Schroeder
Technology and Safety Assessment Division
Los Alamos National Lab
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Dr. Charles Carson
Counterproliferation Program Director
Sandia National Lab
Phone: 505-844-6477

Dr. Anne Vopatek
Counterproliferation Advanced Concept Technology Demonstration
Defense Nuclear Agency
Phone: 703-325-5928

Counterproliferation Analytical Efforts at the Nuclear Weapons Design Labs and Defense Nuclear Agency

What's happening at the national weapons labs and DNA in counterproliferation? Come to this session and find out the latest in programs and initiatives that will be bringing value-added capabilities to the analysis of potential and existing proliferation threats to the US and its allies. Get an overview of modeling and simulation efforts and other analysis activities which support research and development relating to the entire spectrum of the DoD Counterproliferation Initiative.

COMPOSITE GROUP II — NAVAL WARFARE

Working Groups 5 & 6
Chair: William M. Mulholland, McDonnell Douglas Aerospace
Room: Rickover Hall - Room 102

Tuesday, 6 JUNE 1995, 1030-1200

COMPOSITE GROUP II
SESSION #1 ..... Rickover 102

RADM Thomas B. Fargo, USN
OPNAV N81

Dr. James J. Tritten
Naval Doctrine Command

Naval Perspectives for Military Doctrine Development

Theoretical treatment of different types of military doctrine, including multi-service naval doctrine. The two basic aspects of doctrine are how a profession thinks and how it practices. Research then turns to what influences military doctrine: current policy, available resources, current strategy, campaign concepts, current doctrine, current threats, history and lessons learned, strategic and service culture, current technology, geography, demographics, and types of government. Note that a majority of these influences are current and not enduring, leading to a tension between the need to be responsive to current issues and the search for principles. In turn, military doctrine influences tactics, techniques, procedures, local tactical directives, rules of engagement, training and education, organization and force structure, analyses, programming, campaign planning, strategy, policy, and other forms of military doctrine. Final discussion area concerns degree of directiveness that should be found in doctrine. There are no easy answers to this question which lies at the heart of any controversies over doctrine. Conclusions deal with what, then, is a naval doctrine: common cultural perspective, fundamental principles, shared way of harmonious thinking, the art of the admiral, the heart of naval warfare.

COL Michael Patrow, USMC
OPNAV N85

Joint Littoral Warfare Mission Area Assessment

The Navy began its formal mission area and support area assessments in the fall of 1992. In November 1994, the Marine Corps was formally integrated into the process. These twelve assessments are the front end of the Planning, Programming and Budgeting System (PPBS) and help bolster the quality of the planning piece of PPBS. These assessments provide a continuous review of the Department of the Navy program as it relates to joint warfighting and forward presence capabilities. The goal of the twelve assessments taken collectively is a well-considered integrated investment strategy that provides affordable and credible warfighting

and forward presence capabilities with full consideration to other services contributions to each joint mission area. The Joint Littoral Warfare (JLW) assessment is especially key to the process since it encompasses such a broad scope of naval capabilities. This presentation will highlight the salient elements of the most recent JLW assessment: defining the JLW domain (what Navy and Marine Corps programs does JLW include?); developing priority criteria and a method for assigning priorities to programs; determining key capabilities; and conducting a force on force wargame. The presentation provides samples of JLW assessment results, however its focus is the assessment process.

Thursday, 8 JUNE 1995, 1030-1200

COMPOSITE GROUP II
SESSION #2 ..... Rickover 103

William H. J. Manthorpe, Jr.
Johns Hopkins University, Applied Physics Laboratory

Joint Warfighting Requirements Study

This study addresses the current concept of jointness, how it will be implemented at the operational level by joint warfighting, and thereby, how it will affect requirements for combat and supporting systems. It begins by establishing the background of jointness. Then, it examines the various drivers of jointness and finds that the major drivers are declining budgets and force levels. A review of Service Joint initiatives leads to the observation that two pairs of joint forces are emerging: A Navy/Marine Corps forward-deployed joint enabling force and an Army/Air Force CONUS-based rapid deployment joint projection force. The implications of the Chairman's emphasis on joint doctrine and training are considered. Changes in Joint and Defense program/support organizations suggest evolution to a joint acquisition structure and process. A detailed study of the Joint Requirements Oversight Council (JROC) and Joint Warfighting Capabilities Assessment (JWCA) process demonstrates their increasing influence and suggests a shift toward joint requirements driving Service programs. At the operational level, when preparing for and initiating warfighting in response to a future crisis or MRC, some joint warfighting capabilities must be undertaken earlier than others. Those are joint C2 and joint intelligence, surveillance and reconnaissance first, followed by joint air superiority and joint strike. These activities are not only the earliest required form of joint warfighting but also the most joint, because all Services have capabilities to contribute. Thus, it is from these activities that joint warfighting requirements will emerge and predominate.

Brian J. Ramsey, OPNAV N880
JAST Requirements Process

Approved abstract not available at printing.

COMPOSITE GROUP III — AIRLAND CONTINGENCY OPERATIONS
Working Groups 2, 7, 8, 9, 10, 11, 12, 13 & 14
Chair: Lounell Southard, USA TRADOC
Room: Rickover Hall - Room 102

Wednesday, 7 JUNE 1995, 1030-1200

Panel Discussion including:

Mr. Fred Frostic, Deputy Assistant Secretary of Defense (Requirements & Plans)
MG Ray Smith, Director, J-5 Plans, CFC Korea
RADM "Mike" Leucke, Director, Plans & Policy, CENTCOM
BG Robert Hicks, Deputy Director, JCS J-8

Fighting the Near-Simultaneous MRCs

The VIP members of this panel will voice their observations and concerns about the two MRCs and the analyses presented in the previous session. Do the senior decisionmakers think we can do it? What are the possibilities and what are the risks? Find out what is on the minds of OSD, JCS, and the CinCs, and bring your burning questions to ask first hand.

COMPOSITE GROUP IV — SPACE/C3I
Working Groups 15, 16, 17 & 18
Chair: Dr. Alfred (Burt) Marsh, NSA
Room: Rickover Hall - Room 103

Wednesday, 7 JUNE 1995, 1030 - 1200

Dr. John Alger
Information Resources Management College
National Defense University

Information Warfare: Current Views

Since the Gulf War, the Department of Defense has increasingly committed manpower, dollars, and intellectual energy to understanding the implications of information as an element of power. New definitions have resulted. New organizations have emerged—in spite of downsizing. New curriculums have been developed. New ideas of competition and conflict are challenging traditional concepts of war and peace. At the center of these changes lies the concept of Information War. The purpose of this presentation is to provide the status of current Information Warfare initiatives in the Department of Defense and to assess whether Information Warfare is a passing fantasy or a unifying concept for warfare in the Twenty-first Century.

COMPOSITE GROUP V — RESEARCH AND DEVELOPMENT
Working Groups 19, 20, 21, 22 & 23
Chair: CDR Chris Hanson, COMOPTEVFOR
Room: Rickover Hall - Room 102

Wednesday, 7 JUNE 1995, 1330 - 1500

Dr. Patricia Sanders
OUSD(A&T)/DDTSE&E/M&S-SE

Dr. Ernest Seglie
OSD/DOT&E

James F. O'Bryon
OSD/DDOT&E/LFT

Composite Group V will present a session of three speakers who have unique perspectives on changes within the Department of Defense research, development, acquisition and testing community. Dr. Patricia A. Sanders, Deputy Director for Modeling & Simulation/Software Evaluation, Office of the Under secretary of Defense for Acquisition and Technology, and Dr. Ernest Seglie, Science Advisor to the Director, Operational Testing and Evaluation, Office of the Secretary of Defense, will update the group on changes in their offices' policies and visions. Mr. James F. O'Bryon, Deputy Director of Operational Testing and Evaluation for Live Fire Testing, Office of the Secretary of Defense, will talk on "Cost/Benefit Analysis and Gresham's Law." A question and answer period will follow. The session will be moderated by Mr. James B. Duff, Technical Director of the Navy's Operational Test and Evaluation Force, COMOPTEVFOR.

COMPOSITE GROUP VI — RESOURCES AND READINESS
Working Groups 24, 25, 26, 27, 28 & 29
Chair: Mary JoAnn Carroll, AFSAA
Room: Michelson Hall - Room 117

Wednesday, 7 JUNE 1995, 1330 - 1500

Dr. J. J. McIlroy
Northrop Grumman Corporation
Hawthorne CA 90250-3272
Phone: 310-331-5409

Modeling the Dynamics of a Major Defense Acquisition Program

This presentation will describe and demonstrate how today's OR/MS tools can be used to better understand the dynamics of large military acquisition programs and how this understanding can help to improve our performance. The technology we shall elaborate and explore is a comprehensive business simulation model of NGC's portion of the F/A-18E/F EMD Program.

The subject of this presentation/demonstation should be of interest to those concerned with methods and techniques for measuring soft, but critical, factors affecting program performance (e.g. productivity, quality, rework). Also, those responsible for analyzing, forecasting, or simulating resources (especially people) should find the presentation informative. Further, anyone interested in applying computer simulation/decisions analysis will see how they can be used for understanding the dynamics of a large weapon system acquisition program. Finally, those program executives responsible for leading today's major acquisition programs should find the presentation/demonstration of value as they understand the dynamics of untimely funding, non-concurrent engineering, over-staffing, schedule pressure, rework and so on.

Wolf Kohn, Sagent Corporation
Anil Nerode, MSI, Cornell University and Sargent Corp
Benjamin Cummings, Army Research Lab
Jagdish Chandra, Army Research Office
Presenter: **John James**, Sagent Corporation
Fairfax Station, VA 22039
Phone: 703-690-3929

A New Approach for Performing Cost-Benefit Analysis

A constructive approach for selecting actions that are near-optimal with respect to economic costs is compared to the simulation-based approach for heuristic and exhaustive trade-off analysis. This new approach, which is cost -based and near-optimal with respect to a user-specified optimality criterion, is the result of a closed-form, near-optimal solution of a nonlinear problem statement. We provide an overview of this cost-based approach for evaluating alternative architectures for performing sensor fusion. The analytical approach can be applied at the design stage for evaluation of different configurations of major components based upon alternative separation of the problem into different operations performed at different time scales at different locations as well as at the implementation stage to perform on-line modification of the architecture in accordance with system goals, costs associated with the goals, and benefits of achieving the goals.

COMPOSITE GROUP VII — METHODOLOGIES AND TECHNOLOGIES
Working Groups 30, 31, 32 & 33
Chair: Dr. Roy Rice, Teledyne Brown Engineering
Room: Michelson Hall - Room 117

Thursday, 8 JUNE 1995, 0830 - 1000

Dr. William Lese
OD(PA&E)
Pentagon Room 2E330
Washington DC 20301
Phone: 703-695-7341

Future of Joint Modeling - OSD Perspective

Approved abstract not available at printing.

Dr. James C. Spall
John Hopkins University/APL
Johns Hopkins Road
Laurel MD 20723
Phone: 301-953-5000 x 4960

Developments in Stochastic Optimization Algorithms with Gradient Approximatins Based on Function Measurements

Approved abstract not available at printing.

Dr. J. P. Welsh
Joint Test Director, JT&E
Cold Regions Research and Engineering Lab
Hanover, NH 03755
Phone: 603-646-4527

Smart Weapons Operability Enhancement

Approved abstract not available at printing.

Mr. John E. Shepherd
US Army CAA, Attn: CSCA-RSD
8120 Woodmont Ave, Bethesda MD 20814
Phone: 301-295-1643

ARES - Advanced Regional Exploratory System

Approved abstract not available at printing.

WG 1 — STRATEGIC OPERATIONS

Chair: **Lt Col Rick Paulsen, Joint Staff/J-8**
Cochair: **MAJ Rick Yaw, USSTRATCOM/J533**
Advisor: **Kerry Kelley, USSTRATCOM/J533**
Room: **Rickover Hall 209**

Tuesday, 1030-1200

Future Strategic Force Structure
Capt Lynne Baldrighi, USSTRATCOM/J533

Strategic Futures II
LCDR Jerry Anderson, USSTRATCOM/J533

Tuesday, 1330-1500

COMPOSITE GROUP I SESSION . . . Rickover 103

Wednesday, 0830-1000

Airborne Dust Reduction Through Tactical Changes in Weapon Employment
LCDR Mark Edward Bakotic, USSTRATCOM

A Joint and Common Formalism for Analyzing Problems in Nuclear Survivability and Targeting
Lt Col Halvor A. Undem, USSTRATCOM

Wednesday, 1030-1200

An Improved Solution Methodology for the Arsenal Exchange Model (AEM)
Capt Jeffery D. Weir, Capt Michael G. Stoecker, and Lt Col Jim T. Moore, AFIT

ICBM Contributions to the TRIAD in Delayed Response Scenarios
Maj David D. O'Donnell & Maj Justin E. Moul, Air Force Studies and Analysis

Wednesday, 1330-1500

Geopolitical Developments in the Early 21st Century and Possible Implications for the SLBM
Ron Crutchfield, Lockheed Missiles and Space Co, Inc.

Semi-Quantitative Approach to Deterrence
Kurt T. Brintzenhofe, The John Hopkins University Applied Physics Laboratory

Reconstituting U.S. Nuclear Capabilities--An Assessment of Major Variables
Tim Katsapis, Ed Ohlert, & Ken Sullivan, JAYCOR

Thursday, 0830-1000

General Purpose Bombs or Precision Guided Munitions?

Why General Purpose Bombs Are Still Useful
David S. Mazel, The CNA Corporation

Precision Strike Capability/Joint Direct Attack Munition (JDAM), Product Improvement Program (PIP), Accuracy Requirements Study
William V. Beatovich, Veda Inc & Maj Jay Kreighbaum, HQ ACC/DRPW

Thursday, 1030-1200

Deterrence/Counterproliferation of WMD - Joint Warfighting Capabilities Assessment
CDR John Cooke, JCS/J-8/WAD

Assessment for Counterproliferation
Lt Col Chip Frazier, ASD/ISP

Thursday, 1330-1500 (During Special Session III)

Agent Defeat for Counterproliferation
Lt Col Bill Mullins, SAF/AQQS(N)

Counterproliferation Advanced Concept Technology Demonstration
Anne Vopatek, Defense Nuclear Agency/DFTD

Thursday, 1530-1700

The DNA Hazard Prediction Program
LTC Mark Byers & Walt Zimmers, Defense Nuclear Agency/SPWE

Project Vulcan
LTC Mark Byers & Walt Zimmers, Defense Nuclear Agency/SPWE

WG 2 — MISSILE DEFENSE

Chair: **Bob Grayson, MITRE**
Cochairs: **Mike Ellis, BDM**
Proctor Grayson, VRI
Fred Jerding, SPAI
Ms Beverly Nichols, USA SSDC
Ms Sharon Noll, IDA
Maj Paul Tabler, AF SAA
Room: **Chauvenet Hall 117**

Tuesday, 1030 - 1200

TMD Command And Control Plan
Discussant: Bob Grayson, MITRE

Operations Concept
CDR Pat Allen, Joint Staff, J36/DSDD

Integration Architecture
LtCol (SEL) Rene Ramirez, BMDO/AQI

Implementation Strategies
LtCol Steve Kupecz, HQ, ESC/XRS

Interoperability Demonstrations
Ms Katrina Brant, MARCORSYSCOM C4IAD

Tuesday 1330 - 1500
Paving The BMD Information Highway
Discussant: LTC Duard Stephen "Steve" Woffinden, Army Artificial Intelligence Center

Information Interoperability In Missile Defense
LTC Steve Woffinden

TMD BMC3I Information Architecture Tool
Carlton J. Peterson, MITRE and Ms Virginia "Ginny" Wiggins, BMDO/AQI

IA Application To The TMD System Assessment Process
LtCol G. N. "Ozzie" Nelson, BMDO/AQI

Wednesday, 0830 - 1000
TMD Capstone COEA
Discussant: Maj Lou Larsen, BMDO/AQS

Issues
Maj Lou Larsen

Analysis
Bob Sepucha, SPARTA

Follow–On Activities
LtCol Milt Johnson, NTF/WG

Wednesday, 1030 - 1200
Sensitivity Of TMD Performance To The Presence Of Combined Arms Threats
Discussant: Mike Ellis, BDM

TMD In Combined Arms Operation
John Rybicki, BMD International

Extended Air Defense Campaign Analysis Integration
Karsten Engelmann, US Army Concepts Analysis Agency

Impact Of Theater Ballistic Missile Defense On The Joint Campaign
Alan Zimm, Johns Hopkins University, Applied Physics Lab

Wednesday, 1330 - 1500
The Role Of Distributed Integrated Simulation In TMD Development
Discussant: LtCol Milt Johnson, NTF

Air Force Participation In Synthetic Theater Of War (STOW)
LtCol J. D. Dennison, HQ USAF/XOMW

TMD Simulation In A DIS Environment–Towards A Useful Analytical Capability
Dr. Bob Kerchner, RAND

Practical Use of DIS
LtCol Kevin Martin, AFSAA/SASC

Thursday, 0830 - 1000
Integration And Balancing Cruise Missile Defense And Theater Missile Defense
Discussant: Dr. Ted Gold, Hicks & Associates

Cruise Missile Defense Study
Maj Terrence Fox, AFSAA/SAGT

Operator In The Loop Simulation Of Cruise Missile Defense
Dr. Joe Tatman, SAIC

Distributed Netted Sensor Architecture For Cruise Missile Defense
Jim Walsh, Coleman Research

Thursday, 1030 - 1200
Recent TMD Analyses
Discussant: Proctor Grayson, VRI

Theater Defense Netting Study
Ralph W. Bush, MITRE and Steven F. Crisp, MITRE

US–Japan Bi-Lateral Concept Study for BMD
John R. Shure, AEROSPACE Corporation

The USEUCOM TMD Cell–Integrating TMD BM/C4I
Zygmund R. Jastrebski, CAS, Inc.

Thursday, 1330 - 1500
Quantifying The Relation Of Interceptor Lethality To TBMD Effectiveness
Discussant: Dr. Jim Walbert, AMSRL-SL-BA

Challenge Of Developing A Multi–Purpose TBMD/AAW Weapon
Chuck Ellington, Naval Surface Warfare Center

Lethality Requirements For TMD
Hal Holmes, Loral Vaught Systems

TBMD Post–Engagement Effects
Chuck Martin, ARES Corporation

Thursday, 1530 - 1700
TMD C3I Testing
Discussant: Fred Jerding, SPAI

Joint TMD Testing
Col John Carlisle, JTMD Attack Operations JTF

CINC Assessment Program
LtCol Tom Blume, BMDO/AQJ

Army TMD C3I Testing
Mike Phillips, 305 Powell Street, Gurley, AL 35748

WG 3 — ARMS CONTROL

Chair: Pat McKenna, USSTRATCOM/J53
Cochairs: Karen Stark, BDM Federal
Dr. Bob Batcher, US ACDA
Advisor: Al Lieberman, FS, US ACDA
Room: Rickover Hall - Room 208

Tuesday, 1030-1200
Arms Control, Nonproliferation Treaties and Agreements: Status and Prospects:
Dr. Edward J. Lacey, US ACDA

Proliferation Path Assessment and Tracking System (PPATS)
Ms Alane Andreozzi - Beckman, DNA

Tuesday, 1330 - 1500
COMPOSITE GROUP I SESSION . . . Rickover 103

Wednesday, 0830-1000
Proliferation Import Model (PIM)
Dr. Anthony P. Ciervo, Pacific-Sierra Research Corporation

A Methodology for Evaluating Military Systems in Counterproliferation
Capt Stafira, Air Force Studies and Analysis Agency

Wednesday, 1030-1200
Tracking Inventory Drawdown Using START Central Data System (SCDS)
Dr. Richard L. Walker, BDM Federal

Compliance Monitoring and Tracking System (CMTS)
Karen Stark, BDM Federal

Baseline system for CWC verification inspections
Ms Jean Razulis, US ARMY Chemical Biological Defense Command

Wednesday, 1330-1500
Conventional Arm Forces in Europe: Key Elements Update
Dorn Crawford, US ACDA Consultant

Controlling Conventional Arms Transfers
Ken Watman, RAND

Thursday, 0830-1000
Analysis of Three-way Arms Races
Fred S. Nyland

Application of New Sciences Techniques to Proliferation and Arms Control Analysis
Stephen R. Hill, TASC

Thursday, 1030-1200
START III Study
Bob Batcher and Jim Scouras, U.S. ACDA

Toward a New Strategic Arms Control Strategy
Glen R. Otey, SNL

Thursday, 1530-1700
Next Generation of Arms Control and New Security Parameters
Randy Ridley, TASC

Post Cold War Trends in Disarmament
Eric Desautels, TASC

WG 4 — STRATEGIC COMPETITIVENESS ANALYSIS AND PLANNING

Chair: Thomas G. Mahnken
Advisor: Dr. Tom Welch, OSD/NA
Room: Rickover Hall - Room 203

Tuesday, 1030 - 1200
The Revolution in Military Affairs: A Primer
Barry Watts, Northrop-Grumman, Dr. Andrew F. Krepinevich, Defense Budget Project and Michael Vickers, OSD/NA

Tuesday, 1330 - 1500
COMPOSITE GROUP I SESSION . . . Rickover 103

Wednesday, 0830 - 1000
Joint Perspectives on the RMA
James Blaker, JCS and CAPT James FitzSimonds, OSD/NA

Wednesday, 1030 - 1200
Industry Perspectives on the RMA
Chip Pickett, Northrop-Grumman and Chris D. Lay, Lockheed-Martin

Wednesday, 1330 - 1500
The Revolution in Military Affairs and Future War: Nightmare or Dream for the Russian General Staff?
Dr. Jacob Kipp, FMSO

Potential Military Rivals: Technological, Economic, and Operational Considerations
COL Raymond Franck, Dr. Gregory Hildebrandt, Joint Military Intelligence College

Thursday, 0830 - 1000
The RMA and Operations Research
James Hazlett, SAIC, Pat Curry, BDM and Mark Herman, Booz, Allen & Hamilton

Thursday, 1030 - 1200
Measures of Effectiveness for Information Warfare
Richard E. Hayes and Richard L. Layton, Evidence Based Research

BDA for Space and Electronic Warfare
Tamara Luzgin, Naval Research Lab

WG 5 — EXPEDITIONARY WARFARE/POWER PROJECTION ASHORE

Chair: **Tim Sullivan, Texas Instruments**
Cochair: **CDR "Boots" Barnes, OPNAV, N815K**
Advisor: **Frank Kammel, NSWC**
Room: **Rickover Hall - Room 207**

Tuesday, June 6, 1030 - 1200
COMPOSITE GROUP II
SESSION #1 ..... Rickover 102

Tuesday, June 6, 1330 - 1500
Longbow Apache in Joint Operations
Mr. Scott Swinsick, McDonnell Douglas Helicopter Systems

Coastal and Riverine Operations Study
Mr. Frederick B. Reimer, Hughes Aircraft Company

Wednesday, June 7, 0830 - 1000
Strike Munitions Interoperability
CDR Don Kassilke, USN, CNA

Non-Visual Close Air Support
Mr. John Bentrup, CNA

Wednesday, June 7, 1030 - 1200
AEGIS and Air Defense Interoperability
Mr. Jeffrey McManus, NSWC, Dahlgren

Use of JMEM Data and Programs to Support Service Mission Planning Programs
Mr. William Tonkin, NAWC-WD, China Lake

Wednesday, June 7, 1330 - 1500
Vista Graphics Modifications to SUPPRESSOR Simulation
Ms. Camalla Haley, Texas Instruments

MLR Supplemental Analysis, MV-22 Wargame
Col Ted Smyth, USMC, MCCDC

Thursday, June 8, 0830 - 1000
Two MRC Analysis (ITEM) NIMBLE DANCER
CDR "Boots" Barnes, USN, N815K

Two MRC Analysis (ALSWAT) NIMBLE DANCER
Mr. Cliff Perrin, McDonnell Douglas Aerospace

Thursday, June 8, 1030 - 1200
COMPOSITE GROUP II
SESSION #2 ..... Rickover 103

Thursday, June 8, 1330 - 1500
Sea-based Firepower for Joint Land Battle
Dr. Andy Borden, CNA

Amphibious Wargame Lessons Learned
Col Gary Anderson, USMC, MCCDC

WG 6 — LITTORAL WARFARE AND REGIONAL SEA CONTROL

Chair: **Dr. Michael A. Cala, CNA Representative to JIATF-East**
Cochairs: **LCDR Kirk Michaelson, OPNAV N815**
Chuck Samuels, Epoch Engineering
Advisor: **CAPT Steve Pilnick, OPNAV N893**
Room: **Rickover Hall - Room 206**

Tuesday, 1030-1200
COMPOSITE GROUP II SESSION .. Rickover 102

Tuesday, 1330-1500
Non-Lethal Weapons for Counterdrug Operations
Patrick J. Browne, JIATF-East

Use of JMEM Data and Programs to Support Service Mission Planning Programs
William Tonkin, NAWC-WD

Joint Oceanographic Support of Littoral Warfare: Third Generation Wave Modelling
William R. Curtis, Jr., Coastal Engineering Research Center

Wednesday, 0830-1000
Over-the-Horizon Area Defense vs. Cruise Missile Mission Analysis Study
Dr. Bill Dickter, Hughes Aircraft Company

Aegis and Air Defense Interoperability
Jeffrey D. McManus, Naval Surface Warfare Center, Dahlgren Division

Evolutional Learning for Harpoon in Littoral Warfare
Phil Armijo, McDonnel Douglas

Wednesday, 1030-1200

The Nearland Test (NLT)
Dr. Jeff Lutz, CNA Representative to JADO/JEZ/ASCIET

Sea-Air-Land Operations
CDR W. J. Toti, OPNAV N815C

The Challenges of Real Time Analysis in Joint Warfare
CDR Scott Miller, CINCPACFLT N640

Wednesday, 1330-1500

Surface Combatant Force Level Study (SCFLS) Effectiveness / Sufficiency Analysis
Michael Tacey, Johns Hopkins APL and E. Leigh Ebbert, John Hopkins University, APL

Assessment of Streamlining Counterdrug Interdiction in the Transit Zone
Dr. Michael A. Cala, CNA Representative to JIATF-East

Multi-Mission Capabilities of the OWL MKII
Howard Hornsby, NAVTEC and Michael P. Smith, Office of Special Technology

Thursday, 0830-1000

Coordination of DoD Counterdrug Operations: An Inter-Theater Perspective
MAJ Ismael Ortiz, Jr., USMC, JIATF-East

Coastal and Riverine Operations Study
Fred Reimer, Hughes Aircraft Company

Thursday, 1030-1200

COMPOSITE GROUP II SESSION .. Rickover 103

WG 7 — NUCLEAR, CHEMICAL AND BIOLOGICAL DEFENSE

Chair: **Alan Longshore, USA Chemical School**
Cochairs: **Doug Schultz, Institute for Defense Analysis**
LTC Mark Byers, Defense Nuclear Agency
Room: **Rickover Hall - Room 213**

Tuesday, 1030-1200

Joint NBC Defense: A Strategy for Prioritizing Multi-Service Programs
MAJ Dan Maxwell, USA CAA

The OMEGA Model for Chemical & Biological Hazard Assessment
Rich McNally, Science Applications International Corporation

Tuesday, 1330-1500

Review of Joint Pub. 3-12-2, Nuclear Weapons Employment
Dr. Dave Bash, USA NCA

Draft NATO Nuclear Casualty Manual
Doug Schultz, Institute for Defense Analysis & MAJ Curling

Nuclear Shielding Analysis
Dr. Dave Bash, USA NCA

Wednesday, 0830-1000

Theater Missile Defense - Chemical and Biological Warfare Lethality: Status and Issues
Dr. Martin Richardson, Teledyne Brown Engineering

Consequence of Intercept on Bulk Thickened Missile Payloads
Rich McNally, Science Applications International Corporation

Wednesday, 1030-1200

COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330-1500

Reutter & Wade Toxicity Data Applied to M40 Mask Specifications
MAJ Jerry Glasow, USA DCSOPS

Distributed Interactive Simulation (DIS) on the Chemical Battlefield: An Update
Anthony Beverina, Kaman Sciences Corporation

Reutter & Wade Toxicity Data Applied to the Protection Assessment Test Set (PATS) Pass/Fail Threshold
MAJ Jerry Glasow, USA DCSOPS

Thursday, 0830-1000

Effects of Tularemia on Human Performance
George Anno, Pacific-Sierra Research Corporation

Biological Agent Hazard Footprints Based on Performance Degradation
Art Deverill, ARES Corporation

The CASUALTY Model for Biological Agents: A Focus on Time-Based Consequences and the Population Response
Rich McNally, Science Applications International Corporation

Thursday, 1030-1200

The DoD Biological Vaccine Program: Research, Development and Military Operations
David Evans, Analytic Services, Inc. (ANSER)

The Potential Impact of Biological Weapons Use and the Benefit of Medical Intervention
Rich McNally, Science Applications International Corporation

A Sampled Volume Model: A New Approach to Biological Warfare Modeling
Dr. Amnon Birenzvige, USA ERDEC

64th MORS Planning, Selection of Chair and Cochairs, Recommendation of Topics

WG 8 — MOBILITY

Chair: **Maj Kevin Smith, HQ USAF/XOM**
Cochairs: **Lt Col Scott Hagin, AMC/SAF**
Frank McKie, CAA/CSCA-TCM
Tom Denesia, TRANSCOM/JSAA
Lt Col Denis Clements, OSD PA&E
Advisor: **Steve Wourms, ASC/YNE**
Room: **Rickover Hall - Room 224**

Tuesday, 1030 - 1200 - ***Choke Points and Leverage***
Reception, Staging, Onward Movement, and Integration Operations (RSOI-O)
Ms Renee G. Carlucci, US Army CAA

Reception, Staging, Onward Movement, and Strategic Deployment Operations (RSOI-S)
Dr. Elizabeth Abbe and Maj Nancy Daugherty, US Army CAA

Mobility Requirements in Spain
Capt Lance J. Lindsley, AMC/SAF

Tuesday, 1330 - 1500 - ***No Parking on this Level, Lot Full***
Stochastic Airfield Capability Modeling
Capt Jean M. Steppe, Maj Jon Borsi and 2Lt Ken Brown, AMC/SAF

Access of Airlifters to Worldwide Airfields
Dr. Milt Minneman, OUSD(A&T)/S&TS

Tuesday, 1530 - 1700 - ***Doing too Much, with Not Enough***
Measuring Pants Legs to the Nearest Inch and the Waist Size to the Nearest Foot: Input-Model Disconnects in Airlift Analyses
Maj Kirk Yost, OAS/DRC

Strategic Mobility in the 21st Century: What are the Options?
Maj Dan McDonald, Mobility Concepts Agency

Wednesday, 0830 - 1000 - ***That's Three for 95 cents, Two for a Dollar***
Strategic Airlift Force Mix Analysis
LtCol Reed Hanson and Dave Merrill, HQ AMC/XPY

Strategic Lift Tradeoff
Vera Hayes, US Army CAA

Wednesday, 1030 - 1200 - ***Mobility Metaphysics: Nothing Up My Sleeve***
Integrated Computerized Deployment System (ICODES)
Steve Goodman and Dr. Jens Pohl, Military Traffic Management Command

System Utilization Rate Control via an On-Line Differential Control Process
T. E. Kowalski, J. J. Revetta, Washington University

Wednesday, 1330 - 1500 - ***1.7 Children, or 2.0***
Optimiztion Modeling for Airlift Mobility
Dr. Richard E. Rosenthal and Dr. David P. Morton, NPS

Optimizaion of Deployment Enhancement Projects for he US Army
Patricia Murphy and LTC Andrew G. Loerch, USA CAA

Wednesday, 1530 - 1700 - ***Gas 'N Go***
Dynamic Attribute Analysis of Aerial refueling Concepts
Maj Derreck D. Walters, AMC/SAF

CONOP - A Linear Programming Model of the Air Mobility System
Paul Killingsworth and Laura Melody, RAND

Thursday, 0830 - 1000 - ***Cats and Dogs***
Interactive Capability Analysis for Aeromed
Capt Jean M. Steepe, Capt Jonathan Robinson and LtCol Reed Hanson, AMC/SAF

Civil Reserve Air Fleet Passenger Requirements
Thomas E. Denesia, TRANSCOM

Air Mobility Command: A Year-in-Review
Capt Mark R. Grabau, AMC/SAF

Thursday, 1030 - 1200 - ***Lunch the Fleet (Part I)***
Aircraft Carrier's Contribution to the Strategic Mobility of US Tactical Airpower
LtCol Dan Cuda, OUSD (A&T)

Preposition of Attack Helicopters Afloat
Karsten G. Engelmann, USA CAA

Thursday, 1330 - 1500 - ***Lunch the Fleet (Part II)***
PORTSIM: Simulation of Military Unit Movements Through Ports
Michael R. Nevins and Charles M. Macal, MTMC-TEA

WG 9 — AIR WARFARE

Chair: **Thomas M. Lillis, McDonnell Douglas Aerospace**
CoChairs: **LTC Marty Allen, AFSAA/SAG**
Mark Butler, NAIC/TAAE
Advisor: **David E. Spencer, FS, RAND**
Room: **Rickover Hall - Room 225**

Tuesday, 1030 - 1200

Parametric Study of Warhead Pk vs CEP for Surface-to-Air Missile Targets
Robert Stovall, 46 OG/OGML (Chicken Little Joint Project)

SEAD - Cost and Benefit of Lethal SEAD at Mission Level
Paul R. Hylton, VEDA Inc. and Major Jay Kreighbaum, HQ ACC - DRPW

Tuesday, 1330 - 1500

Precision Strike Capability/JDAM Product Improvement Program Accuracy Requirements Study
William V. Beatovich. VEDA, Inc.

Evaluating Force Effectiveness - A Survivability Approach to Force Allocation
Sheryl A. Payne and Keith Dugue', Northrop Grumman

Weapons Effectiveness Study
Major W. Paul Schroeder, AFSAA/SAGW

Wednesday, 0830 - 1000

MCM3-1 Adversary Tactics Reconstruction
Mark Butler, NAIC/TAAE

Pilot-in-the-Loop Threat Fighter Simulation
Mark Butler, NAIC/TAAE

Adversary Air Tactics in Digital Simulation
Capt Doug Fullingim, NAIC/TAAE

Wednesday, 1030 - 1200

COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330 - 1500

Over-the-Horizon Area Defense vs Cruise Missile Mission Analysis Study
William Dickter, Hughes Aircraft Company

Engagement Analysis of MIG-25 (FOXBAT E) VS. U-2
Scott Fullenkamp, NAIC/TAAE

Degraded States Vulnerability Analysis of Air Systems Update
Robert W. Kunkel and Lisa Roach, U. S. Army Research Laboratory, AMSRL-SL-B

Thursday, 0830 - 1000

Close-in Combat (CIC) Air Combat Engagement Analysis of Hypothetical Fishbed Upgrades
Scott Fullenkamp, NAIC/TAAE

Rearward Firing Missile Combat Effectiveness Analysis
Scott Fullenkamp, NAIC/TAAE

AMRAAM P3I COEA Results
Major Eileen A. Bjorkman, AFSAA/SAGW

Thursday, 1030 - 1200

Analytical Framework for Strike Operations
Gregg Burgess, Cambridge Research Associates

Scenario Development for Joint Operations
W. R. Baker, Northrop Grumman

In Search of Robust Weapons Mixes: Methods for Maximizing Flexibility in Conventional Munitions Stockpiles
Lt Jay Deyonke, AFMC OAS/DRC

WG10 — LAND WARFARE

Chair: **Phillip A. Kubler, TRADOC Analysis Center**
Cochair: **Larry Cantwell, TRADOC Analysis Center**
Advisor: **Mark Herman, Booz-Allen & Hamilton, Inc.**
Room: **Rickover Hall - Room 228**

Tuesday, 1030-1200

Building the Synthetic Environment
Keith R. Carson, TRADOC Analysis Center

Verification, Validation, and Accreditation (VV&A) of Distributed Simulations
Pamela Blechinger, TRADOC Analysis Center

DIS Data Initiatives
Howard Haeker, TRADOC Analysis Center

Developing Distributed Simulation Environments for AWEs (Arming the TRADOC Battle Labs)
Kent Pickett, TRADOC Analysis Center

Tuesday, 1330-1500

Battlefield Distribution for the Future: An Analytical Excursion
Ron Fisher, CASCOM, and Robert H. Wright, 143d Transportation Command

Fratricide Reduction in the Digitized Battlefield
Chaunchy McKearn, Hughes Missile Systems Corporation and Kim Daugherty, Hughes Aerospace and Defense Sector.

Application of Force-on-Force Parametrics to Design of the Line-of-Sight Anti-Tank (LOSAT) System
Jody Allsion, LOSAT Project Office and Paul Deason, TRAC-White Sands

Wednesday, 0830-1000
Requirements Definition for All Electric Armored Vehicles in a Joint Operations Environment
Scott Fish and Richard D. Lawrence, University of Texas at Austin

Nonlethal Weapon Employment Analysis
Bruce P. Mamont, US Army Concepts Analysis Agency

"Graceful Degradation" - A Sea Change in System State
Mark Wroth, Aerojet Mission Analysis

Near-Term Battlefield Combat Identification System (NTBCIS) Survivability
Thomas E. Maloney, US Army Materiel Systems Analysis Activity

Wednesday, 1030-1200
Analysis and Experimentation Support for Army Force XXI
John A. Riente, DA-DCSOPS

A Baseline Set of Critical Information Requirements for Establishing the Relevant Common Picture for FORCE XXI
Mike McGinnis, Mike Barbero, George Hull, and Scott Torgerson, United States Military Academy

An Architecture for an Information Age Command and Control System
Mike McGinnis, Mike Barbero, and George Hull, United States Military Academy

Wednesday, 1330-1500
Studies of Personnel Attrition Rates in Land Combat Operations: A Status Report
Robert L. Helmbold, US Army Concepts Analysis Agency

Determining the Implications of Unexploded Ordnance (UXO) on the Battlefield using a Minefield Effectiveness Model
David H. Eimer, US Army Materiel Systems Analysis Activity

"We have Met the Enemy and..."
Cyrus Holiday, Forces Command

Thursday, 0830-1000
Advanced Field Artillery System/Future Armored Resupply Vehicle (AFAS/FARV) Cost and Operational Effectiveness Analysis (COEA)
Patrick G. Smock, TRADOC Analysis Center

Land Warrior Performance Analysis
Windsor L. Jones, US Army Materiel Systems Analysis Activity

Who's Got the Data? Report on Data Sources Identification Efforts
Cathy Corley, TRADOC Analysis Center

Approximations, Assumptions, and Validation
Hugo E. Mayer, Jr., TRADOC Analysis Center

Thursday, 1030-1200
TAA03 Operations Other Than War (OOTW) Methodology - Force Analysis Spreadsheet Tool OOTW Requirements (FASTOR)
Joe Manzo, US Army Concepts Analysis Agency

Special Reconnaissance/Direct Action Missions Study - Taken from the Special Operations/Low Intensity Conflict (SO/LIC) Study - Phase 2
Frederick B. Reimer, Hughes Aircraft Company

Source Data Acquisition for the Close Combat Tactical Trainer (CCTT)
Robert H. Wright, Resource Consultants, Inc

WG 11 — SPECIAL OPERATIONS/OPERATIONS OTHER THAN WAR

Chair:	**Greg Jannarone, Consultant**
Cochairs:	**Rob Roberson, Argonne National Laboratory**
	LTC Robert Smith, USSOCOM
	MAJ Andy Yee, USASOC
	COL Terry Silvester, USAF Special Operations School
	Robert Holcomb, IDA
Advisor:	**Ray Stratton, Locheed Martin Corporation**
Room:	**Rickover Hall - Room 235**

Tuesday, 1030 - 1200
Modeling Special Operations In Major Regional Conflicts (MRC), Lessor Regional Contingencies (LRC), Peace Time Operations, and Operations Other Than War (OOTW)
LCDR Bruce Willhite, USN

SOF Attrition Factors Development and Analysis
CPT Greg Wilson, USA

Tuesday, 1330 - 1500
SOF in the Joint Tactical Simulation
MSGT Fedrigo, USAF

Impact Assessment of Psychological Operations During Desert Storm
Major John Young, USA

Wednesday, 0830 - 1000
USSOCOM COEA of the Advanced Multi-Mission Vertical Lift Aircraft (MV-X)
Mr. William C. Fite, ANSER

Advanced SEAL Delivery System COEA
Mr. Steve Armstrong, USSOCOM

Wednesday, 1030 - 1200
COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330 - 1500
SOF Joint Applications: SOF Integration into a Joint Synthetic Battlefield Environment
Mr. John Cox, USSOCOM

Conceptual Framework to Analyze Contributions of SOF
Dr. Bruce Pirnie, RAND

Thursday, 0830 - 1000
Theater Level OOTW Modeling: Applications of Decision Making Theory
CPT Neal Lovell, USA

SPECTRUM, An Operations Other Than War Simulation
Dennis Chrisman, Nathinal Simulation Center

Force Facilitator for OOTW Planning and Analysis
LTC Jim Stover, USA

Thursday, 1030 - 1200
Defense Science Board Summer Study Results: Military Operations in Built-up Areas
Mr. Robert Holcomb, IDA

USSOUTHCOM Counter Drug Effort/Analysis
Rex Rivolo, IDA

WG 12 — AIR DEFENSE

Chair: **Michael Minnick, Martin Marietta**
Cochair: **Anita Ontiveros, USAADAS**
Advisor: **Dan Willard, ODUSA(OR)**
Room: **Rickover Hall - Room 236**

Tuesday, 1030 - 1200
Theater Missile Defense Ground Effects Analysis
Robert L. Bowen, Potomac Systems Engineering

Tuesday, 1330 - 1500
Joint Analysis Methods to Measure How Well We Get the ID of the Shooter
Robert J. Anderson, SAIC

Wednesday, 0830 - 1000
State of the Art Ground Vehicle Signature Characterization Capability at Eglin AFB
K. L. Weeks, TASC

Wednesday, 1030 - 1200
COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330 - 1500
Counter Drug Operations -- Counter Drug Operations Module
Walter Leyland, NAWC

Thursday, 0830 - 1000
FAADS C3I COEA
Ronald Magee, US Army TRADOC Analysis Command

WG13 — ELECTRONIC WARFARE AND COUNTERMEASURES

Chair: **James Oliver, AFIWC**
CoChairs: **Terry Cronin, IEWD**
Don Lewis, Battelle
Fred Levien, NPGS
Advisor: **Roy Reiss, AFSAA**
Room: **Rickover Hall - Room 237**

Tuesday, 1030 - 1200
Joint Tacair Electronic Warfare Study
Maj Daniel Clevenger, Air Force Studies and Analysis Agency

C2W Analysis and Targeting Tool
LtCol Tom White, Air Force Information Warfare Center

Survey of Air-Air Threats
Carlos Colon, National Air Intelligence Center

Tuesday, 1330 - 1500
Flight Path Planning to Support Collection Management
Terence Cronin, Army Intelligence and Electronic Warfare Directorate

Sensor Planning for Elusive Targets
Dr Chris Elsaesser, MITRE

Deployment Planning and Analysis for Time Difference of Arrival and Differential Doppler Location Finding Assets
Prof Don Brown/Capt Jeff Schamburg, Institute for Parallel Computation

Wednesday, 0830 - 1000

Development of an Automated Catalog of Models and Simulations Including EW and CM Elements
Leo Vroombout, Battelle

Missile Approach Warning System Navy Force Package III/IV (Operational Effectiveness Study)
Maj Jim Herring, Air Force Studies and Analysis Agency

Practical Lessons Learned in DIS
Alan Tischer, Battelle

Wednesday, 1030 - 1200

COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330 - 1500

Ultra Wideband as a Communication Systems Jamming Tool
Prof Fred Levien, Naval Postgraduate School

Optimization of Shipboard Self-Protection ECM Systems Using SCE Techniques
Prof Phil Pace, Naval Postgraduate School

A New Approach to EW Model Development and VV&A
Lt Craig Rizzo, Air Force Information Warfare Center

Wednesday, 1530 - 1700

The AIM-120 CSS - An All Digital High Fidelity Missile Simulation Employing Tactical OFP
Jerry Weed, Dynetics

Simulation of Foreign ECM System in a High Fidelity All Digital Environment
Jerry Weed, Dynetics

Assessing Weapon System Performance in Complex ECM Environment Utilizing All Digital Simulations
Maj David Delaney, Aeronautical Systems Center

Thursday, 0830 - 1000

Joint Advanced Distributed Simulation Electronic Warfare Test
LtCol Homer Jeffers, Joint Advanced Distributed Simulations/Joint Test Force

A Constraint-Based System for Siting of Air Defense Missile Batteries
John Benton, Army Topographic Engineering Center

Potential and Limitations of High Temperature Superconductivity (HTS) in Electronic Warfare and Radio Communications
Tom Tuma, Army Intelligence and Electronic Warfare Directorate

Thursday, 1030 - 1200

Line of Sight Algorithms
Dan Champion, TRADOC Analysis Center

Evolution of Field Line of Sight Collection Techniques and Statistical Analyses
Lou Fatale, Army Topographic Engineering Center

Propagation Analysis using TIREM
Dave Eppink, ITT Research Institute

Thursday, 1530 - 1700

Radar Dynamic Target Signatures
Jim Havens, Air Force Information Warfare Center

Development of a Low RCS Reflector Antenna System
Dr Dan Reuster, ARINC

Electronic Warfare High Frequency Size Reduction Antenna
Russ Frazier, Army Intelligence and Electronic Warfare Directorate

WG 14 — JOINT CAMPAIGN ANALYSIS

Chair: **Dr. Cyrus Staniec, OSD(PA&E)**
Co-chairs: **Mr. Richard Morris, McDonnell Douglas**
LCDR Robert Gregg, OPNAV (N81)
Advisor: **James L. Wilmeth, SAIC**
Room: **Rickover Hall - Room 238**

Tuesday, 1030-1200

Common Scenario Development in Support of Campaign Analysis
LCDR Tom Lang, OPNAV Code N812C3

Data Consistency for Joint Analytic Tools
Carl Carden and William Burch, ISA, Inc.

Tuesday, 1330-1500

Joint Campaign Analysis Using Expert In The Loop Modeling Operations
Dr. Robert C. Powers , Global Associates, Ltd.

Two Near Simultaneous Regional Conflicts - 1997 - 2001 - 2005-
Cliff Perrin, McDonnell Douglas

Wednesday, 0830-1000

Fighting the Near-Simultaneous MRCs: Part One - Analysis
Col Dewey George, J-8; Dr. Jim Metzger, OSD(PA&E); Major David Cox, CENTCOM

Wednesday, 1030-1200

COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330-1500

Regional Conflict Model (RCM): A Generic Threat Alternative
Major Bill Eliason, AF/XOOC (Checkmate)

Early Entry Force Analysis (EEFA)
CPT Thomas M Cioppa, TRAC-SAC

Thursday, 0830-1000

Analysis Issues in the Warfighting Headquarters ..... Rickover 102

Panel discussion featuring:
Col Gabriel Rouquie, USCENTCOM - Chair
Col Henry Cobb, USSOCOM
Col Robert Graebner, USACOM
Col Carl Johnson, USEUCOM

The DoD Joint Analytic Model Improvement Program
Dr. William Lese, Jr. Deputy Director (PA&E) /Theater Assessments and Planning

Thursday, 1030-1200

Joint Campaign Analysis Using the Integrated Theater Engagement Model (ITEM) in USACOM
LCDR Todd Morgan, USACOM

Naval Theater Level Model (NTLM)
LCDR Jeffrey Cares, CFC-KOREA, Operations Analysis Branch

Joint Air Campaign Analysis Using The TACWAR Simulation Tool
Peter C. Byrne and LtCol John O. Yanaros, Jr., Joint Staff J-8/Warfighting Analysis Division

WG 15 — COMMAND, CONTROL, AND COMMUNICATIONS (C3)

Chair: **Patrick Allen, Cubic Applications Inc.**
Cochairs: **Zach Furness, MITRE**
Bill Kemple, Naval Postgraduate School
Ed Cesar, Consultant
Advisor: **Donald Kroening, TRAC/OAC**
Room: **Rickover Hall - Room 239**

Tuesday, 1030-1200

Coalition C2 in Peace Operations
Richard E. Hayes, Richard I. Layton, Jan W. S. Spoor, Evidence Based Research, Inc.

Information Warfare Modeling Methodology
CPT Robert Claflin, US Army TRAC

Communications Performance and Shortfalls in Operations Desert Shield/Desert Storm
Katharine Poehlmann, RAND

Tuesday 1330-1500

Battalion-Level Command and Control at the National Training Center
John Grossman, RAND

A DIS Model for a Multisensor Airborne Surveillance Platform
John Santapietro, The MITRE Corporation

The Army Theater Missile Defense Tactical Operations Center
Maj Clarence Wells, USSPACECOM

Wednesday 0830-1000

Modeling Joint Theater-Level C3I: Joint Stochastic Warfare Analysis Research (J-STOCHWAR) at the Naval Postgraduate School
LTC Mark A. Youngren, NPS

Performance and Cost Considerations in theTactical Use of Commercial COMSATs
David Trinkle, RAND

Military Applications for Proposed LEO Communications Satellite Systems
Katharine Poehlmann, RAND

Wednesday, 1030 - 1200

COMPOSITE GROUP IV SESSION . Rickover 103

Wednesday 1330-1500

Modeling and Simulation in the Leading Edge Environment
John C. Roberts, MITRE

The DIS-Compliant SINCGARS Radio Model
Joe Lacetera, MITRE

Thursday 0830-1000

Analysis of Nonlethal Weapon Employment Effects on Command and Control
LTC Bruce P. Mamont, U.S. Army Concepts Analysis Agency

Information Readiness: Preparing for Information Warfare in Peacetime
Dr. Patrick D. Allen, Cubic Applications Inc.

Thursday 1030-1200

A Bayesian Perspective of Dominant Battlefield Awareness
COL Raymond E. Franck, Jr., Defense Intelligence Agency

The Effects of Decisionmaking Quality and Timeliness on the Response Surface of a Simple Combat Simulation
John Gilmer, Jr., Wilkes University

WG 16 — MILITARY ENVIRONMENTAL FACTORS

Chair: **Eleanor Schroeder, NAVOCEANO/N53**
Cochairs: **Warren Olson, IDA**
Kathy Cooper, ODPA&E (DC&L)
Tom Piwowar, STC
Room: **Rickover Hall - Room 210**

Tuesday, 1030-1200

The Effects of Different Line-of-Sight Algorithms and Digital Terrain Elevation Resolutions on Combat Simulation
Danny C. Champion, TRAC/WSMR

Line-of-Sight Data Sets for Comparative Studies of Twenty-Nine Palms Range 400 Elevation Data Set
Albert L. Zobrist, RAND Corporation

Visibility-Based Terrain Analysis
LTC Clark Ray, USMA

Tuesday, 1330-1500

Operational Test Visualizer (Demo/Presentation)
Donald Hue McCoy, IDA

Use of Transportation Infrastructure Planning and Assessment in Military Operations
Jim Robinson, USAE/WES

Weapons and Obstacles Synergism During the Obstacle Planning Process
P. Doiron, USAE/WES

Janus Desert Hammer Extrapolation
LTC Stan Ritter, TRAC-WSMR

Wednesday, 0830-1000

Environmental Effects for Distributed Interactive Simulation
Dr. Harry Heckathorn, NRL

Master Environmental Library for Modelling and Simulation
Dr. Martin C. Miller, USAE WES

Joint Warfare Environmental Analysis and Prediction Systems
Peter C. Chu, NPS

SWOE Synthetic Scene Generation Process
Dr. James P. Welsh, SWOE JT&E

Wednesday, 1030-1200

COMPOSITE GROUP IV SESSION . Rickover 103

Wednesday, 1330-1500

Joint Oceanographic Support of Littoral Warfare: Wave Modelling
Bill Curtis, USAE WES/CERC

Joint Oceanographic Support of Littoral Warfare: Tide Modelling
Dr. Ted Bennett, NAVOCEANO

Dynamic Meteorological Modeling for Field Artillery Effectiveness Studies
Abel Blanco, ARL/BED

Battle Weather Testbed Technology Initiatives for Army Weather Support
John R. Elrick, ARL/BED

Thursday, 0830-1000

Synthetic Environment Data Representation Interchange Specification (SEDRIS)
Paul A. Birkel, MITRE

Selected Wheeled Vehicle Mobility in Sand
James Robinson, USAE-WES

Rainfall as a Contributing Factor in Military Operations/Mobility
James Robinson, USAE-WES

Development of a Theoretically Based Soil Moisture Model to Support Military Operations Worldwide
James Robinson, USAE-WES

Thursday, 1030-1200

Military Training and the Environment
Robin M. Brandin, SAIC

Integrating Conservation and the Military Mission
L. Peter Boice, ODUSD(ES)/EQ-CO

Range Capacity and Utilization Model
Robin M. Brandin, SAIC

Thursday, 1500-1530

WRAPUP AND DISCUSSION

WG 17 — OPERATIONAL CONTRIBUTION OF SPACE SYSTEMS

Chair: **Gary Streets, SWC/AES**
CoChairs: **Jim Huttinger, Booz Allen & Hamilton**
Corinne Wallshein, AFSAA/SASS
David Glen Taylor, RAND
Advisor: **Dr. David Finkleman, USSPACECOM/AN**
Room: **Rickover Hall - Room 211**

Tuesday, 1030-1200

SPACECAST 2020: Projecting Future Military Space Technology
Maj Roger Burk, AFIT

SPACECAST 2020: The Operational Analysis
Maj Roger Burk, AFIT

Tuesday, 1330-1500

Force-on-Force Analysis to Assess the Operational Contribution of Space Systems
Gregg Burgess, Cambridge Research Associates

Autonomous Battle Damage Assessment Study: BDA for Space and Electronic Warfare
Tamara Luzgin, Naval Research Laboratory

Wednesday, 0830-1000

Space Based Infra-Red Sensor System Architecture Analysis
Dr. David Finkleman and Jerry Brown, USSPACECOM/AN

Communication and Information Architecture to Support Evolving Joint and Coalition Operations in an Information Warfare Environment
David Taylor, RAND

Wednesday, 1030-1200

COMPOSITE GROUP IV SESSION . Rickover 103

Wednesday, 1330-1500

Demand Assignment Multiple Access (DAMA) for Satellite Communications: Ways to Improve its Robustness and Efficiency
Phillip Feldman, RAND

STRATC2AM: A Strategic Communications Model Recast as a Tactical Communications Model
Corinne Wallshein, AFSAA/SASS

Thursday, 0830-1000

Military Use of Commercial Remote Sensing Satellites: Operations and Economic Considerations
Dick Buedeke, RAND

The Application of Supervised Spectral Classifications of Remotely Sensed Earth Imagery to Determine Optimal Airlift Dropzones for Large Regions - An Example
Timothy Eveleigh, Autometric Inc.

Thursday, 1030-1200

Analyzing GPS Effectiveness via Modeling and Simulation
Capt Brian Anderson, AFIWC/SAV

Weighting Scheme for the Space Surveillance Network Automated Tasker
Capt Beth Petrick and Maj Roger Burk, AFIT

WG18 — OPERATIONS RESEARCH & INTELLIGENCE

Chair: **Peter Shugart, USATRAC-WSMR**
Cochairs: **Allan Rehm, MITRE**
Advisor: **John Milam, BDM**
Room: **Rickover Hall - Room 212**

Tuesday, 1030 - 1200

Intelligence Issues and Air-To-Ground Modeling: Methods For Modeling Intelligence Issues In Determining Conventional Munitions Stockpiles
Lt. Jay DeYonke, OAS/DR

An Improved Target Assessment Model for U.S. Marine Corps Seismic Sensors
Mr. William G. Kemple, Naval Postgraduate School

Tuesday, 1330 - 1500

Design Of Data Exploitation Tools For Intelligence Analysts
LTC Annette L. Sobel, MC, Sandia National Laboratories

AA-10a/c 6-DOF Digital Model
Mr. Carlos R. Colon, National Air Intelligence Center

Wednesday, 0830 - 1000

Nonlinear Science and the Lanchester Equations
Dr. L. D. Miller, National Ground Intelligence Center

Introducing Nonlinear Science Into Military Research and Analysis: The Threat Spectrum Model
Dr. M.F. Sulcoski, National Ground Intelligence Center

Wednesday, 1030 - 1200

COMPOSITE GROUP IV SESSION . Rickover 103

Wednesday, 1330 - 1500

Russian Views On Electronics and Information Warfare
Ms. Mary FitzGerald, Hudson Institute

Modeling the Impact of Joint Theater-Level Intelligence: Joint Stochastic Warfare Analysis Research (J-STOCHWAR)
LTC Mark A. Youngren, Naval Postgraduate School

Thursday, 0830 - 1000

Estimating the Relationship Between Information and Combat Results
Professor Don Barr, US Military Academy

Intelligence Requirements For Economic Modeling In Support Of Targeting Analysis
Dr. Allan Rehm, MITRE

Thursday, 1030 - 1200
First Principles and Soviet Perceptions Of Silo Vulnerability: Implications For Cold-War Deterrence and Stability
Mr. John Hines SAIC

WG 19 — MEASURES OF EFFECTIVENESS

Chair: **John M. Green, Lockheed Martin**
Cochair: **Robert Meyer, Naval Air Warfare Center, China Lake**
Room: **Michelson Hall - Room 108**

Tuesday, 1030 - 1200
Miss Distance to PK: Endgame Measures of Effectiveness
Dorothy L. Saitz, Naval Air Warfare Center, China Lake

Some MOEs and Modeling Techniques Used to Evaluate Proposed AEGIS AAW System Improvements.
Peter Bishop, Lockheed Martin Government Electronics Systems

Joint Analysis Methods to Measure How Well We Get the ID to the Shooter
Robert Anderson, SAIC, Elgin AFB

Tuesday, 1330 - 1500
Information Warfare in Gaming and Simulation: A Critcal Look at MOEs
George F. Kraus, SAIC

Measures of Effectiveness for Information Warfare
Richard E. Hayes, Evidence Based Research, Inc.

Give MOE Another Job? How Study MOEs Drive VV&A Requirements
David H. Hall, Naval Air Warfare Center, China Lake and Dennis Laack, Computer Sciences Corporation

Wednesday, 0830 - 1000
Association of Old Crows Measures of Effectiveness Study
John "Rusty" Porter, Russ Porter Assoc.

Measures of Effectiveness for Civil Emergency Management Planning and Peacekeeping
John Farr Ph.D., USMA

Wednesday, 1030 - 1200
Developing Measures of Control of Combat Ground Units
LTC Jack M. Kloeber, US Army, AFIT, Wright-Patterson AFB

Defender's Advantage as a MOE
Robert L. Helmbold, US Army Concepts Analysis Agency

Stochastic MOEs for Conventional Strategic Weapons
Michael Senglaub Ph.D., Sandia National Laboratories

Wednesday, 1330 - 1500
COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830 - 1000
The Value of Electronic Warfare: In Search of the Magic Metric
Robert J. Meyer, Naval Air Warfare Center, China Lake

Joint Combat Search and Rescue Joint Test and Evaluation Issues, Measures, and Analytic Framework
Guy Morgan, SENTEL, JCSAR Joint Feasibility Study

Thursday, 1030 - 1200
WORKING GROUP WRAP-UP

WG 20 — TEST AND EVALUATION

Chair: **Dr. Ernest R. Montagne, BDM Engineering Services Company**
Co-Chairs: **Maj Larry Dubois, US Army Operational Test and Evaluation Command**
Michelle D. Kirstein, HQ AFOTEC/TSL
Bard K. Mansager, Naval Postgraduate School
Capt Bruce G. Mitchell, HQ AFOTEC/WE
Advisor: **Dr. Marion Williams, HQ, AFOTEC**
Room: **Michelson Hall - Room 109**

Tuesday 1030-1200
Test and Evaluation Enhanced by Modeling
Dean A. Payne, Applied Physics Lab.

Simulation Drives Operational Testing
John W. Diem, Maj Lawrence Turner, Jr., Cpt Jonathan L. Urquhart, TEXCOM, Tami J. Johnson, Army Experimentation Site

The Role of Simulation in Weapons System Space Testing and Evaluation
Susan K. Bruce, Northrop-Grumman

Tuesday 1330-1500
The Utility of Advanced Distributed Simulation to the Test and Evaluation Process
Eric Keck, Joint Advanced Distributed Simulation Joint Test Facility

Validation of a Surrogate Battlefield Scene Simulation Capability
Dr. James P. Welsh, Dr. George G. Koenig, Smart Weapons Operability Enhancement Joint Test and Evaluation Program

A Real-Time Open Air Mission Level Analysis System
Randall W. Yates, Northrop Grumman and Daniel R. McGauley, Naval Air Warfare Center

Tuesday 1530-1700
Testing to Validate Modeling of Foreign Rocket Motor Response to Ballistic Impact
Elizabeth T. Thorn, Sverdrup Technology, Inc.

Parametric Study of Warhead Pk versus CEP for Surface-to-air-missile (SAM) Targets
James B. Flint and Robert L. Stovall, Eglin AFB

The Status of a Model-Experiment-Model Procedure in an Advanced Warfighting Experiment
Eugene Dutoit, Dismounted Battlespace Lab.

Wednesday 0830-1000
Framework for Assessing the Validity of Field Experiments
Dr. Rick Kass, TEXCOM

Non-Traditional C4I Systems Impose T&E Challenges for the 90s and Beyond
Maj Randy Douglass, AFOTEC

T&E Test Plan and Acquisition Program Documents Linkage
Capt Gary W. Moore, Capt Stephen J. Dippel and 1Lt Stephanie Lind, AFOTEC

Wednesday 1030-1200
Test and Evaluation Strategy for Evolutionary Automated Information Systems
Anthony F. Shumskas and Matthew M. McGuire, BDM Engineering Services Company

Operational Evaluation Metrics and Associated Criteria for Mission-Level Evaluation of Automated Information Systems
Nickolas P. Angelo, AFOTEC

Testing the Reliability of Information Systems
Maj John A. Stine, TEXCOM

Wednesday, 1330-1500
COMPOSITE GROUP V ..... Rickover 102

Wednesday, 1530-1700
System Understanding and Statistical Uncertainty Bounds from Limited Test Data
James C. Spall, Applied Physics Lab

Optimization Techniques Used by the 445th Flight Test Squadron in Radar Software Development Testing
Blair Budai, Edwards AFB

Estimating Uncertainty Using the Bootstrap Technique
Capt Scott Frickenstein, AFOTEC

Thursday 0830-1000
Cost-Effective Test and Evaluation Methodology and Techniques
Leonas K. Jokubaitis, Tank-Automotive and Armaments Command

Chicken Little: A Model for Cost Effective Test and Evaluation
James Michael Heard, Eglin AFB

Testing so as to Minimize Expected Cost
Dr. Bryce R. Parry, Center for Naval Analyses.

Thursday 1030-1200
The Continuous Evaluation Database System
Alan Davis, Jo Belser, BDM Federal, Inc, Maj Jere Norman, OEC

Summary of the Development and Implementation of the Transportable Integrated Data Analysis and Management System (TIDAMS) and Relative Approaches to Improve T&E Effectiveness at the 46th Test Wing - Eglin AFB, FL
Wink Yelverton, The Sentel Corporation

Software Configuration Management in Operational Testing
Maj Lawrence W. Turner, Jr., TEXCOM

Thursday 1530-1700
Airborne Instrumentation and Analysis System for Electronic Combat Test and Evaluation
Bradley D. Thayer, Institute for Defense Analysis, CAPT Chris Larsen,USN, OSD/DOT&E

Data Injection and Monitoring Unit: a Multipurpose Test Tool
Michelle D. Kirstein, AFOTEC, Mark Cozemchak, Peter Sebald, The Core Group

Integrated Product Team Flight Test Management Database
Vi Luong, Edwards AFB

WG 21 — UNMANNED VEHICLES

Chair: **Brad W. Bradley, USAMSAA**
Cochairs: **Robert E. Bowen, Potomac Systems Engineering**
CPT Ed Kleinschmidt, USA/USMC
Frederick Cancilliere, USN/NUSC
MAJ Gerald Diaz, USAF Studies and Analysis
Room: **Michelson Hall - Room 110**

Tuesday, 1030-1200

Intelligent Systems in the Coming Anarchy and the Transformation of War
Dr. Robert Finkelstein, Robotic Technology Incorporated

Value of Organic Unmanned Vehicles to Light Infantry Battalions
Clifford J. Landry, IDA

Evaluating the Role of Robotic Vehicles and Sensors using JANUS(A)
MAJ Rocky Gay, USMA

Tuesday, 1330-1500

Teleoperated Vehicle Modeling for Combat Simulation
Lisa Mason, USAHRED

Unmanned Ground Vehicle/Systems Analytical Activities
Robert Elick, Summa Technology Incorporated (JPO-UGV)

Distributed Interactive Simulation: A New Development Tool for Unmanned Vehicles
Dr. Robert Finkelstein, Robotic Technology Incorporated

Wednesday, 0830-1000

Program Overview of TTCP KTA-21: Operational Assessment of Battlefield Robotics
Brad W. Bradley, USAMSAA

Exploring Unmanned Ground Vehicle Utility Using Technology Seminar Wargaming
MAJ Harvey Graf, USAMSAA

Measures of Merit for Unmanned Vehicles
Dr. Robert Finkelstein, Robotic Technology Incorporated

Wednesday, 1030-1200

Close Range Unmanned Aerial Vehicle Joint Cost and Operational Effectiveness Analysis
Robert E. Bowen, Potomac Systems Engineering

High Altitude Endurance (HAE)/Low Observable HAE Campaign Force Mix
MAJ Steve McGuire, USAF Studies and Analysis

Endurance Unmanned Aerial Vehicle Advanced Technology Concept Demonstration Program
CPT Allen Rutherford, USN, Unmanned Aerial Vehicle Joint Project

Wednesday, 1330-1500

COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830-1000

Cost Benefit Trade-off Analysis Approach for Unmanned Ground Vehicle Human Factors Research
Tom Haduch, USAHRED

Marine Corp Involvement with the Tactical Unmanned Ground Vehicle Cost and Operational Effectiveness Analysis
CPT Robin G. Gentry, USMC Studies and Analysis

Countering Mines in the Littoral Using Unmanned Undersea Vehicles
John Benedict, John Hopkins University, APL

Mobile Detection Assessment Response System: Cost Benefit Analysis and Operational Test Issues
Susan P. Hower, CSC

Thursday, 1030-1200

Unmanned Aerial Vehicle Common Automated Recovery System Analysis
R. Huff, Patuxent River Naval Station

Capabilities and Future Requirements of the System Integration Laboratory as Applied to Modeling Unmanned Aerial Vehicles
Charles Hardt, Systems Dynamics International Inc.

Airborne Reconnaissance Flight Planner Requirements aka "The Travelling Salesman Problem"
MAJ Gerry Diaz, USAF Studies and Analysis

Unmanned Aerial Vehicle Dropsondes: A Target Area System
Dr. James Cogan, USA Research Lab

WG 22 - COST AND OPERATIONAL EFFECTIVENESS ANALYSIS

Chair: **Dr. Patricia Sanders, OSD(ODTSE&E)**
Cochairs: **LTC Bob Clemence, (OSD(ODPA&E)**
Lt Col Dean Illinger, AF/XOME
Advisor: **Dr. William G. Lese, Jr., OSD(ODPA&E)**
Room: **Chauvenet Hall - Room 116**

Tuesday, 1030-1200 - Methodology

Ordinal Ranking Methods for COEAs: Avoidance of Independence and Subjectivity Requirements
Dr. Zachary Lansdowne, The MITRE Corporation

Nonnuclear Consumables Annual Analysis (NCAA) Target Values/Priorities
Dennis M. Coulter, ASI Systems International

Advanced Field Artillery System/Future Armored Resupply Vehicle Cost and Operational Effectiveness Analysis
Patrick Smock, TRADOC Analysis Center

Tuesday, 1330 - 1500

JOINT SESSION - WORKING GROUP 22 & 23 ..... Chauvenet 116
Increasing the Relevance of COEAs to the Acquisition Process

Panel Discussion:
OSD Perspective
Dr. Mike Gilmore, OSD(ODPA&E)
Service Perspective
Mr. John Riente, USA DCSOPSS
Program Manager Perspective
COL Bob Garner, USMC, V-22 Program Office

Wednesday, 0830 - 1000 - Non-Traditional Applications of COEAs

Suppression of Enemy Air Defenses (SEAD) - Costs and Benefits of Using Lethal SEAD at the Mission Level
Paul R. Hylton, VEDA, Inc., and Maj Jay Kreighbaum, HQ ACC/DRPW

Precision Strike Capability/Joint Attack Munition (JDAM), Product Improvement Program (PIP), Accuracy Requirements Study
William V. Beatovich, VEDA, Inc., and Maj Jay Kreighbaum, HQ ACC/DRPW

Wednesday, 1030 - 1200 - Integrating Cost and Effectiveness Analysis

Do These Costs Make Any Sense? The Use and Abuse of Costs in Defense Acquisition Analysis
Michael W. Smith and Henry L. Eskew, CNA

Cost and Effectiveness Integration
Mary H. Henry, USA TRADOC

Wednesday, 1330 - 1500

COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830 - 1000

JOINT SESSION - WORKING GROUPS 22 & 23 ..... Chauvenet 116
COEAs for Joint Acquisition Programs

Joint Studies: A Joint Stars Example
Cindy L. Jahnke, TRADOC Analysis Center

Joint Stars COEA - OT&E Linkage
Ronald A. Gustafson, AFOTEC

Thursday, 1030 - 1200 - Jointness in COEAs

The Joint Context with Army Cost and Operational Effectiveness Analyses
Ronald G. Magee, TRADOC Analysis Center

Problems Associated with Joint COEAs
Jeff Sackett, VEDA, Inc.

WG 23 — WEAPON SYSTEMS ACQUISITION

Chair: James C. Kolding, Teledyne Brown Engineering
Cochairs: Terry Cooney, VEDA, Inc.
LCDR Pat Crotzer, OCNO
Room: Michelson Hall - Room 107

Tuesday, 1030 - 1200

Centralized Procurement: Mapping Resources to Operational Assessments
Capt Gregory K. Cohen, MCCDC

An Analytic Framework for Strike Operations
Gregg Burgess, Cambridge Research Assoc.

Tuesday, 1330 - 1500

JOINT SESSION
WORKING GROUP 22 & 23 ..... Chauvenet 116
Increasing the Relevance of COEAs to the Acquisition Process

Panel Discussion:
OSD Perspective
Dr. Mike Gilmore, OSD(ODPA&E)
Service Perspective
Mr. John Riente, USA DCSOPSS
Program Manager Perspective
COL Bob Garner, USMC, V-22 Program Office

Wednesday, 0830 - 1000

Linking Requirements to Technologies is one of the Current Analytical Challenges
Bard Mansager, Naval Postgraduate School

Analysis of the Advanced Field Artillery System (AFAS)
CPT Mickey A. Sanzotta

Wednesday, 1330 - 1500

COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830 - 1000

JOINT SESSION
WORKING GROUPS 22 & 23 ..... Chauvenet 116
COEAs for Joint Acquisition Programs

Joint Studies: A Joint Stars Example
Cindy L. Jahnke, TRADOC Analysis Center

Joint Stars COEA - OT&E Linkage
Ronald A. Gustafson, AFOTEC

Thursday, 1030 - 1200
Joint Requirements Analysis in the CR-UAV COEA
Dr. Alfred G. Brandstein, MCCDC

Precision Strike Capability/Joint Direct Attack Munition (JDAM), Product Improvement Program (PIP), Accuracy Requirements Study
William V. Beatovich, VEDA, Inc., and Maj Jay Kreighbaum, HQ ACC/DRPW

Thursday, 1330 - 1500
Role of Experimentation in Streamlining Acquisition
Dr. Hank Dubin, USA OPTEC

WG 24 — SOFT FACTORS IN MILITARY MODELING AND ANALYSIS

Chair: **William M. Pugh, Naval Health Research Center**
Cochairs: **Ronald Laughery, Micro Analysis and Design**
Sally VanNostrand, ARL
Advisor: **Eugene P. Visco, SAUS-OR**
Room: **Michelson Hall - Room 111**

Tuesday, 1030 - 1200
Human Performance Modeling: An Overview of Issues and Methods
Dr. James Hodgdon, Naval Health Research Center

Tuesday, 1330 - 1500
Energy Expenditure Prediction: Simulation and Field Studies
Dr. George R. Mastroianni and Dr. Reed W. Hoyt, US Army Research Institute of Environmental Medicine

Wednesday, 0830 - 1000
Development of a Prototype Micro Saint Model for Predicting Unit Performance as a Function of Unit Design
Dr. James S. Ainsworth, US Army Research Lab

A Computer Simulation and Analysis of the Forward Surgical Team
MAJ Robert Syvertson, US Army, MSC

Wednesday, 1030 - 1200
Joint Service Medical Planning and Disaster Response: A Panel Discussion
COL Rober Owens, First US Army/AFRA-JRMPO

Wednesday, 1330 - 1500
COMPOSITE GROUP VI SESSION Michelson 117

Thursday, 0830 - 1000
Telecommunication Techniques and Medical Care on the Joint Battlefield
Dr. Eric Allely, Henry M. Jackson Foundation

Thursday, 1030 - 1200
Integration of Medical and Warfighter Model
Jamie K. Pugh, NRAD

Using the Forecas Projection System to Simulate Casualty and Illness Rates Among Ground Forces
Christoper G. Blood, Naval Health Research Center

WG 25 — SOCIAL SCIENCE METHODS

Chair: **Maj George (Mark) Waltensperger, AL/CFHP**
Cochairs: **Dr. Jock O. Grynovicki, USARL**
LCDR Mark T. Sandvigen, Naval Space Command
Ensign Craig Arndt, USNR
Advisor: **Dr. James C. Geddie, USARL**
Room: **Michelson Hall - Room 112**

Tuesday, 1030 - 1200
Modeling the Auditory Detection of the Squad Automatic Weapon Magazine
George Garinther, Army Research Laboratory

The Influence of Load Mass and Load Distribution on the Road March Performance of Special Operations Forces Soldiers
Dr. Joseph Knapik, Army Research Laboratory

Tuesday, 1330 - 1500
Verification, Validation and Accreditation of a Soldier Modeling Tool:HARDMAN III
Dr. Laurel Allender, Army Research Laboratory

Improving Team Coordination: A Case for Behavior-Based Training
Dr. Dennis Leedom, Army Research Laboratory

The Effects of a Computer-Aided Teleoperation Technology on Operator Workload and of Concurrent Task
Monica Glumm and Dr. J. O. Grynovicki, Army Research Laboratory

Wednesday, 0830 - 1000
Human Engineering for the Force XXI Assessment Process
Dr. Stanley Bolin, Army Research Laboratory

Comparing Information Requirements for BMD C2 Centers
Berverly Knapp , Army Research Laboratory, and Annette Ensing, MITRE

Wednesday, 1030 - 1200
A Combined Modeling, Simulation and Demonstration Methodology for Assessing Theater Missile Defense Effectiveness
Gilbert G. Kuperman, Armstrong Laboratory

Analyst Tool for Forecasting Political Instability
Grace I. Scarborough, Evidence Based Research, Inc.

Wednesday, 1330 - 1500
COMPOSITE GROUP VI SESSION Michelson 117

Thursday, 0830 - 1000
The Use of Non-parametric Statistics in Marine Corps Area Assessments
CAPT Gregory K. Cohen, Marine Corps Combat Development Command

The the SHIPCAS Projection System to Simulate Casualty and Illness Rates Among Forces Afloat
Dr. Christopher Blood, Naval Health Research Center

Thursday, 1030 - 1200
Validation of Energy Expenditure on the I-Port Mobility Platform
Andrea Ilynes, Army Research Laboratory

Localization of Acoustic Beacons in a Free-Field Listening Environment
Tuyen V. Tran and J. O. Grynovicki, Army Research Laboratory

WG 26 — LOGISTICS

Chair: **Clarke J. Fox, USAMSAA**
Cochairs: **Alan Cunningham, TRAC-LEE**
Sal Culosi, LMI
Room: **Michelson Hall - Room 114**

Tuesday, 1030-1200
Navy Logistics Requirements-A Wholesale Level Perspective
Robert Greiner, DORO

Evaluation of Statistical Demand Forecasting (SDF)
Eric Wehde, USAMSAA.

Warfighting Assessment and Requirements Model (WAR)
LTC Gary Arnett and Ludwig Coco, DLA

Tuesday, 1330-1500
Battlefield Distribution System for the Future System: An Analytical Excursion
LTC Robert Wright, 143rd Transportation Command

Asset Redistribution Model (ARM)
CPT Scott Schutzmeister, USAMSAA

Availability of Army Line Haul Trucks
Michael F. Byrd, TRAC-LEE

Wednesday, 0830-1000
Maintenance Modernization System
Richard Bell, Martin Marietta.

Secondary Reparable Maintenance Concept Analysis
CPT Mark Adams, HQ USMC

A DLA Wholesale Perspective of the Air Force Wing Commander's Test
Tom Lanagan, DORO.

Wednesday, 1030-1200,
Force Analysis Spreadsheet Tool OOTW Requirements (FASTOR)
LTC Manzo, CAA

Army War Reserve Decision Support System:
Robert Abercrombie, Martin Marietta

USMC ATLASS Program
LTC Mike McCormick, HQ USMC

Wednesday, 1330-1500
COMPOSITE GROUP VI SESSION Michelson 117

Thurday, 0830-1000
Analysis of Joint Logistics over the Shore (JLOTS)
Dr Richard Staats, LMI

Analysis of the US Army's Ability to Execute Port Construction
CPT Michael K. Baisden, TRAC-LEE

Readiness Based Sparing/Secondary Item Weapon System Management (RBS/SIWSM)
Jere Engelman, Navy Ships Parts Control Center

Thursday, 1030-1200
Cost-Effective Test and Evaluation Methodology
Leon Jokubaitis, TACOM

Reliability Projection Metrics
Linda Wald, USAMSAA

WG 27 — MANPOWER & PERSONNEL

Chair: **David Rodney, CNA**
Cochairs: **Maj David Clement, USAF AFMPC/DPMYAP**
Judy Curtis, OCNO N-81
Herbert Shukiar, RAND
B. J. Wroblewski, OASA(M&RA)
Advisor: **Ken Martell, CALIBRE Systems, Inc.**
Room: **Michelson Hall - Room 115**

Tuesday, 1030 - 1200

Air Force Recruiting Service Quality Standards
LT Angela Giddings, AFRS/RSOAM, Randolph AFB

Planning Resources Optimization Model
Edward Schmitz & LCDR Valerie Reinert, Navy Recruiting Command

The Compensatory Screening Model
Carl Kannapel & Edward Schmitz, Navy Recruiting Command

Navy Recruiting Command's New Contract Forecast Models
C. E. Kearl & R. W. Sladyk, Navy Recruiting Command

Tuesday, 1330 - 1500

Supply and Demand for Pilots in a Changing Environment
Dr. Harry Thie et. al., RAND

Requirements Analysis and High-level Architecture Definition for ODCSPER Manpower System Re-Design
John Boon Jr. & Capt. Pugh-Newby, Army ODCSPER

Queuing Manpower Model
Capt Jeff Grobman & Capt Dave Quick, Armstrong Labs., Brooks AFB

Documenting Personnel Resources
Col Harry Eng (Ret.) et. al., USA Force Integration Support Agency

Wednesday, 0830 - 1000

Initial Assignments of USAF Academy Graduates Using a Modifed Stable Marriage Algorithm
Maj David La Rivee, AFPOA/DPYO

Navy Job Advertising & Selection System (JASS)
Thuvan Nguyen & Dr. Tim Liang, NPRDC

Optimal Distribution of Army Commissioned Officers
Maj Doug McAllaster, Army PERSCOM

Who is Joint? How many can be Joint? Reevaluating the JDAL
John Schank, RAND

Wednesday, 1030 - 1200

Choosing Force Structures: Modeling Interactions among Wartime requirements, Peacetime Basing Options, and Manpower & Personnel Policies
Craig Moore, Jim Kakalik et. al., RAND

Manpower, Personnel and Training Decision Support -- Status Review
Larry Looper & Lt David Quick, Armstrong Labs., Brooks AFB

Manpower and Personnel Estimation for Automated Information Systems
Dr. Bob Rue & Dr. David Promisel, SRA Corp. & US Army Research Lab.

Military Force Structure and Realignment "Sharpening the Edge through Dynamic Simulation "
MAJ Stephen Parker, USA CAA

Wednesday, 1330 - 1500

COMPOSITE GROUP VI SESSION Michelson 117

Thursday, 0830 - 1000

Using Air Force Total Officer Personnel Projection System (AFTOPS) for Joint Specialty Officer Studies
Dr. Bob Rue & Maj Tom Garin, SRA & AFPOA/DPYO

Insights from Single Source, Steady-State Personnel Inventory Profiles
Maj Tom Garin, AFPOA/DPYO

A Model to Analyze the Effects of a Changing Billet Structure on Army Personnel Policies
Paul Hogan & Minesh Mehta, Lewin - VHI

Officer Career Field Analysis, Issues and Approaches
Capt David McCormick, AFPMC, Randolph AFB

Thursday, 1030 - 1200

Enlisted Attrition, Assumptions & Military Draw-down
Maj David Clement, AFMPC / DPMYAP, Randolph AFB

The Effect of SRB on Army Re-enlistment Rates
Dr. Steve Wilcox, GRC

The Relationship of Manpower and Personnel in the Military Services
B. J. Wroblewski, OASA (M&RA)

Thursday, 1530 - 1700

Equitableness of Treatment in Army Judicial Proceedings
James Connelly, USA CAA

Marine Corps Officer Performance & Promotions
Dr. Jim North, CNA

Champions of Total Quality: Their Competencies, Styles, and Organizational Climate
Dr. Adams-Stroud, Hay Group

The Relationship of Manpower Requirements and Allocations
Bruce Gray, USA FISA

WG 28 — RESOURCE ANALYSIS AND FORECASTING

Chair: **Maj Mark A. Gallagher, OSD PA&E**
Cochairs: **LTC Andrew G. Loerch, CAA**
CDR Barbara Marsh-Jones, NCA
Advisor: **Mr. Daniel P. Barker, OSD PA&E**
Room: **Michelson Hall - Room 116**

Tuesday, 1030-1200 ***Software Costs***

An Empirical Evaluation of Software Cost Models
Dr. Thomas P. Frazier, IDA

Integrated Commercial-Off-The-Shelf Software Implementation
Ms. Evelyn M. Robinson, MITRE

Tuesday, 1330-1500 ***Budget Optimizations***

Application of Mixed-Integer Linear Programming to BRAC 95
Dr. Ronald H. Nickel, CNA

Resource Allocation Issues Based on Complex Joint Analysis
Mr. Van Cunningham, DCSOPS, HQ, DA
Dr. Cy Staniec, OSD PA&E

Value Added Analysis DSS Development -- An Update
LTC Andrew G. Loerch, CAA

Wednesday, 0815-0830 ***Working Group Business***

Nomination of Chair and Cochairs
1996 session topics and presenter suggestions

Wednesday, 0830-1000 ***Peacekeeping Operations and O&S Costs***

Peacekeeping Cost Analysis (PECAN)
Mr. Joel Gordon, CAA

Deployment Cost Model
Mr. Michael D. Nielsen, USD(C)

Resource Implications of Joint Force Packages
Dr. Gregory G. Hildebrant, NPG
Col. Raymond E. Franck, Jr., Joint Military Intelligence College, DIA

Wednesday, 1030-1200 ***Activity Based Costing and Acquisition Reform***

Activity Based Costing (ABC) for DoD Infrastructure
Dr. T. Arthur Smith, Management Analysis, Incorporated

Business Practices and Business Base and Weapon System Costs
Mr. Mike Niggel and Mr. Mike Boito, SAIC

The Impact of Acquisition Reform on Resource Analysis
Mr. David Houdulich, MITRE

Wednesday, 1330-1500

COMPOSITE GROUP VI SESSION Michelson 117

Wednesday, 1530-1700 ***Health, Environment, and Energy Costs***

Military Health Care Costs
Dr. Matthew S. Goldberg, IDA

Planning Environmental Resource Strategy Evolution and Utilization Study
Mr. James J. Connelly, CAA

Synthesizing Energy Worth (SEW)
Dr. Robert J. Schwabauer, CAA

Thursday, 0830-1000 ***Learning Curves***

The Learning Rate's Overpowering Impact on Cost Estimates and How to Diminish It
Dr. Stephen A. Book and Mr. Erik L. Burgess, Aerospace Corporation

Estimating Learning Curve Parameters
Mr. Philip M. Lurie, IDA

Thursday, 1030-1200 ***Business Base Analyses***

Contractor Indirect Costs
Mr. Jack Cloos, IDA

System Design, Development and Production Process Modeling
Mr. Harold E. Rafuse, SAIC

Thursday, 1330-1500 ***Budgeting for Forces***

Thinking about FYDP Reform
Mr. Michael B. Donley and Mr. Ronald Porten, IDA

Defense Program Projection
Mr. Timothy J. Graves, IDA
Dr. R. Royce Kneece, USD(A&T)

Advance Force Costing Methods
Mr. Wayne E. Grant, Management Analysis, Incorporated

Thursday, 1530-1700 ***Program Risk Analysis***
Cost Risk Assessment and Analysis for Weapon and Information Systems
Mr. Morteza Anvari, CEAC

The Development of a Metamodel for a Major Weapon System Cost Model
Capt Paul W. Campbell and Lt Col James S. Shedden, AFIT

WG 29 — READINESS

Chair:	**Mary T. Bonnet, AFSAA/SASM**
Cochair:	**John Tillson, IDA**
	John D. Walsh, OSD, Readiness
Advisor:	**Michael A. Parmentier, OSD**
Room:	**Michelson Hall - Room 120**

Tuesday, 1030 - 1200
Readiness Overview
Michael Parmentier, OSD, Director of Readiness and Training

Assessing the Adequacy of Defense Readiness Funding
Jim Wilson, IDA

Tuesday, 1330 - 1500
A Framework for Resource Analysis
Linda Cavalluzzo and Stan Horowitz, CNA

Joint Tasks, Conditions & Standards: A Foundation for Assessing Joint Readiness
Dr. Michael Wagner, Dynamics Research Corp., LTC Chris Anzalone, Joint Staff/J-7 and Dr. David M. Promisel, USARL

Wednesday, 0830 - 1000
Building a Joint Training Readiness Management and Reporting System
John Tillson, IDA

Concepts for Measuring Joint Readiness
William Buchanan, IDA

Wednesday, 1030 - 1200
Army War Reserve - Decision Support Systems
Robert K. Abercrombie and Richard E. Bell, Martin Marietta Energy Systems

Analysis of America's Readiness-Based Aviation Consolidated Allowance List
Anne J. Hale, CNA

Wednesday, 1330 - 1500
COMPOSITE GROUP VI SESSION Michelson 117

Thursday, 0830 - 1000
A Framework for Assessing Readiness and Relevancy
David E. Thaler, AF/PE

Avoiding a Hollow Navy
Jim Jondrow, Matt Robinson, LCDR Millie Simons, Laura Junor and Ted Cavin, CNA

Thursday, 1030 - 1200
Readiness Baseline Analysis - Hollow Forces
Colvin Halverson, LMI

Equipment/Personnel Readiness Measurements
Colvin Halverson, LMI

WG 30 — DECISION ANALYSIS

Chair:	**Matt Vance, McDonnell Douglas Aerospace**
CoChairs:	**Landon Elswick, NSWC/Carderock Division**
	LCDR Matt Boensel, Office of the CNO, N814E
	Dr. Dick Pariseau, Kapos Associates
	Col Greg Parnell, AFIT/ENS, Dept. of Operational Sciences
Advisor:	**Col Bruce Smith, AF Geophysics Lab**
Room:	**Michelson Hall - Room 118**

Tuesday, 1030-1200
Application of Mixed-Integer Linear Programming to the Base Realignment and Closure (BRAC) '95 Process
Dr. Ron Nickel, Center for Naval Analysis

Army War Reserve-Decision Support System (AWRDSS)
Dr. Robert K. Abercrombie, Martin Mareitta Energy Systems, Inc.

Tuesday, 1330-1500
Counterproliferation Decision Support Methodology
CPT Stan Staffira, Air Force Institute of Technology

Nonnuclear Consumables Annual Analysis (NCAA) Target Values / Priorities
Dennis M. Coulter, ASI Systems International

An Approach to Joint Test of Advanced Weapon Systems
Dr. J.P. Welch, US Army Corps of Engineers

Wednesday, 0830-1000
The Development and Application of the United States Air Force Environmental Technology Priority System (ETPS)
Brian T. Fox, USAF Human Systems Center

Use of Design of Experiments Methodology in the Search for a Halon Replacement Chemical
2LT Todd E. Combs, USAF Wright Labratories

C-17 Paratroop Jump Separation Analysis
Daniel D. Dassow, McDonnell Douglas Aerospace

Wednesday, 1030-1200
A Methodology for Evaluating Joint Task Group Performance
CDR Charlie Morin, USN, Office of the CNO

Educating for Joint Decision Making
CAPT George Conner, USN (Ret.), Naval Postgraduate School

The Use of Decision Analysis in Evaluating Special Operations Forces in Joint Operations
Dr. Kneal Marshall, Naval Postgraduate School

Wednesday, 1330-1500
Integrating Electronic Meeting Support Groupware and Decision Analysis
Freeman Marvin, Larry Hutchison, The Analytic Services Corporation

Decision Analysis with Elicited Audience Participation
Peter Beck, Decision Technology

Thursday, 0830-1000
Evaluating Future Military Space Technologies
Maj Roger Burk, Air Force Institute of Technology

Using Decision Analysis to Support Selection of Science & Technology Initiatives
Landon L. Elswick, Naval Surface Warfare Center/Carderock Division

Optimizing Investment in Science & Technology
Col Bruce Smith, USAF Geophysics Lab

Thursday, 1030-1200
When the Analyst Speaks, Who Listens? What Do They Hear? And What Do They Do With The Results?
Dr. Steven Fought, Naval War College

Responsive Surface Methodology as a Decision Analysis Sensitivity Tool
CPT Dave Meyers, Air Force Institute of Technology

Rank Disagreement: A Comparison of Multi-Criteria Methodologies
MAJ Daniel T. Maxwell, PhD, US Army Concepts Analysis Agency

Thursday, 1530 - 1700
A Methodology for Comparing the Value of Competing AFMC Manpower Allocation Strategies
CPT Sandy Smith, Air Force Institute of Technology

Modeling Corps Artillery in a Theater Level Combat Model
CPT Richard Bowyer, Office of the Army Deputy Chief of Staff

Interactive Selection of Best in Work Group Presentation
Matt Vance, McDonnell Douglas Aerospace

WG 31 — COMPUTING ADVANCES IN MILITARY OPERATIONS RESEARCH

Chair: **MAJ Charles Pate, TRADOC Analysis Center**
Cochair: **CPT David Briggs, University of Florida**
Advisor: **MAJ George Stone, University of Florida**
Room: **Rickover Hall - Room 110**

Tuesday, 1030 - 1200
JLINK - A Distributed Interactive Janus
MAJ Chris Pate, TRAC-Mtry

High Resolution Terrain Representations: An Application in Parallel Processing
Dr. Wolfgang Baer, NPS

High Fidelity Terrain Visualization: Applications to Janus Modeling and Opportunities for Parallelism
Dr. Morris Driels, NPS

Tuesday, 1330-1500
Exploratory Analysis of Combat Using Neural Networks
Oliver Hedgepeth, TRADOC

Joint Munitions Effectiveness Manual CD-ROM
MAJ Edwin Wolfe, DNA/SPSD

Military Force Structure & Realignment Through Dynamic Simulation
MAJ Stephen Parker, CAA

Wednesday, 0830 - 1000
Use of JMEM Data & Programs to Support Service Mission Planning
William Tonkin, NAWC-WD

Re-Engineering Legacy Computer Wargames
CPT Karl Mathias, CADRE

Model Abstraction Techniques for Models with Multiple Levels of Fidelity
Frederick Frantz, Computer Science Corporation

Wednesday, 1030 - 1200
ATPS: An Expert Systems Based Automated Test Planning System
Karen Okagaki, Science Applications International Corporation

Optimizing Airborne Operations Using Hybrid Modeling
CPT David Briggs, USMA

Re-engineering the Target Acquisition Model
David Yonika, Cambridge Research Associates

Wednesday, 1330 - 1500
J-MASS: A Maturing Technology for Modeling and Simulation
William Schoening, McDonnell Douglas Aerospace

Operations Other Than War Modeling: Applications of Decision Making Theory
CPT Neal Lovell, TRAC-Mtry

Thursday, 0830 - 1000
COMPOSITE GROUP VI SESSION Michelson 117

WG 32 — ADVANCED ANALYSIS, TECHNOLOGIES AND APPLICATIONS

Chair: **Mark Axtell, VEDA Incorporated**
Cochair: **Molly McKenna, VEDA Incorporated**
Advisor: **Dr. Roy Rice, Teledyne Brown Engineering**
Room: **Michelson Hall - Room 121**

Tuesday, 1030-1200
Creation of TTD-like Vector Files from ADRG Using Neural Networks
Dr. Niles D. Ritter and Mr. Thomas A. Kreitzberg
Jet Propulsion Labs

A Force Disengagement Model Using Neural Nets And Fuzzy Logic
Mr. Michael Senglaub, Sandia National Labs

Tuesday, 1330-1500
An Improved Heuristic For Intercontinental Ballistic Missile Crew Scheduling
Lt Col James T Moore, AFIT, WPAFB

Solving The Traveling Salesman With The Time Windows Problem Using Tabu Search
LTC William Carlton, University of Texas , Austin

Wednesday 830-1000
Bio-Analytics Applied To Statistical Mission Analysis
Mr. Michael Senglaub, Sandia National Labs

Operations Research Techniques for Neural Networks Training Data Considerations
Capt Lisa M. Belue, Capt Jean M. Steppe, and Lt Col Kenneth W. Bauer, Air Force Institute of Technology

Wednesday 1030-1200
Near-Term Battlefield Combat Identification System (NTBCIS) Survivability
Mr. Thomas E. Maloney, Director, U.S. Material Systems Analysis Activity

Early Entry Force Analysis (EEFA)
CPT Thomas Cioppa, TRAC-SAC, Ft. Leavenworth, KS

Wednesday 1330-1500
A State of the Art Ground Vehicle Signature Characterization Capability at Eglin AFB, FL
Mr. Kirk L. Weeks, TASC, Inc.

Automated RWR Data Reduction
Mr. Vanchon, Sverdrup, Inc.

Maintenance Modernization System
Mr. Robert Abercrombie, Martin Marietta Energy Systems, Inc.

Thursday, 0830 - 1000
COMPOSITE GROUP VI SESSION Michelson 117

Thursday 1030-1200
Military Force Structure and Realignment "Sharpening the Edge"
MAJ Stephen R. Parker, US Army Concepts Analysis Agency

Modeling Control in Computer Simulations
CPT Robert A. Claflin, Studies Directorate, TRAC-SAC

The Effects of Decision Making Quality and Timeliness on the Response Surface of a Simple Combat Simulation
Dr. John B. Gilmer Jr., Wilkes University

Thursday 1530-1700
Computer-Based Instruction
Mr. Robert Abercrombie, Martin Marietta Energy Systems, Inc.

Smart Weapons Operability Enhancement
Dr. James P. Welsh, Joint Test Director, SWOE JT&E

WG 33 — MODELING, SIMULATION AND WARGAMING

Chair: **Major Jude C. Fernan, USA, TRAC-Monterey**
Cochairs: **CDR Jeffrey Kline, USN, OSD-PA&E**
Michael Garrambone, VEDA, Inc
Steve Packard, Martin Marietta Energy Systems
John Winkelman, Martin Marietta Government Electronic Systems
Advisor: **Dr. Sam Parry, NPS**
Room: **Michelson Hall - Room 119**

Tuesday, 1030-1200

Navy Theater Level Model
LCDR Jeffrey R. Cares, Operations Analysis Branch, HQ, UNC; CFC

A Case Study for the Use of Models, Simulations, and Wargames in Support of Joint Training and Joint Training Analysis
Charles J. Venable, VEDA, Inc

Joint Campaign Analysis Using Expert in the Loop Modeling Operations
Dr. Robert C. Powers, Global Associates, LTD

Tuesday, 1330-1500

VULCAN's FORGE: How to use a technology game to develop revolutionary solutions to counter-proliferation problems
Lt Col Roy Griggs, HQ USAF/XOXP

The Use of Modeling and Simulation in Educational Wargaming
Major Michael J. Loftus, Air Force Wargaming Institute

Use of Modeling and Simulation in Joint Analysis of Joint Operations
William P. Leavenworth, SAIC

Wednesday, 0830-1000

Developing the Data Inputs Required for Modeling and Simulation
Dr. Susan Marquis, IMAG, OSD PA&E

Building the Synthetic Environment
Keith Carson, TRADOC

VIVA LA VV&A! or Verification, Validation, and Accreditation (VV&A) Efforts and Objectives under the DoD Modeling and Simulation Master Plan
Priscilla Vanderpool Glasow, SAIC

Wednesday, 1030-1200

Janus Analysis of Added Value of Unmanned Vehicles
MAJ Rocky Gay, USMA

Determining the Implications of Unexploded Ordnance (UXO) on the Battlefield Using a Minefield Effectiveness Model
David H Eimer, AMSAA

Modeling and Simulation in Support of the Sensor Fuzed Weapon Cost and Operational Effectiveness Analyses
Robert L Sarno, VEDA, Inc. and Michael W. Garrambone, VEDA, Inc.

Wednesday, 1330-1500

Parametric Study of Warhead Pk verses CEP for Surface-to-Air Missile (SAM) Targets
James B. Flint, 46 OG/OGML

J-MASS: A Maturing Technology for Modeling and Simulation
William W. Schoening, McDonnell Douglas Aerospace
Capt Philip Lienert, J-MASS Program Officer

A State-of-the-Art Ground Vehicle Signature Characterization Capability at Eglin AFB, FL
Kirk L. Weeks. TASC

Thursday, 0830-1000

COMPOSITE GROUP VII ..... Michelson 117

Thursday, 1030-1200

Some MOEs and Modeling Techniques used to evaluate proposed AEGIS AAW System Improvements
Peter N. Bishop, Martin Marietta Government Electronics System

Modeling Psycho-Social Attributes in Conflict
Dean S. Hartley III, Martin Marietta Energy Systems

Credible Uses of DIS for Analysis
LTC Pat Vye, RAND

Thursday, 1530-1700

The Effects of Decisionmaking Quality and Timeliness on the Response Surface of a Simple Combat Simulation
John B. Gilmer Jr., Wilkes University

The Simulation for Prediction of Availability and Reliability of Complex Systems SPARCS
Alan Davis, BDM Federal, Inc.

Pleiades: A Hybrid Simulation Architecture for Mission Effectiveness Analysis
Dr. Steven B. Hall, Lockheed Martin

MORS Office

MORS will have an office at USNA during the 63rd MORSS. It will be located in Room 104, Rickover Hall. The office will be open on Monday, 5 June, 0830-1730; on 6, 7, 8 June, 0700-1730. The telephone and FAX numbers for the MORS office at USNA are 410-293-4351; DSN 281-; FAX 410-293-4350; DSN 281-.

Bus Transportation from the Pentagon to USNA

Buses will run from the South Pentagon Parking lot to Annapolis each morning and back each evening. The cost is $15.00 round trip per day or $10.00 one way. Tickets must be purchased in advance from the MORS office or purchased at the bus stop on June 6 - 7 from a MORS representative. The morning schedule will allow working group chairs and co-chairs to arrive at USNA in time for early meetings. The bus schedule is listed below.

Bus Transportation from the Pentagon to USNA

	Pentagon South Parking Departure	USNA Arrival	USNA Departure	Pentagon South Parking Arrival
TUESDAY	0550	0650	1715 - Alumni	1815
	0630	0730	1900 - Alumni	2000
WEDNESDAY	0550	0650	1715- Rickover	1815
	0630	0730	2030- Dahlgren	2130
THURSDAY	0615	0715	1315- Dahlgren	1415
	0645	0745	1515- Rickover	1615
			1715- Rickover	1815

Alumni Hall pick-up/departure location = Main entrance of Alumni Hall

Rickover Hall pick-up/departure location = Rear lab deck (ground level) entrance on Holloway Road

Dahlgren Hall pick-up/departure location = Seaward entrance (on Cooper Road)

Bus Transportation from Hotels to USNA and back

	Bus 1 Pickup from Loews, Maryland Inn to USNA	Bus 2 Pick-up from Marriott, Days Inn to USNA	Bus 3 Pickup from Holiday, Wyndham to USNA	DEPARTURE from USNA to listed hotels
TUESDAY	0630	0630	0630	1715 - Rickover Hall
	0730	0730	0730	
	0830	0830	0830	1900 - Alumni Hall
WEDNESDAY	0630	0630	0630	1715 - Rickover Hall
	0730	0730	0730	
	0830	0830	0830	2030 - Dahlgren Hall
THURSDAY	0630	0630	0630	1315 - Dahlgren Hall
	0730	0730	0730	1515 -Rickover Hall
	0830	0830	0830	1715 - Rickover Hall

Statements of Non-availability

USNA billeting office WILL NOT provide blanket non-availability for personnel attending the symposium. If personnel wish to stay in the MORS hotels, they need to get special authorization to NOT use government quarters annotated in block 16 of their DD Form 1610. See disclaimer under **Government Quarters.**

Government Quarters

MORS has been advised by the USNA Bachelor Officer's Quarters (BOQ) office that government quarters and messing are not available. Further they have advised us that to accommodate this constraint, orders should specify Annapolis, MD as the TDY destination, with the following disclaimer provided in Block 16 of DD Form 1610: *"Use of Government facilities would adversely affect the performance of the assigned mission."* Placing USNA as the TDY destination would require the BOQ office to issue a nonavailability number. In the event your command's travel office insists upon annotating USNA as the TDY destination or requires a Certificate of Non-Availability, you may obtain one by calling the BOQ at 410-293-3906/2024 or DSN 281-3906/2024 from 45 days in advance of TDY commencement to 7 days following TDY completion. Should no one be available to answer your call, the voice mail will answer the telephone. Leave a message stating that you are attending the MORS conference and need a Certificiate of Non-Availability. Also leave your name, rank, date of TDY as annotated on your orders, command name, command telephone and FAX numbers. The Certificate will be faxed to you at your command FAX.

Lost and Found

The Lost and Found will be in the MORS office, Room 104, Rickover Hall during the Symposium. Lost and Found items not claimed at the end of the Symposium will be left with the host facility.

Mixer

There will be an informal mixer at Alumni Hall on Tuesday evening, 6 June, from 1715-1900. There will be a cash bar. Transportation will be provided back to the hotels and to the Pentagon before and after the mixer.

Banquet

On Wednesday evening from 1730 - 2030, MORS will hold a banquet, with speaker, at Dahlgren Hall. A social hour will begin at 1730 with dinner at 1830. **Maj Gen George Muellner**, USAF, Joint Advanced Strike Technology Program has been invited to speak.

The cost is $21.00 per person. A few tickets are still available and may be purchased in the MORS office. A cash bar will be provided. Transportation will be provided to the hotels and to the Pentagon before and after the dinner.

Lunches

The following facilities are available within walking distance.

- The Officer's Club
- The Drydock at Dahlgren Hall (see menus on pages 47 - 49)
- Many restaurants outside Gates 1 and 3
- Box lunches will be available for those attending tutorials on Tuesday and Wednesday. The cost is $8.00 each. Tickets for Wednesday box lunches will be sold on Tuesday (NLT 1400) at registration and in the MORS office, Room 104, Rickover Hall.

- **Thursday Luncheon with speaker**. There will be a sit-down luncheon on Thursday, 1200-1330, at Dahlgren Hall. **MG Robert Howard,** Director, Army Budget, has been invited to speak. The cost is **$15.00**.

Coffee

Coffee and snacks will be provided without additional charge. Coffee will be served at the following times:

Tuesday	0700-0830	1500-1530
Wednesday	0730-0830	1500-1530
Thursday	0730-0830	1500-1530

Designated Smoking Areas

Smoking is NOT permitted in any of the US Naval Academy complex buildings. Smoking is permitted outside buildings (Rickover, Michelson, Chauvenet Halls) on the ground/lab decks only. No smoking is permitted on the terraces.

VIP Parking

MORS attendees possessing a MORS VIP Pass may park in the MORS VIP lot located between the Library and Rickover Hall on McNair Road. On Tuesday additional VIP parking will be available in the first row of the Alumni Hall parking lot located across from the Alumni Hall main entrance on Decatur Road.

General MORS Parking

MORS attendees may park in parking spaces along Sims Road and in spaces reserved for midshipmen. After 0900, attendees may park in ANY unreserved parking space. Do NOT park in any space with a red curb or otherwise reserved/posted.

MORS Sales

MORS publications (*Military OR Analysts Handbook*, mini-symposium and workshop proceedings) and 63rd MORSS memorabilia (coffee mugs and T-shirts) will be available for sale throughout the

Symposium in the area outside the MORS office (Rickover 104).

Naval Academy Visitor Center

Open 0900 - 1700 daily. The Visitor Center houses an extensive USNA memorabilia Gift Shop, a snack bar, and information and guide service. A 15 minute movie about life at the Academy is played continuously.

- ***Guided Tours***: 90 minute guided tours of the Academy Complex are offered every half hour by signing up at the tour desk. Tours are $5.00/adult, $4.00/senior citizens, $3.00/students, preschool children are free. Guided tours are available Monday - Saturday 0930 - 1530 and on Sundays 1230 - 1530. For more information call 410-293-3363.

US Naval Academy Museum

Located in Preble Hall, the Museum's holdings include ship models, paintings, prints, flags, uniforms, swords, firearms, medals, sculptures, manuscripts, rare books, photographs, ship instruments and gear, and a wide variety of personal memorabilia. Specific exhibits include: the 150th Anniversary of the Naval Academy display, Class of 1951 Gallery of Ships, and the ship bone model collection (one of the largest in the world). Temporarily on exhibit: the Soviet Space Exhibit and 4 Oscars awarded to John Ford for *The Quiet Man*, *Informer*, *Battle of Midway*, and a Documentary on the Japanese attack on Pearl Harbor. Museum hours are Monday - Saturday 0900 - 1700 and Sunday 1100 - 1700. For more information call 410-263-2108.

US Naval Institute Bookstore

All US Naval Institute Press books, other institute insignia items as well as numerous books, bookmarks, mugs, etc., sporting nautical or sea history themes are available. Open Monday - Saturday 0900 - 1700 and Sunday 1100 - 1700. Located on the ground floor Preble Hall (adjacent to the Museum's Gallery of Ships). For more information call 410-268-6110 or on weekends 410-268-6112.

US Naval Academy: 150 years in Annapolis Documentary

The 62 minute documentary celebrates the Academy's 150 years of Leadership, Service and Knowledge with a vision for the future. The video may be viewed Tuesday through Thursday, 6-8 June in R243 or M113 at the following times: 0835, 1030, 1215, 1330 and 1530.

Yard Patrol Craft

The 108-foot yard parol craft (YP) training vessel is one of the Academy's afloat laboratories used to teach midshipmen fundamentals of seamanship, navigation naval operations in preparation for the fleet. YPs will be available for tours on Tuesday and Wednesdy, 6-7 June, 1200-1330 behind Rickover Hall along Dewey Seawall on Sims Road.

Marina

The Naval Station Marina (Building 338) has several Boston Whalers and Rainbow sailboats available for check out (rent) by active duty military, retirees or government employees, 0900 - 1700 daily.

- ***Boston Whaler*** (if born < 1972 must attend the Navy Boat Safety Class at marina [approx. 1 hour]). If born > 1972, must hold a Safe Boater Certificate). 15'-- $15.00/hr; 20' -- $16.00/hr

- ***Rainbow Sailboats*** require 2 adults (one must have a "B" qualification). Weekends -- $9.00/hr; Weekdays -- $7.00/hr.

For more information/reservations (up to 5 days in advance) call Ed Beck at 410-293-3731.

MacDonough Hall

Nautilus machines, free standing weights, lifecycles, stair climbers, racquet ball courts, basketball courts, swimming pool, and showers are available for use by MORS attendees 5 - 9 June from 1100 - 2000 weekdays and 1100 - 1830 weekends. MacDonough Hall is located at the Naval Academy on the seaward side of Chauvenet Hall.

Golf

MORSS attendees may use the Naval Academy Golf Course 4 - 10 June. Be sure to identify yourself as a MORSS attendee when calling for tee times.

- ***Tee times***: Reservations may be made up to one week in advance by calling **410-757-2022** between 1700 - 1900 only.

- ***Fees:*** Green fees will be the same as those who are permitted to play as non-members.

- ***Attire:*** Each golfer should have their own set of clubs (a VERY limited number are available for rent) with a bag, a shirt with a collar, golf shoes or flat-soled tennis shoes, and if wearing shorts they must be Bermuda length.

- ***Location:*** The golf course is located on 64 Greenbury Point, near the Naval Station Annapolis. Point of contact at the Golf Course is the Pro and Coach, Mr. Pat Owens, 410-757-3544 (DO NOT call this number for tee times!!!).

Vending Machines

Vending machines are available in the following locations:

- *Rickover Hall*
  - Lab Deck (near service entrance/MORSS Bus Stop): soda, juice, snacks, food, microwave, cigarettes, dollar bill changer.
  - 2nd Deck (outside Student Lounge Room 247): soda and snacks.
  - 3rd Deck (Room 333a): soda and snacks.
- *Michelson Hall*
  - 3rd Deck (Science Wardroom, Room 352): soda and snacks.
- *Chauvenet Hall*
  - 3rd Deck (Math Wardroom, Room 354): soda and snacks.

To obtain change for a one dollar bill from the vending machines when the dollar changer is empty or not available:

- Put a one dollar bill in the snack machine.
- After the machine recognizes the dollar amount, push and hold the coin return button. The machine will dispense one dollar in coins.

Telephones

Ten Class "G" telephones are available in the Student Lounge, Rickover 247. Each phone has DSN/AUTOVON, DC, Baltimore and local lines.

Dialing Instructions:

- LOCAL CALL (410 area code/Annapolis) = 9 + number;
- DSN/AUTOVON = 8 + number;
- NAVAL ACADEMY = 3 + four digit extension
- WASHINGTON/BALTIMORE (703/301/202 & SOME 410) = 9 + 1 + area code + number;
- LONG DISTANCE ACCESS CODES:
  - AT&T = 9 + 1-800-CALL-ATT
  - MCI = Use the 1-800 number on back of calling card (call 9 + 1-800-444-3333, customer service if you do not know your specific access number)
  - US SPRINT = 9 + 1-800-877-8000 (customer service 9 + 1-800-755-8722).

Security Matters

Attendees are reminded of the necessity for continuing attention to security precautions. While every effort will be made to provide a secure facility for the meeting and to insure that attendees are properly identified, cleared, and in possession of the required need-to-know, all are reminded that the responsibility for the unauthorized disclosure, particularly with regard to conversations, rests with the individual attendee.

Attendees are requested to keep in mind the following important points:

1. Be careful WHERE you make classified disclosures. Do not extend classified discussion to hotels, restaurants, officers' clubs, or other places in which you are unable to positively identify all within hearing distance and be reassured of the nonexistence of eavesdropping devices.

2. Be careful TO WHOM you make classified disclosures. You should assure yourself that the people to whom you are talking are indeed registrants at the 63rd MORSS. You are advised that a uniformed or civilian person located away from the restricted area of the meeting and not personally recognized as a registrant does not have authorized access to classified information, regardless of his possession of a MORS name badge.

3. The attention of non-government attendees is invited to the National Industrial Security Program Operating Manual (NISPOM), Chapter 5, Section 5, with regard to disclosure authorizations.

4. Attendees are advised that possession of photographic, audio recording or electronic transmitting devices is not authorized in the meeting spaces of the 63rd MORSS.

Admission Policy

Admission to the secure area of the meeting is limited to holders of current printed invitations properly authenticated and issued by the MORS office to the named individual for his attendance at the 63rd MORSS.

Persons who enter or attempt to enter the secure area of the meeting without proper invitation and persons who aid, encourage, or willfully permit improperly authorized persons to enter the secure area of the meeting are liable for citation for security violation.

Invitations

The only admissible invitation is the official 63rd MORSS Invitation issued by the MORS Office. Other invitations, including official invitations for earlier MORSS, are inadmissible. There is no provision for one-session-only invitations and MORS has no obligation to issue invitations after the announced deadline or to work out invitations for persons who arrive uninvited at the meeting. ***Invitations must be brought to the meeting. They are required for registration.***

Restricted Meeting Areas

Those portions of the meeting area lying inside of the posted guards are designated restricted meeting areas for the 63rd MORSS. All classified presentations and discussions in connection with the MORSS program are

to be conducted inside this area. Only the following persons are permitted access to MORS meeting areas:

- Officially invited 63rd MORSS attendees with appropriate MORS-issued name badges and approved ID cards;
- MORS staff and service personnel with appropriate MORS-issued name badges and approved ID cards;
- Members of the 63rd MORSS guard force;
- Officials representing the host command on official business.

Entry to the Meeting Areas

Entry to the restricted meeting areas will be regulated by the guard force and working group chairs and cochairs.

At each entry to the meeting area, each attendee will be required to stop long enough to show his properly validated 63rd MORSS name badge and his identification and to be recognized by the guards. The name badge and ID card MUST be displayed at all times within the restricted meeting area. The guards or working group chairs and cochairs will check the following before admitting an attendee to the classified area:

- The validity of the ID card
- The validity of the name badge
- The correspondence of face and ID picture
- The correspondence of name on badge and ID card.

So that the ID check can be accomplished speedily, name badges and ID cards must be displayed together in the MORS name badge holder.

Picture ID Cards

All attendees in the restricted meeting areas are required to display their ID cards in the MORS badge holders along with their name badges. Only two types of ID cards are permissible: the active duty military ID card and the ID card issued by MORS. The MORS-issued ID cards will be delivered to the attendees when they register. It is important that the attendee return the card to the MORS office when leaving the meeting. Otherwise, the attendee will have to obtain a new ID card for subsequent MORSS.

MORS Name Badges

A MORS name badge is issued to each properly registered attendee, along with a plastic pouch for its display and MUST be visibly worn at all times while in the secure areas. Attendees should take care that the badge is not lost or loaned during the meeting as these are avenues for improper entry and security violations. Badges should not be changed, corrected, or altered in any way. If such action is necessary, a member of the MORS staff will issue and authenticate a new badge at the MORS Office, Room 104, Rickover Hall.

Note Taking

Classified presentations shall be delivered orally and/or visually. Classified documents shall not be distributed and classified note-taking and electronic recordings shall not be permitted by attendees during classified presentations.

Classified Matter --Transmittal

Classified matter transmitted by mail may be picked up in the MORS office upon presentation of MORS credentials, after 1000 on Tuesday, 6 June 1995.

When no longer needed for the Symposium, attendees may bring their classified material to the MORS office to be wrapped for hand carry or transmittal to their parent activity. ***The attendee is responsible for providing a letter of transmittal to be included in the package.*** The meeting security staff will be responsible for proper wrapping and marking of inner and outer envelopes in accordance with Navy security regulations. The address for classified mail shown on the attendee's personal security voucher will be used for mailing purposes. MORS will accept responsibility for mailing a properly wrapped and sealed package by registered mail and will provide the attendee with a receipt for the sealed package. Because of congestion, MORS staff will not be able to wrap packages during the breaks between sessions.

Classified Matter—Overnight Storage

The MORS office will accept (until 15 minutes after the end of the last session) and safeguard (for the meeting duration) classified matter to the level of SECRET. Material will be accepted as a package rather than loose. Receipts must be presented on recovery of material by its holder. The MORS office staff is cleared to the SECRET level.

Classified Matter—Late Arrival

There are NO facilities for receiving classified matter after hours at the Naval Academy. Courier carrying of classified materials to US Naval Academy is **strongly** discouraged.

In the event that you will be arriving after MORS office hours and need to store classified material, you must make *PRIOR* arrangements with the MORS Security Manager at 703-751-7290 or the USNA Security Manager at 410-293-2188.

Classified Disclosure

Persons participating in the discussions at the 63rd MORSS have been granted limited disclosure authorization via their personal security vouchers for the 63rd MORSS. It is the individual responsibility of each participant to find out in advance, from his certifying official, the limits to his own classified disclosures and to stay within those limits at the symposium.

A written disclosure authorization is required for all papers and presentations (government and contractor). All disclosure authorizations must be forwarded to the MORS Security Manager. If the disclosure authorization is not received by MORS prior to the symposium, the presentation will be canceled.

David Rist and Barchi Prize Awards

MORS offers two prizes for best papers—the ***Barchi Prize*** and the ***Rist Prize***. The ***Rist Prize*** is awarded to the best paper in military operations research submitted in response to an announcement and call for papers. The ***Barchi Prize*** will be awarded to the best paper from the entire symposium, including Working Groups, Composite Groups, and General and Special Sessions.

David Rist Prize: Papers submitted in response to the announcement and call for papers will be eligible for consideration for the *Rist Prize*. The committee will select the prize-winning paper from those submitted and award the prize at the 64th MORSS. If selected, the author(s) will be invited to present the paper at the 64th MORSS and to prepare it for consideration for publication in the MORS Journal, *Military Operations Research*. The cash prize is $1000.

Richard H. Barchi Prize: Author(s) of those papers selected as the best paper from their respective Working Group or Composite Group, and those of the Special Sessions at the 63rd MORSS will be invited to submit the paper for consideration for the Barchi Prize. The committee will select the prize-winning paper from among those presented and submitted. The prize will be presented at the 63rd MORSS. The cash prize is $1000.

MORS Purposes and Objectives

The purpose of the Military Operations Research Society is to enhance the quality and effectiveness of classified and unclassified military operations research. To accomplish this purpose, the Society provides media for professional exchange and peer criticism among students, theoreticians, practitioners, and users of military operations research. These media consist primarily of the traditional annual MORS symposia (classified), their published proceedings, special mini-symposia, workshops, colloquia and special purpose monographs. The forum provided by these media is directed to display the state of the art, to encourage consistent professional quality, to stimulate communication and interaction between practitioners and users, and to foster the interest and development of students of operations research. In performing its function, the Military Operations Research Society does not make or advocate official policy nor does it attempt to influence the formulation of policy. Matters discussed or statements made during the course of its symposia or printed in its publications represent the positions of the individual participants and authors and not of the Society.

The Military Operations Research Society is operated by a Board of Directors consisting of 30 members, 28 of whom are elected by vote of the Board to serve a term of four years. The persons nominated for this election are normally individuals who have attained recognition and prominence in the field of military operations research and who have demonstrated an active interest in its programs and activities. The remaining two members of the Board of Directors are the Past President who serves by right and the Executive Director who serves as a consequence of his position. A limited number of Advisory Directors are appointed from time to time, for a 1-year term, to perform some particular function. In addition to the members, the Society maintains a general distribution list of its clientele to whom announcements, newsletters, and information are routinely sent.

The MORS Board of Directors wants to make the meetings and other operations of the Society as responsive as possible, both to the needs of the times and the desires of the members. Consequently, attendees are invited to communicate their relevant ideas and thoughts to any Officer or other Director or to the Society in writing. Where practicable, your communications will be duplicated and furnished to the MORS Board Members and Program Chairs for guidance in respect to future plans and operations.

The following are particularly encouraged:

- Offers of help in future symposium programs and working groups.
- Proposals for establishing new working groups.
- Suggestions for future banquet speakers, keynote speakers, meeting themes, meeting sites, arrangement improvements.
- Criticism of current operations or programs.

The Society will consider all comments, suggestions, and proposals.

Society Organization

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DRYDOCK RESTAURANT

OPEN:

MON - FRI 8:00 - 10:00 A.M
SAT - SUN 8:00 - 11:00 A.M.

BREAKFAST MENU:

DRYDOCK PLATTER - 2 EGGS, HAM, BACON, OR SAUSAGE, HASH BROWN POTATOES, TOAST & JELLY.....2.95

CHEESE OMELETTE, HASH BROWNS & TOAST.....3.00
HAM & CHEESE OMELETTE, HASH BROWNS & TOAST.....3.75
FRENCH TOAST W/OLEO & SYRUP, BACON, HAM OR SAUSAGE.....3.20
PANCAKES.....1.75
PANCAKES, BACON, HAM, OR SAUSAGE.....3.00
SAUSAGE & CHEESE OMELETTE.....3.75
WESTERN OMELETTE.....3.75
FRENCH TOAST W/OLEO & SYRUP.....1.95

BREAKFAST SANDWICH

EGG SANDWICH.....1.50
EGG SANDWICH W/SAUSAGE, BACON, OR HAM.....2.75

******CHEESE $.20 EXTRA****** TOMATO $.25 EXTRA******
BAGEL OR KAISER ROLL $.50 EXTRA

SIDE ORDERS:

HASH BROWNS.....0.90 TOAST.....0.50
BAGEL.....1.00 ONE EGG.....0.50
HAM, BACON, SAUSAGE....1.25 ASSORTED MUFFINS.....1.25
ASSORTED COLD CEREALS..1.00

DRINKS:

SPECIALTY COFFEES.....0.75
COFFEE, HOT TEA, HOT CHOCOLATE.....0.55
CRANBERRY, ORANGE JUICE OR APPLE JUICE..10 OZ...1.00
CRANBERRY, ORANGE JUICE OR APPLE JUICE..16 OZ...1.60
CRANBERRY, ORANGE JUICE OR APPLE JUICE..24 OZ...2.40
CRANBERRY, ORANGE JUICE OR APPLE JUICE..32 OZ...3.20
MILK.....0.60

DRYDOCK RESTAURANT

JUNE 1995

(PHONE ORDERS FOR LUNCH - 10:30 A.M. - 11:30 A.M.)

263-6210

OPEN: 7 DAYS A WEEK.....8:00 A.M. - 3:00 P.M.

(THE GRILL CLOSES AT 3:00 P.M. DAILY)

SPECIAL OF THE MONTH: MEATBALL SUB & 24 OZ SODA OR ICED TEA.....$2.95

SOUP

SOUP OF THE DAY.....CUP....$1.50.....BOWL.....$2.20
CHILI.....CUP....$1.75.....BOWL.....$2.50

TRY OUR HOMEMADE CROUTONS AND CHEESE WITH YOUR CHILI.....$ .25

SPECIAL OF THE DAY

MONDAY: MEATBALL SUB & 24 OZ SODA OR ICED TEA.....$2.95
TUESDAY: CUP OF SOUP, TOSSED SALAD & 24 OZ. SODA OR ICED TEA..... $3.25
WEDNESDAY: 2 HOT DOGS, F.F. & 24 OZ. SODA OR ICED TEA.....$3.25
THURSDAY: PORK BBQ SANDWICH, COLE SLAW & F.F.& 24 OZ. SODA OR TEA.....$3.25
FRIDAY: TUNA SALAD SANWICH & 24 OZ. SODA OR ICE TEA.....$3.25

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ROLLS, CHEESE, AND TOMATO SLICES AVAILABLE ON SPECIALS FOR AN ADDITIONAL CHARGE.

****

FRESH SALADS

TOSSED SALAD WITH YOUR CHOICE OF DRESSING.....$1.70
(ADDITIONAL SALAD DRESSING: $.50 EACH)

TUNA SALAD.....$2.95 SHRIMP SALAD....$3.75
CHICKEN SALAD...$3.25 CHEF SALAD.....$2.50

SERVED ON A BED OF ICEBERG LETTUCE WITH FRESH TOMATO SLICES, COMPLETE WITH A PICKLE.

DELI SANDWICHES

CORNED BEEF.....$2.75
COLD CUT SUB.....$2.95
TURKEY CLUB.....$3.75
TURKEY&HAM CLUB..$3.75
ROAST BEEF.....$2.95
CHEESE SAND.....$1.60
TURKEY.....$2.75
CHICKEN SALAD...$3.00
TUNA FISH.....$2.75
HAM.....$2.75
BLT.....$2.75
EGG SALAD.....$1.65
SHRIMP SALAD...$3.50

CHEESE $.25 EXTRA...TOMATO $.25 EXTRA...BACON $1.25 EXTRA...ROLLS $.50 EXTRA

SANDWICHES FROM OUR GRILL

HAMBURGER.....$1.50	BACON CHEESEBURGER.....$2.95
DOUBLE HAMBURGER.....$2.50	CHICKEN PATTY.....$2.50
CHEESEBURGER.....$1.70	HOTDOG.....$1.00
DOUBLE CHEESEBURGER..$2.95	GRILLED CHEESE.....$1.60
FISH FILET SANDWICH..$2.50	CRABCAKE SANDWICH.....$3.25
VEGGIE BURGER.....$2.95	

HOT SUBMARINE SANDWICHES

FISH FILET SUB.....$3.95	PHILLY STEAK SUB.....$3.25
HAMBURGER SUB.....$2.70	PHILLY STEAK & CHEESE....$3.50
CHICKEN PATTY SUB....$4.25	CHEESEBURGER SUB.....$3.00

CHEESE..$.25 EXTRA BACON..$1.25 EXTRA TOMATO..$.25 EXTRA

SPECIALTY PLATTERS

SOUTHERN FRIED BONELESS CHICKEN BREAST & F.F.....$4.25
4 FISH 'N CHIPS.....$2.95

PIZZA BY THE PIE

MEDIUM CHEESE PIZZA.....$4.50	EXTRA TOPPINGS.....$.50 EACH
LARGE CHEESE PIZZA.....$6.00	EXTRA TOPPINGS.....$.75 EACH

ADDITIONAL TOPPINGS INCLUDE: GREEN PEPPERS, ONIONS, MUSHROOMS, HAM, PEPPERONI, ITALIAN SAUSAGE, DICED TOMATOES, HOT PEPPERS AND BLACK OLIVES

SPECIALTY PIZZA

MEDIUM SPECIALTY PIZZA....$6.00	EXTRA TOPPINGS.....$.50 EACH
LARGE SPECIALTY PIZZA.... $8.25	EXTRA TOPPINGS.....$.75 EACH

ITALIAN WHITE, SPICY CHICKEN, HAWAIIAN, TACO AND VEGGIE PIZZA

SAMPLER PIZZA

MEDIUM SAMPLER PIZZA.....$6.75 LARGE SAMPLER PIZZA....$9.25

INCLUDES HAM, ONIONS, PEPPERONI, SAUSAGE, GREEN PEPPERS MUSHROOMS AND TOMATOES

PIZZA BY THE SLICE.....$1.00

PIZZA BY THE PIE CAN BE PRE-ORDERED FOR LUNCH. ORDERS CAN BE PLACED BETWEEN 8:00 A.M. - 11:30 A.M.
FOR A LARGE ORDER OF PIZZAS, WE NEED 24 HOURS NOTICE.

WG 1 — STRATEGIC OPERATIONS - ABSTRACTS

Chair: **Lt Col Rick Paulsen, Joint Staff/J-8**
Cochair: **MAJ Rick Yaw, USSTRATCOM/J533**
Advisor: **Kerry Kelley, USSTRATCOM/J533**
Room: **Rickover Hall - Room 209**

Tuesday, 1030-1200

Capt Lynne Baldrighi
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Future Strategic Force Structure

Approved abstract not available at printing.

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Strategic Futures II

Approved abstract not available at printing.

Tuesday, 1330-1500

COMPOSITE GROUP I SESSION . . . Rickover 103

Wednesday, 0830-1000

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Airborne Dust Reduction Through Tactical Changes in Weapon Employment

Real world experience suggests that airborne dust and debris can have a hazardous effect on air breathing aircraft. A nuclear exchange might produce this type of hazardous environment. Logically, this environment might prevent some friendly weapons from arriving over target. In order to prevent this possible attrition, there needs to be a reduction in the overall amount of dust lofted-up without adversely effecting the expected Probability of Damage (PD).

I completed a statistical study researching the potential amount of dust reduction possible through changing employment characteristics of the weapons while holding the change in PD for the weapon and target pair to a set maximum value. In short, the goal was to find out if macro-guidance given to weapon planners was having an inadvertent effect of causing greater amounts of airborne dust and debris to be generated.

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A Joint and Common Formalism for Analyzing Problems in Nuclear Survivability and Targeting

Approved abstract not available at printing.

Wednesday, 1030-1200

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An Improved Solution Methodology for the Arsenal Exchange Model (AEM)

The Arsenal Exchange Model (AEM) allocates weapons to targets using linear programs (LP) formulated by the model. In creating the LPs, the AEM generates weapon constraints, target constraints, and goal or hedge constraints. The current solution method uses a revised simplex algorithm to determine an optimal solution. In order to use this methodology, some of the original constraints are modified. Also, the current algorithm uses a computationally slow matrix inverter which introduces precision error and increases the overall solution time. The improved methodology uses a revised simplex algorithm to first solve a subproblem having only the weapon constraints generated by AEM. Given this optimal allocation, hedge constraints that are violated by the current solution are added to the original subproblem. A dual simplex algorithm is used to find the optimal solution for this new subproblem. By only adding the violated constraints, redundant and identical constraints are not included in any of the subproblems. This eliminates the need to alter the problem as before, and also allows the use of a faster, state of the art, matrix inverter. Additionally, since fewer constraints are used to find the overall optimal solution, fewer computations are necessary. This solution methodology was used to solve five test cases. In four of the five test cases, the improved solution methodology produced an optimal integer solution. In all five test cases, it maintained damage expectancy and target coverage, and its solution achieved higher goal satisfaction than the current method.

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ICBM Contributions to the TRIAD in Delayed Response Scenarios

The Global Deterrence Branch of the Air Force Studies and Analyses Agency (AFSAA) conducted this study at the request of the Air Force Chief of Staff during the OSD Nuclear Posture Review (NPR). AFSAA analyzed the role of ICBMs in the U.S. strategic nuclear TRIAD in delayed response scenarios assuming START II treaty implementation. The analysts used the Arsenal Exchange Model (AEM) to compare coverage of various U.S. strategic force structures being discussed in the NPR. The analysis of target coverage highlighted ICBM contributions and demonstrated the importance of bomber forces to the TRIAD, especially in light of the current 2-MRC strategy. AFSAA again used AEM to examine U.S. ICBM force survivability and damage to the overall U.S. target base as a function of the number of ICBMs in the U.S. inventory. The study also measured the effects of reductions in U.S. ICBMs with regard to enemy warplanning and targeting considerations. The study observed that ICBMs significantly contribute to U.S. target coverage, especially when other forces are not fully generated; that ICBMs are highly cost efficient across the spectrum of generation levels; and that reducing the number of U.S. ICBMs increases an enemy's targeting flexibility and increases the risk of damage to other U.S. targets.

Wednesday, 1330-1500

Ron Crutchfield
Lockheed Missiles and Space Co, Inc.

Geopolitical Developments in the Early 21st Century and Possible Implications for the SLBM

Approved abstract not available at printing.

Kurt T. Brintzenhofe
The John Hopkins University Applied Physics Laboratory

Semi-Quantitative Approach to Deterrence

Deterrence is an evolving concept that has taken on greater importance in the past few years with the transition from a bi-polar to multi-polar threat environment. Since deterring a crisis or conflict is preferable to becoming militarily involved on the ground, sea, or air, the challenge to our military is to identify systems or technologies to invest in for the future that enhance its capability to deter crises or conflicts over a broad spectrum of scenarios. The major obstacle in identifying deterrent enhancing systems and technologies is the current inability to quantitatively evaluate deterrent action effectiveness. This paper proposes a broader definition of deterrence than is traditionally used. Under this proposed definition a structure and methodology are introduced that may have eventual application in the identification and semi-quantitative evaluation of scenario dependent deterrent actions. The approach taken requires consideration of underlying factors supporting specific perceived threats and the interrelationships that these factors might have with other seemingly unrelated or undetected potential threats.

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Reconstituting U.S. Nuclear Capabilities - An Assessment of Major Variables

In this paper, we will discuss options for preserving high confidence deterrence despite decreasing budgets and weakened infrastructure. Further, identify options for rapidly restoring, reconstituting, or innovatively augmenting U.S. deterrent capability should future need arise.

In response to major changes in worldwide geopolitical alignment, continuing arms control initiatives, and budget driven force reductions, the U.S. has lowered its capability in nearly every area related to strategic nuclear forces. The U.S. has completed over 90% of reductions under START I, even though that agreement has not been implemented, is programmatically reducing to START II levels by 2003, even though START II is not ratified. In contrast, Russia is only 5% complete in START I reductions and suffers from a variety of instabilities in both its government composition and objectives of government. The relative imbalance in reductions, the irreversible nature of most U.S. actions, rapidly developing new threats, and the prospect that Russia may not continue to view reductions as desirable, raises the issue of how the U.S. can best preserve credible deterrence at reduced budget levels. Innovative options may permit restoration of high confidence deterrence, albeit through non-traditional means.

This paper will 1) provide a baseline summary portraying the actual status of all U.S. drawdowns affecting relative strategic power, 2) identify options for the reconstitution of U.S. deterrent forces and associated command and control if necessary, 3) identify options for dealing with regional crises, particularly nuclear proliferation.

Thursday, 0830-1000

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General Purpose Bombs or Precision Guided Munitions?
Why General Purpose Bombs are still Useful

It is no secret that military planners today favor precision guided bombs over unguided munitions. Precision guided weapons are more accurate than general purpose bombs and hence fewer are required to hit a particular target. In this paper, however, I show that for a certain class of targets general purpose bombs dropped b planes such as a B-52 will, in fact, destroy more of that target with fewer sorties than precision guided bombs. This class of targets is called *area targets* and examples include ammunition storage sites; petroleum, oil, and lubricant storage; personnel; truck parks; and "hard-to-find" targets. Since area targets are common, may include strategic targets, and are often attacked in war, I contend that general purpose bombs are still very much needed today and can play a useful role in both future operations and strategic planning.

This paper begins with an analysis of area targets in terms of the number of bombs needed and number of sorties required to inflict a specific level of damage. The analysis applies to both general purpose bombs and precision guided ordnance. Then, to further prove my point, I present examples of real-world area targets taken from Desert Storm that shoe how a B-52 dropping general purpose bombs would have been more effective than, say, an F-111 with precision guided bombs on a per sortie basis. I therefore believe that general purpose bombs are still useful and needed - a surprising conclusion for today's thinking.

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Precision Strike Capability/Joint Direct Attack Munition (JDAM), Product Improvement Program (PIP), Accuracy Requirements Study

The value of precision strike can only be understood in light of the needs for specific forms of weapon accuracy on the battlefield. Currently accuracies required to effectively destroy targets for certain military regions had not been fully determined, nor were the impacts of various combat factors on weapon accuracy requirements completely understood. The purpose of this study was to provide insights into the accuracy requirements needed to destroy regional-specific targets and to ascertain the factors that influence these requirements. Presented are the analyses of the accuracy requirements for the application of aircraft delivered 2,000 lb class unitary warheads employed in two different regions. It incorporated the optimal use of these weapons based initially on least number of munitions necessary to achieve threshold destruction of each respective target set and then on minimized cost to accomplish the same mission. Sensitivity analyses and excursions are described which investigated causality in shifts of the requirements, more fully bounding the value of the results. Three measures were used in this study. First, Circular Error Probable (CEP) value required to attain the desired destruction per target, this was the largest integer CEP value needed to accomplish the mission with the minimum number of munitions. Secondly, the number of bombs required per CEP value to destroy the target set; this measure was used to characterize the target set and to evaluate the impact of various driving factors. Finally, the total number of bombs (by type) needed to destroy the target set; this was the "greater perspective" measure which was used to describe weapon quantity shifts due to selection of alternate munitions.

Thursday, 1030-1200

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Deterrence/Counterproliferation of WMD - Joint Warfighting Capabilities Assessment

The role of the Joint Requirements Oversight Council (JROC) has been expanded to provide the principle forum for senior military officials to address military requirements from a joint perspective. The expanded JROC process is provided with analytical support in the form of Joint War fighting Capability Assessment (JWCA) Teams with participation from a wide range of DOD offices, agencies, and research organizations. The assessment process integrates key war fighting areas across traditional functional stovepipes in order to gain new insights and innovation.

The Deterrence/Counterproliferation of Weapons of Mass Destruction (WMD) JWCA analyzes nuclear and advanced conventional/unconventional warfighting capabilities that contribute to both strategic and regional WMD deterrence and defeat. The JWCA has particular responsibility for assuring that US forces can be protected should they confront an adversary armed with WMD.

The assessment framework and key insights and issues will be presented.

Lt Col Chip Frazier
Assistant Secretary of Defense
International Security Policy

Assessment for Counterproliferation

Approved abstract not available at printing.

Thursday, 1330-1500 (During Special Session III)

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Defeating Agents of Mass Destruction

The freedom of action of U.S. forces could be greatly reduced in a regional conflict where the adversary possesses weapons of mass destruction (WMD) and the means to deliver them. Effectively countering these weapons will be necessary in the very early stages of the confrontation. However, collateral damage resulting from an attack with today's conventional weapons could be totally unacceptable. We will outline four technologies for neutralizing the WMD materials, chemical/biological agents or nuclear materials, with attention paid to minimizing the dispersal of material. We will then discuss, in detail, one very promising defeat mechanism, sterilizing radiation, employed against a typical WMD storage facility.

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Counterproliferation Advanced Concept Technology Demonstration

In light of recent developments in North Korea and elsewhere, hard targets, particularly weapons of mass destruction (WMD) targets, are of increasing concern to the intelligence and warfighting communities. This concern has been expressed in the Deputy Secretary of Defense's Report on Nonproliferation and Counterproliferation Activities and Programs, the DoD Counterproliferation Acquisition Strategy, and Mission Need Statements regarding Agent Neutralization and Hard Target Defeat by Air Combat Command and the United States Strategic Command (USSTRATCOM).

The challenges to the defense community in addressing this concern are:

(1) characterization of underground (hard) facilities,
(2) damage assessment of hard targets from conventional weapon attacks,
(3) improved confidence in battle damage assessment (BDA) of underground targets,
(4) determining collateral effects as a result of WMD target strikes, and
(5) overcoming hard target countermeasures such as human (civilian infrastructure) shields and other protective designs.

The objective of the Counterproliferation Advanced Concept Technology Demonstration (CP ACTD) is to assemble and demonstrate a significant, new military capability, based upon maturing technologies to meet the challenges. This program will deliver an end-to-end system of sensors, targeting tools, and weapons options for effective (maximum mission disruption time), efficient (minimum number of weapons), low risk (minimum casualties) attacks against WMD hard targets.

For pre-attack employment, special sensors will be packaged as ground-based systems or integrated into Unmanned Aerial Vehicles (UAVs) for the purpose of collecting information about the target layout, single point failure locations, content (equipment and weapon inventory) and operational status.

A targeting tool will be developed to describe physical and functional representations of targets and accept fused intelligence data. It will also include data on weapons delivery systems; penetration capabilities; weapons effects; nuclear, biological and chemical (NBC) material characteristics; and population centers). It will use these inputs to predict target response and collateral effects (using real time weather updates).

Lethal and non-lethal payloads will be weaponized in BLU-109s with smart fuses to achieve functional kill with a minimum number of weapons. High confidence battle damage assessment will be provided by the same off-the-shelf sensor technologies developed for pre-attack data collection.

A demonstration of the end-to-end capability will occur during FY97 and 98 A simulated hardened chemical weapons production and storage facility and a simulated hardened air defense control center are being planned as targets.

Users of the capability are the theater CINCs. Other organizations that assist in and influence the development of the capability include USSOCOM, USSTRATCOM, ACC and the Space Warfare Center. To field this capability in a cost effective, timely manner, technology programs in the Defense Nuclear Agency (DNA), the Service Labs, DoE, the intelligence community, and the National Test Facility are being (and will continue to be) leveraged and managed to meet program milestones.

Thursday, 1530-1700

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The DNA Hazard Prediction Program

The Defense Nuclear Agency (DNA) is developing an operational forecasting system capable of predicting the dispersal of hazardous materials released into the atmosphere for virtually any scenario. Such scenarios may be associated with the use of nuclear, biological, or chemical weapons or may derive from releases of hazardous materials from facilities or targets which store, produce, or use nuclear, biological, or chemical materials. The program includes both research into the basic physical phenomena and development of efficient computational models. All models developed are being

integrated into a flexible and responsive predictive system that supports both mission planning and emergency response. The major technical thrusts include characterizing the release of hazardous materials, accurately representing the wind fields and weather and the associated transport of materials through the atmosphere and appropriately formalizing the expected effects on military and civilian personnel in terms that have operational significance.

Characterizing the source is a very complex process. The release of hazardous material may result from weapons that have been used or intercepted, from military or terrorist strikes on weapons production or storage facilities or on industrial facilities or even from accidents. This portion of DNA's program includes experiments, hydrocode simulations and release source model development. The source terms generated are used to initialize an atmospheric transport calculation.

Accurate prediction of atmospheric transport requires high resolution prediction of the local wind fields and weather. DNA is attacking this challenge by both applying current high resolution nested atmospheric simulations and by developing a new multi-scale integrated simulation tool. Both approaches are focused on fore casting capabilities to enable real-time response to emergency scenarios. Multiple vapor, aerosol and large particle transport tools are being applied and evaluated to transport the hazardous materials through wind and weather.

To be useful the patterns of flow and dispersal must be evaluated in terms of their effects on both military forces and non-combatants in an area of concern. The transported environments must be merged with extensive nuisance, incapacitation and lethality databases and population data to generate casualty assessments and to evaluate potential actions in migration. DNA is adapting models developed for nuclear cloud fallout effects to the more general problems of current interest.

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Project Vulcan

The Venture Library of Codes for Analysis of Nuclear Systems (VULCAN) is a collection of state-of-the-art neutronics codes for characterization of world nuclear facilities and making hazards assessments for events at those facilities. The codes are being assembled to run on state-of-the-art workstation clusters using the latest evaluated nuclear data files, industry-standard verified and validated nuclear codes and a newly-developed code for calculating detailed radioactive inventories and exposure does rates. The primary purpose of VULCAN is to support military planning exercises and to provide reliable isotopic inventory data, dose rate data for input in the PC-based HASCAL code system for military in-the-field hazard assessments of compromised nuclear facilities.

The five categories of nuclear codes in VULCAN are (1) cross-section processing codes, (2) unit-cell and assembly codes, (3) multidimensional neutronics codes, (4) fuel burnup codes, and (5) inventory-to-dose conversion code. The cross-section processing codes are those comprising the NJOY and AMPX code system. Currently, the AMPX system of codes uses ENDF/B-V data. An effort being sponsored jointly by DNA, NRC, and DOE has just been initiated to upgrade the AMPX system to include the use of ENDF/B-VI data with its new formats and resonance treatment as well as recent improvements in unit cell spectrum calculations that have become more feasible with improvements in computer storage capacities and speed. Several assembly codes have been added to VULCAN, each of which have been validated for specific reactor types. State-of-the-art diffusion theory neutronics codes using finite-difference and nodal approximations to the neutron transport equation are incorporated into VULCAN and coupled to industry-standard fuel burnup and isotopic transmutation codes. One code developed specifically for VULCAN is a code to quickly operate on isotopic inventories to generate radioactivity and dose rates such as those calculated using well known ORIGEN point-depletion code. To provide a detailed accounting of all isotopes as ORIGEN does, the transmutation chains for over a thousand isotopes have been developed and incorporated into the fuel burnup code along with a new 99-group master cross section library. This new code, the transmutation chains and the master cross section library are undergoing testing and validation for a wide range of applications.

Two very important features provide the underpinning of the VULCAN system: (1) flexible coupling between any code in a category to any other code of the same or different category, and (2) graphical user interfaces to assure that code couplings are performed correctly and to provide visual verification and manipulation of each code's input data and output results.

WG2 — MISSILE DEFENSE - ABSTRACTS

Chair: **Bob Grayson, MITRE**
Cochairs: **Mike Ellis, BDM**
Proctor Grayson, VRI
Fred Jerding, SPAI
Ms Beverly Nichols, USA SSDC
Ms Sharon Noll, IDA
Maj Paul Tabler, AF SAA
Room: **Chauvenet Hall - Room 117**

Approved abstracts were not available at printing.

WG 3 — ARMS CONTROL - ABSTRACTS

Chair: **Pat McKenna, USSTRATCOM/J53**
Cochairs: **Karen Stark, BDM Federal**
Dr. Bob Batcher, US ACDA
Advisor: **Al Lieberman, FS, US ACDA**
Room: **Rickover Hall - Room 208**

Tuesday, 1030-1200

Dr. Edward J. Lacey
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Arms Control, Nonproliferation Treaties and Agreements: Status and Prospects

In light of the evolving new world order and developments in the Former Soviet Union, an effective evaluation of U.S. National Security interests requires a thorough understanding of U.S. arms control commitments and opportunities. This briefing will provide this necessary foundation through an up-to-date presentation of the status and prospects of arms control and nonproliferation treaties and agreements. It will proved the latest information on the full panoply of related ratification, implementation, and verification issues.

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Proliferation Path Assessment and Targeting System (PPATS)

Approved abstract not available at printing.

Wednesday, 0830 - 1000

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Proliferation Import Model (PIM)

Approved abstract not available at printing.

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A Methodology for Evaluating Military Systems in a Counterproliferation Role

This research develops a methodology to evaluate how dissimilar military systems support the accomplishment of the United States counterproliferation objectives. The overall scope is to develop a model of the counterproliferation decision process that enable systems to be evaluated against common criteria. By using decision analysis, an influence diagram model is developed which represents military activities in the counterproliferation process. The key questions which must be asked in evaluating counterproliferation systems are highlighted. An analysis of perfect intelligence, perfect defensive and perfect offensive systems revealed that a perfect intelligence system provides the greatest potential to meet the United States counterproliferation objectives. Sensitivity analysis is conducted to determine which factors in the model are most important

To demonstrate the model, nine systems from the Air Force wargame Vulcan's Forge 1995 are evaluated. The results are used to demonstrate the type of analysis which can be performed to evaluate U.S. counterproliferation systems.

Wednesday, 1000 - 1200

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Tracking Inventory Drawdown Using the START Central Data System (SCDS)

Approved abstract not available at printing.

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Compliance Monitoring and Tracking System (CMTS)

Approved abstract not available at printing.

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Baseline system for CWC verification inspections

Approved abstract not available at printing.

Wednesday, 1330 - 1500

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Conventional Arm Forces in Europe: Key Elements Update

Approved abstract not available at printing.

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Controlling Conventional Arms Control Transfers

Approved abstract not available at printing.

Thursday, 0830 - 1000

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Analysis of Three-way Arms Races

This paper addresses the analysis of three-way arms races based on an expansion of Richardson's arms race equations, with some modifications. The analysis is a first step in understanding the implications of arms build-ups in the third world.

The first part of the paper is a short summary of the basic Richardson arms race equations and their implications for arms race stability. A basic criterion for stability between two contenders is derived and examples are presented.

The second part of the paper expands the arms race equations to three party competitions. The criterion for stability is expanded to more restricted conditions. In addition, a model for examining several sides trying to catch up with a dominant arms producer is formulated.

Implications of arms races in a multi-polar world is of primary interest. Potential competitions between superpower and lesser-power nations can be examined using the methods provided
in this paper.

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Application of "New Sciences" Techniques to Proliferation and Arms Control Analysis

Approved abstract not available at printing.

Thursday, 1030 - 1200

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START III Study

Approved abstract not available at printing.

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Toward a New Strategic Arms Control Strategy

The success of past policy seems to be masking new opportunities for greater security through arms control. Nuclear policy centered on deterrence, export controls, bilateral agreements and the non-proliferation treaty (NPT) doesn't get directly at the most critical issue. America can be destroyed by less than 100 warheads. START-II will not make us much safer. The NPT written to accommodate the realities of the Cold War, does not deal well with future threats. Under the nuclear have/have-not arrangement, the arsenals of the haves remain and proliferation continues, albeit slowly.

The INF treaty offers a model for completely eliminating classes of nuclear weapon delivery systems. Consider a treaty where the parties would be obligated to put forth acceptable plans for nuclear downsizing by completely eliminating classes of weapon systems first, followed by the weapons themselves on practical time scales. The plans, through instruments akin to the INF verification protocols, would provide for a thorough safeguards inspection process.

Ballistic missiles are the greatest current threat. Would it not be in America's interest to see all ballistic missile weapon systems, nuclear and conventional, with ranges greater than say 500 km, eliminated? Negotiating a verifiable treaty dealing first with these most dangerous weapons, then moving on to cruise missiles seems logical and practical. Elimination of nuclear warheads, while important in the long haul, doesn't offer large immediate gains in safety and stability, and is far more difficult to implement and verify. Eventually, we must deal with the knotty problem of warhead dismantlement and verifiable disposition of special nuclear material. The terrorist threat
dictates sound processes. We don't have all the answers today, but there is some reason for optimism.

By dealing with the most dangerous weapon systems first, we make early progress in reducing the danger of mass destruction. By imposing intrusive verification, we force the hand of undeclared possessor states and build confidence among all parties. By putting forth a verifiable phased approach for elimination of nuclear warfighting, we place limits on damage that can be done by clandestine proliferators. By systematic, class by class, elimination of delivery systems, we can move beyond nonproliferation to a strategy centered on verifiable threat reduction, bolstered perhaps by defensive measures to hedge against limitations on verification.

Thursday, 1530 - 1700
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Next Generation Arms Control and New Security Parameters
Approved abstract not available at printing.

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Post Cold War Trends In Disarmament
Approved abstract not available at printing.

WG 4 — STRATEGIC COMPETITIVENESS ANALYSIS AND PLANNING - ABSTRACTS

Chair: **Thomas G. Mahnken, USSTRATCOM/J533**
Advisor: **Dr. Tom Welch, OSD/NA**
Room: **Rickover Hall - Room 203**

Approved abstracts not available at printing.

WG 5 — EXPEDITIONARY WARFARE/ POWER PROJECTION ASHORE - ABSTRACTS

Chair: **Tim Sullivan, Texas Instruments**
Cochair: **CDR "Boots" Barnes, OPNAV, N815K**
Advisor: **Frank Kammel, NSWC**
Room: **Rickover Hall - Room 207**

Tuesday, June 6, 1330 - 1500
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Longbow Apache in Joint Operations
Approved abstract not available at printing.

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Coastal and Riverine Operations Study
Approved abstract not available at printing.

Wednesday, June 7, 0830 - 1000
CDR Don Kassilke, USN, CNA

Strike Munitions Interoperability
Approved abstract not available at printing.

Mr. John Bentrup, CNA

Non-Visual Close Air Support
Approved abstract not available at printing.

Wednesday, June 7, 1030 - 1200
Mr. Jeffrey McManus
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AEGIS and Air Defense Interoperability
Approved abstract not available at printing.

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Use of JMEM Data and Programs to Support Service Mission Planning Programs
Approved abstract not available at printing.

Wednesday, June 7, 01330 - 1500
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Visual Analysis Tool (VAT) - An Operations Research Analyst's Tool for Analysis Debugging and Presentations
Approved abstract not available at printing.

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MLR Supplemental Analysis, MV-22 Wargame
Approved abstract not available at printing.

Thursday, June 8, 0830 - 1000

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Two MRC Analysis (ITME) Nimble Dancer

Approved abstract not available at printing.

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Two MRC Analysis (ALSWAT) Nimble Dancer

Approved abstract not available at printing.

Thursday, June 8, 1030 - 1200

COMPOSITE GROUP II
SESSION #2 ..... Rickover 103

Thursday, June 8, 1330 - 1500

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Sea-Based Firepower for Joint Land Battle

Approved abstract not available at printing.

Col Gary Anderson, USMC
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Amphibious Wargame Lessons Learned

Approved abstract not available at printing.

WG 6 — LITTORAL WARFARE AND REGIONAL SEA CONTROL - ABSTRACTS

Chair: **Dr. Michael A. Cala, CNA Representative to JIATF-East**
Cochairs: **LCDR Kirk Michealson, OPNAV N815**
Chuck Samuals, Epoch Engineering
Advisor: **CAPT Steve Pilnick, OPNAV N893**
Room: **Rickover Hall - Room 206**

Tuesday, 1030-1200

COMPOSITE GROUP II SESSION .. Rickover 102

Tuesday, 1330-1500

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Non-Lethal Weapons for Counterdrug Operations

Approved abstract not available at printing.

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Use of JMEM Data and Programs to Support Service Mission Planning Programs

Approved abstract not available at printing.

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Joint Oceanographic Support of Littoral Warfare: Third Generation Wave Modelling

The Spectral Wave prediction System (SWAPS) is a wave forecast system developed as a cooperative effort between the USAE Waterways Experiment station, Coastal Engineering Research Center (CERC) and the NAVal OCEANographic office (NAVOCEANO). SWAPS has been implemented and runs unattended on a high performance computer system located at NAVOCEANO. In the automated mode, SWAPS provides a continuous 48 hour forecast of mean wave parameters and spectral parameters twice a day for designated Areas of Responsibility to support operational Naval commands worldwide.

The basis of the wave forecast model is a nested grid application of 3GWAM Cycle 4, a state-of-the-art third generation wave model describing the evolution of a 2-D ocean wave spectrum. For the purpose of wave model verification, SWAPS was implemented for the Gulf of Mexico marginal basin at 0.25 degrees spatial resolution. Predicted mean wave parameters were compared to data collected at 11 moored buoy locations from January to June 1994. SWAPS was also implemented in the nearshore and continental shelf region of the eastern United /States during the DUCK94 field observation experiment (August to November 1994) at a spatial resolution of 0.0833 degrees. Predicted mean wave parameters were compared to data collected at 5 moored buoy locations and one bottom mounted linear array of

pressure gauges located in 8 meter water depth. Based on these comparisons, an assessment of the forecast system is made.

Wednesday, 0830-1000

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Over-the-Horizon Area Defense vs. Cruise Missile Mission Analysis Study

Approved abstract not available at printing.

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Aegis and Air Defense Interoperability

Approved abstract not available at printing.

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Evolutional Learning for Harpoon in Littoral Warfare

Approved abstract not available at printing

Wednesday, 1030-1200

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The Nearland Test (NLT)

The traditional concept of air defense has been to physically separate friendly weapon systems by assigning them unique operational fighter engagement/missile engagement zones (FEZ/MEZ). The Joint Engagement Zone (JEZ) concept eliminates separate engagement zones through the application of positive hostile identification rules of engagement (PHID ROE). PHID ROE restricts engagements to those targets that have been positively identified as hostile. Successful implementation of a JEZ concept requires effective communication among intelligence platforms, command and control units and weapon systems.

The NLT was a test of the JEZ concept in a joint air defense operation in a littoral environment. It was conducted from 21 March through 1 April 1994 in the Gulfport Mississippi area. It stressed the communication among systems from all four Services, including Air Force fighter, AWACS, and Rivet Joint aircraft; Navy fighter, EP-3,, ES-3, and E-2C aircraft; a Navy AEGIS cruiser; a Marine Corps air control squadron operating from a Tactical Air Operations Center (TAOC); Marine Corps low altitude air defense systems; and an Army Patriot Battalion. NLT results are presented in three areas: the ability of the systems to adequately track aircraft, identify aircraft, and pass information among themselves.

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Sea-Air-Land Operations

Building on a 1992 award winning article, "Sea-Air-Land Battle Doctrine", "Sea-Air-Land Operations" explores the impact of naval support to land battle. The relevance of the Navy's new "Forward...From the Sea" paper is analyzed. A combined arms approach to warfare is developed, using naval forces as one of the methods to place fires on target. The issue of maneuver is explored, and a concept of naval maneuver is developed. A historical view of the battlefield is summarized, with some strengths and weaknesses of "compartmentalizing" the battlefield. A description is provided of our evolving doctrine, with some thoughts on how we might better plan for future operations. Finally, the issue of military redundancy is explored, with some thoughts on cost-effectiveness.

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The Challenges of Real Time Analysis in Joint Warfare

Approved abstract not available at printing.

Wednesday, 1330-1500

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Surface Combatant Force Level Study (SCFLS) Effectiveness / Sufficiency Analysis

Approved abstract not available at printing.

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Assessment of Streamlining Counterdrug Interdiction in the Transit Zone

Approved abstract not available at printing.

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Multi-Mission Capabilities of the OWL MKII (TM)

Approved abstract not available at printing.

Thursday, 0830-1000

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Coordination of DoD Counterdrug Operations: An Inter-Theater Perspective

Approved abstract not available at printing.

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Coastal and Riverine Operations Study

Approved abstract not available at printing.

WG 7 — NUCLEAR, CHEMICAL AND BIOLOGICAL DEFENSE - ABSTRACTS

Chair: **Alan W. Longshore, UsA Chemical School**
Cochairs: **Doug Schultz, Institute for Defense Analysis**
LTC Mark Byers, Defense Nuclear Agency
Room: **Rickover Hall - Room 213**

Tuesday, 1030-1200

MAJ Dan Maxwell
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Joint NBC Defense: A Strategy for Prioritizing Multi-Service Programs

The recent Public Law integrating previously separate service NBC defense programs into a single, joint program significantly impacts on the manner in which resources for developing new systems are allocated. The Army, as executive agent, has developed an experimental strategy for prioritizing resource allocation among NBC Defense systems that is based on their potential contribution to the performance of the overall force. This paper presents an overview of the modeling process, available early results and lessons learned in the development effort.

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The OMEGA Model for Chemical & Biological Hazard Assessment

Approved abstract not available at printing.

Tuesday, 1330-1500

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Review of Joint Pub. 3-12-2, Nuclear Weapons Employment

Approved abstract not available at printing.

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Draft NATO Nuclear Casualty Manual

Approved abstract not available at printing.

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Nuclear Shielding Analysis

Approved abstract not available at printing.

Wednesday, 0830-1000

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Theater Missile Defense - Chemical and Biological Warfare Lethality: Status and Issues

The US Army Space and Strategic Defense Command, Lethality Division, is responsible for developing criteria for negation of all Theater Missile Defense (TMD) payloads, including chemical (bulk and submunition) and Agents of Biological Origin (ABO) bomblet payloads, through kinetic energy engagements (i.e., hit to kill and fragmenting warhead). This lethality criteria is embodied in empirical and semi-empirical models validated and supported by small scale phenomenology, sub-scale and full-scale high fidelity testing and numerical analysis.

The various phenomena that have been addressed by the Lethality Division for bulk chemical lethality include: initial penetration and structural response of the aeroshell and payload walls, *in situ* destruction of the agent, aerodynamic response of surviving agent, and transport and diffusion of the agent aerosol cloud. The various phenomena that have been addressed for chemical submunition payloads include: penetration and structural response of the aeroshell and submunitions, and dispersal and fly-out of the chemical submunitions. In addition the aforementioned phenomena associated with the chemical submunitions, phenomena specific to ABO bomblets have been addressed which include *in situ* destruction and environmental reactivity (solar irradiation and atmospheric radical reactions).

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Consequence of Intercept on Bulk Thickened Missile Payloads

Approved abstract not available at printing.

Wednesday, 1030-1200

COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330-1500

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Reutter & Wade Toxicity Data Applied to M40 Mask Specifications

The US Army Chemical School (USACMLS) Protective Mask Requirements Analysis, 1 Oct 86, (SECRET), established a DUSA(OR) approved procedure to link protective mask production standards to an acceptable operational risk standard. The operational risk standard is less than 1% lethalities or requiring medical care and less than 15% myosis effects for a specified chemical attack scenario (1%/15% standard). The Edgewood Research, Development and Engineering Center (ERDEC) Review of Existing Toxicity Data, Mar 94, Reutter & Wade, (SECRET), indicates that agent toxicity may be more lethal than that used in the USACMLS analysis. I repeated the USACMLS analysis using the ERDEC tox data to see if the M40 series protective mask still meets the DUSA(OR) approved 1%/15% standard. When I repeated the analysis changing only the tox data, the M40 mask fails (0%/24.58%). However, if I replace the original assumed Protection Factor (PF) distribution with the actual PF distribution now available, the M40 mask easily passes (0%/8.42%). We built a better mask than the JSOR required, so it still passes the 1%/15% standard even using Reutter & Wade tox data.

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Distributed Intractive Simulation (DIS) on the Chemical Battlefield: An Update

Approved abstract not available at printing.

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Reutter & Wade Toxicity Data Applied to the Protection Assessment Test Set (PATS) Pass/Fail Threshold

The US Army Chemical School (USACMLS) Protective Mask Requirements Analysis, 1 Oct 86, (SECRET), established a DUSA(OR) approved procedure to link protective mask production standards to an acceptable operational risk standard. The operational risk standard is less than 1% lethalities or requiring medical care and less than 15% myosis effects specified chemical attack scenario (1%/15% standard). The Edgewood Research, Development and Engineering Center (ERDEC) Review of Existing Toxicity Data, Mar 94, Reutter & Wade, (SECRET), indicates that agent toxicity may be more lethal than that used in the USACMLS analysis. The M41 pass/fail threshold of 1667 Protection Factor (PF) comes from dividing the traditionally used challenge dosage of 5,000 mg-min/m3 by the GB myosis estimate of 3.0 mg-min/m3. Reutter & Wade's GB myosis estimate of 0.5 mg-min/m3 suggests the 1667 PF should be 10,000 PF. In fact, this logic does not justify either figure as an M41 pass/fail threshold. the "88% of masks will provide better than a 1667 PF" JSOR production standard comes from one of two points the USACMLS analysis postulated to define an assumed PF distribution that meets the 1%/15% standard. Testing masks with an M41 set at 1667 PF to assure meeting the 1%/15% standard is equivalent to counting the number of people over a single threshold age to build an age histogram. You need the data, not just the quantity over a given data threshold. ERDEC has only one set of post-M41-test mask PF data. Unfortunately, the M41 in this case was a depot M41 set at a 3000 PF threshold. By repeating the USACMLS analysis, I found that an M41 set at 3000 PF meets the 1%/15% standard (0%/8.42%). The nature of the data suggests that a 1667 PF threshold will probably meet the 1%/15% standard. However, only PF data from masks tested after passing an M41 set at 1667 PF can definitively answer this issue.

Thursday, 0830-1000

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Effects of Tularemia on Human Performance

Approved abstract not available at printing.

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Biological Agent Hazard Footprints Based on Performance Degradation

Approved abstract not available at printing.

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The CASUALTY Model for Biological Agents: A Focus on Time-Based Consequences and the Population Response

Approved abstract not available at printing.

Thursday, 1030-1200

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The DoD Biological Vaccine Program: Research, Development and Military Operations

The proliferation of Biological Weapons (BW) is one of the most serious threats to US Forces following the Cold War. The threat is exacerbated by (1) the ease and low cost of producing biological agents; (2) the difficulty in detecting biological agents and protecting or treating its intended victims; (3) the potential for genetically-selective targeting; (4) the dual-use nature of BW which makes proliferation difficult to detect; and (5) potential lethal areas from a BW system of thousands of square kilometers. Biological agents can also be used with devastating effect in combination with nuclear, chemical or conventional weapons.

The Medical Biological Defense Research Program was created to develop medical countermeasures to deter, constrain, and defeat the use of biological agents against US Forces (DoD Directive 5160.5, May 1985). The objective of this paper is to provide a framework for addressing issues related to the DoD vaccine program, provide options and strategies for resolving issues, and recommend optimal strategies for the acquisition and the deployment of vaccines. Additionally, this paper will address relevant interactions between the biological vaccine program and other aspects of NBC defense, Joint operations, and Coalition warfare.

In implementing the DoD vaccine program,, three key issue need to be addressed:

1. What quantities and kinds of vaccines are needed for US Forces?

2. What quantities and kinds of vaccines are needed for other than US Forces (OTUSF)?

3. What quantities and kinds of vaccines will be used from the acquired stocks for annual or periodic immunizations?

In evaluating these issues, several criteria will be considered, including technical, medical, operational, economic, legal, ethical, political, and policy concerns.

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The Potential Impact of Biological Weapons Use and the Benefit of Medical Intervention

Approved abstract not available at printing.

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A Sampled Volume Model: A New Approach to Biological Warfare Modeling

This paper describes a new approach to modeling the threat of BW agents - the so called "sampled volume" model. The objective is to develop a model that describes the behavior of a BW aerosol cloud from dissemination to impaction upon the target, including transport and diffusion and interaction of the BW agents with the environment. The model is designed to interact with large scale war game models, and also will be useful to the materiel developer for determining required operational characteristics for this equipment.

The model will follow a volume of air as it travels downwind from the point of dissemination to the point of impact on the target (people and/or detectors). The uniqueness of the model will be it's ability to predict the constituents of the volume of air at each point along its path, including the concentration and state of the agent itself as well as background material. It will include several modules - dissemination, transport and diffusion, environmental interaction, human effects and detector response. The paper will describe the underlying assumption for the model and its proposed structure.

WG 8 — MOBILITY - ABSTRACTS

Chair: **Maj Kevin Smith, HQ USAF/XOM**
Cochairs: **Lt Col Scott Hagin, AMC/SAF**
Frank McKie, CAA/CSCA-TCM
Tom Denesia, TRANSCOM/JSAA
Lt Col Denis Clements, OSD PA&E
Advisor: **Steve Wourms, ASC/YNE**
Room: **Rickover Hall - Room 224**

Approved abstracts not available at printing.

WG 9 — AIR WARFARE - ABSTRACTS

Chair: **Thomas M. Lillis, McDonnell Douglas Aerospace**
CoChairs: **LTC Marty Allen, AFSAA/SAG**
Mark Butler, NAIC/TAAE
Advisor: **David E. Spencer, FS, RAND**
Room: **Rickover Hall - Room 224**

Tuesday, 1030 - 1200

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Parametric Study of Warhead Pk vs CEP for Surface-to-Air Missile Targets

The Joint Munitions Test and Evaluation Program Office (46th Test Wing, Eglin AFB, FL) is assisting ASC/LKG in the Lethal SEAD (Suppression of Enemy Air Defenses) Mission Area in a conceptual study of smart munition warhead designs and delivery conditions to optimize lethality of the munition to produce hard kills on threat SAM targets. Results of this work are being used to support ASC in the concept exploration phase of their lethal SEAD Pre-emptive Destruction development program and will also support a related Air Combat Command (ACC) COEA being conducted by AFSAA. This paper presents results of this study for target engagement radar(s) and TEL(AR)s of the SA-6, SA-8, SA-12 and ZSU-23-4 air defense units (ADUs). Warhead classes addressed include explosively formed penetrators (EFPs), multiple-EFP (MEFP), unitary blast-fragmentation, flechette and shaped charge warheads (with and without fragmentation wrap). The effects of warhead kill mechanism, warhead fuze, aimpoint, and delivery accuracy characteristics, in term of circular error probable (CEP) hit distributions, are parametrically studied to produce various metrics useful to munitions designers. Products of this study for each munition variant and target include target P(K/H) matrices versus attack aspect, and 1x1 results such as average single shot

probability of kill (SSPK) versus CEP for mobility (M), Firepower (F), Catastrophic (K) and Hard (H) kill metrics.

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Suppression of Enemy Air Defenses (SEAD)- Cost and Benefit of Lethal SEAD at Mission Level

Approved abstract not available at printing.

Tuesday, 1330 - 1500

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Precision Strike Capability / Joint Direct Attack Munition (JDAM) Product Improvement Program Accuracy Requirements Study

Approved abstract not available at printing.

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Evaluating Force Effectiveness - A Survivability Approach to Force Allocation

Today's diverse force structure requires the optimal assignment of available assets in theatrer in order to maximize force utilization. Evaluating force effectiveness in various scenarios requires attention to such factors as weapon effectiveness, survivability, availability, and weapon cost. A model called the Force Effectiveness and Allocation Model (FEAM) has been developed that addresses these factors and allows efficient sensitivity analyses performance.

FEAM is an air-to-surface model that allocates available and appropriate aircraft to specfic targets each day during a campaign. It is based on the Force Allocation Model (FAM), which assigns airfcraft to targets according to the highest target value killed (TVK), where TVK is an aircraft's expected kill per sortie multiplied by a target's value. However, this methodology does not address survivability nor does it accommodate specific target locations. This can result in analyses that do not reflect aircraft sensitivity to range or threart capabilities. Therefore, aircraft range and survivability factors were included in FEAM to produce a more rebust model.

FEAM utilizes a defense suppresson matrix defining what specific air defense sites are protecting specific critical targets. The overall objective of the model is to maximize the target value killed while simultaneously maximizing the available aircraft utilization. In order to fully utilize the available air assets, defense suppression must be great enough to allow aircraft to penetrate the threat area.

FEAM is a very useful model for performing cost and effectiveness analyses. Its parameters are easily varied to accommodate numerous sensitivity analyses within a short period of time, including the aircraft's RCS, altitude, and weapon carriage. Top level measures of effectiveness include campaign duration, wartime cost, and distribution of targets killed among aircraft types.

This paper further illustrates the algorithms used in FEAM as well as sample analyses performed with the model.

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Weapons Effectiveness Study

The Weapons Effectiveness study was conducted to update the 1990, Air Force Conventional Weapons Program Assessment. Specifically, the Weapons and Tactics Branch of Air Force Studies and Analyses, along with ASI-Systems International, examined and evaluated the relative military value of all current and planned conventional weapons, budget and unit cost changes, and the effect of force structure and attrition changes on the weapons program. The result of the study provide senior decision makers with analysis that can be used to make munitions and force structure decisions in a declining budget environment.

Wednesday, 0830 - 1000

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MCM3-1 Adversary Tactics Reconstruction

Approved abstract not available at printing

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Pilot-in-the-Loop Threat Fighter Simulaton

Approved abstract not available at printing

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Adversary Air Tactics in Digital Simulation

Approved abstract not available at printing

Wednesday, 1030 - 1200

COMPOSITE GROUP III SESSION . Rickover 102

Wednesday, 1330 - 1500

William Dickter
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Over-the-Horizon Area Defense vs Cruise Missile Mission Analysis Study

Approved abstract not available at printing

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Engagement Analysis of MIG-25 (FOXBAT E) VS. U-2

Approved abstract not available at printing

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Degraded States Vulnerability Analysis of Air Systems Update

The Ballistic Vulnerability/Lethality Division (BVLD) of the U.S. Army Research Laboratory (ARL), formerly the U.S. Army Ballistic Research Laboratory, plays an integral role in assessing the vulnerability of the Army's current and future air and ground combat systems.

In the past, the air systems vulnerability process has included the use of Damage Modes Effects Analysis (DMEA). These tools incorporate the damage/failure mode effect on air systems and kill criteria which are then used in vulnerability analysis. Since 1993, the Air Systems Branch (ASB) of BVLD has been developing and implementing a new approach for assessing vulnerability of air combat vehicles.

This methodology, known as Degraded States Vulnerability Methodology (DSVM), has been applied to ground combat vehicles and subsequently has been extended to other combat systems. DSVM provides more robust and mathematically correct vulnerability analyses. Implementation of the DSVM for air systems will permit consistency in the way vulnerability analyses are conducted for both air and ground systems.

In FY93, the Air Systems Branch (ASB) of BVLD began to develop a new stochastic air systems vulnerability methodology, the Modular Air-systems Vulnerability Estimation Network (MAVEN), for which an AP/API version is being alpha-tested. DSVM metrics are the primary output, but other methodology outputs will be included in MAVEN. For the DSVM approach, Capability Categories and Levels have been established and refined. Current efforts are directed at defining/developing fault trees for each capability category. DSVM for air systems is also the pilot program for integrated analysis within the Chemical-Biological Nuclear Effects Division (CBNED) and the Electronic Warfare Division (EWD) of the Survivability/Lethality Directorate (SLAD). The integration is being accomplished by means of common fault trees, detailed target descriptions, and capabilities for all analyses.

This paper will address ASB's general approach to vulnerability analyses, MAVEN, and the fault tree displayed in the vulnerability methodology for air systems. It will also address the BVLD's general approach to vulnerability analyses, highlighting the extension of the vulnerability methodology to air systems.

Thursday, 0830 - 1000

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Close-in Combat (CIC) Air Combat Engagement Analysis of Hypothetical Fishbed Upgrades

Approved abstract not available at printing

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Rearward Firing Missile Combat Effectiveness Analysis

Approved abstract not available at printing

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AMRAAM P3I COEA Results

The Advanced Medium Range Air-to-Air Missile (AMRAAM) Pre-planned Product Improvement (P3I) Cost and Operational Effectiveness Analysis (COEA) examined the operational and cost effectiveness of specific AMRAAM candidates with seeker improvements, and/or propulsion improvements against the current and projected threat. Specifically, the Weapons and Tactics Branch of Air Force Studies and Analyses looked at the impact of increased missile average velocity, increased terminal velocity, increased no-escape range, and increased autonomous range, along with the impact of tactics and ECM on missile operational effectiveness at the engagement level.

Thursday, 1030 - 1200

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Analytical Framework for Strike Operations

Approved abstract not available at printing

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Scenario Development for Joint Operations

Scenario flexibility is necessary in order to test various suppositions and strategies. including the development of force compositions and deployment schedules. **Desert Storm 2010**, an unclassified scenario originally developed for the THUNDER theater model, allows for variable time-line excursions with different ground, naval and air force compositions. Despite the Soviet Union's military demise and the absence of another high threat environment in the near future, many Third World countries are accumulating large numbers of newer and more sophisticated weaponry.

Desert Storm 2010 is based on the actual ground situation of 6 August 1990, with three Iraqi Corps deployed into Kuwait. **Desert Storm 2010** resumes the attack with the corps' eleven Iraqi divisions striking southward into Saudi Arabia, initially opposed by one Gulf Cooperation Council and three Saudi brigades.

Accordingly, the baseline scenario demands a different airpower strategy amd emphasis that the actual Desert Shield/Storm of 1990-91. *Halting the movemnent of the FEBA/FLOT and the overall Iraqi drive is the prime mission* with Riyadh only 450km away. Failure to slow the Iraqi advance places prepositioned supplies, ports, airfields and the entire coastal road at risk - with it, Bahrain and Qatar. The baseline scenario inserts U. S. ground troops, naval combatants and the USN, USMC, and USAF aircraft deploying to the Gulf region as they did in 1990-91.

In general, the baseline scenaro suggests that a rapid reaction, long-range force, consisting of long-range bomber and carrier aviation, would have the best chance of initially slowing the Irqai advance until the arrival of larger numbers of fighter and ground units.

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In Search of Robust Weapons Mixes: Methods for Maximizing Flexibility in Conventional Munitions Stockpiles

Approved abstract not available at printing

WG 10 — LAND WARFARE - ABSTRACTS

Chair: **Phillip A. Kubler, TRADOC Analysis Center**
Cochair: **Larry Cantwell, TRADOC Analysis Center**
Advisor: **Mark Herman, Booz-Allen & Hamilton**
Room: **Rickover Hall - Room 228**

Tuesday, 1030-1200

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Building the Synthetic Environment

The Distributed Interactive Simulation (DIS) environment offers the Army and DoD the power of information technology to share and integrate knowledge on common synthetic battlefields. The essence of DIS is sophisticated integration of simulations and information resources to permit unencumbered information sharing, to generate knowledge, and to enhance innovation for systematically improving military capabilities. It can greatly reduce the acquisition life cycle, produce better analytical products, and through the technology provide for cost effective training devices and mission rehearsal capabilities.

The presentation first discusses Army DIS responsibilities for requirements definition, the Army DIS Master Plan, and prioritizing use of the Core DIS Facilities. The Army defines requirements to support major Army programs such as Joint Venture, Battle Laboratories Advanced Warfighting Experiments, and STOW. The Army's DIS Master Plan provides the Strategic Vision for the Army for DIS development for the next ten years. In the Master Plan's Technology Roadmaps specific technology areas, such as VV&A, are viewed across programs and projects to identify linkages, dependencies, and voids which need to be addressed. The requirements that become products are used at the Army's Core DIS facilities (Fort Knox, Fort Rucker, Fort Benning, and Orlando).

The Army currently chairs the DIS Interoperability Workshop's User Sponsor Committee (USC). This committee with membership from all services and DoD seeks to identify user needs which focus the development of DIS standards. Projects such as major documents database and DIS Lessons Learned system support USC's education mission.

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Verification, Validation, and Accreditation (VV&A) of Distributed Simulations

The Department of Defense is aggressively moving to institutionalize the development and use of distributed interactive simulations. Currently, there are no defined procedures to verify that models and systems joined in a distributed simulation environment properly portray real-life battle missions and functions.

This project brings together numerous agencies from all services to gain a tri-service perspective concerning the VV&A of distributed applications. The products gained from the first year verification focus will benefit future validation and accreditation efforts.

This presentation will outline a process to develop a broad, comprehensive method for VV&A of models, systems, and simulations within distributed simulation applications. Products from the first year effort include: a high resolution attrition algorithm standard, procedures for predicting network and node overload, tools useful in VV&A of distributed applications, and a VV&A Implementation Guide. The approach for each task will be discussed, as well as goals for a second year effort.

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DIS Data Initiatives

As the Army moves to creating synthetic environments which meet the needs of the user domains, the Distributed Interactive Simulations (DIS) must have common elements via a library of standard approved data, nomenclatures, icons, algorithms, subroutines, and terrain data bases. All data bases must be consistent and interoperable across all DIS compliant simulations.

Many of the Army and DoD efforts regarding nomenclature standardization, centralization of information, data sharing and data definitions will be discussed along with the status of data efforts supporting the DIS data standards and requirements.

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Developing Distributed Simulation Environments for AWEs (Arming the TRADOC Battle Labs)

Approved abstract not available at printing.

Tuesday, 1330-1500

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Battlefield Distribution for the Future: An Analytical Excursion

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Fratricide Reduction in the Digitized Battlefield

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Application of Force-on-Force Parametrics to Design of the Line-of-Sight Anti-Tank (LOSAT) System

Approved abstract not available at printing.

Wednesday, 0830-1000

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Requirements Definition for All Electric Armored Vehicles in a Joint Operations Environment

Future all-electric armored combat vehicles may greatly enhance the effectiveness of joint operations through reduced logistics and increased lethality. These new vehicles will, however, place significant requirements on prime power to accommodate a variety of loads beyond the normal need for propulsion. Additional power will be required for a variety of electric weapon systems, active protection, active or semi-active suspension systems, and auxiliaries. Moreover, weight and volume limitations in these vehicles may preclude the installation of separate power systems for these various energy consumers. Because these various systems will not require maximum power throughout a combat scenario, there is presumably an optimum combination of prime power output and energy storage available to satisfy any set of duty cycles considered for the power systems employed during vehicle operations. Numerical tools are being developed to address power system performance for all-electric armored vehicles. However, one of the more difficult aspects in the optimization process involves the specification of representative combat mission profiles which can be used in the design process. These combat mission profiles are greatly influenced by the evolving joint operations doctrine. This paper examines the process needed for developing an all electric vehicle which takes into account "all electric" technology capabilities along with the changes in joint operational implementation which are facilitated by these new technologies.

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Nonlethal Weapon Employment Analysis

This analysis investigated the effectiveness of nonlethal weapon (NLW) employment methods using the Eagle combat simulation in its debut at the U.S. Army Concepts Analysis Agency. The analysis team developed a generic model of a NLW incapacitation effect to compare alternative employment methods that could be applied in a mid-intensity, heavy force scenario. The approach contrasts with other NLW studies that have focused on specific weapons, technologies or operations other than war. In the base case, a U.S. Army armor-heavy brigade conducted offensive operations without employing NLW against a defending opposing force (OPFOR). In the excursions, the brigade employed NLWs to attack OPFOR battlefield operating systems (e.g., command and control, fire support, maneuver), to disrupt OPFOR plan synchronization, and to shape the battlefield. NLW incapacitation effects were temporary; effect duration was varied as a parameter. The analysis compared fractional exchange ratios and blue personnel casualties to determine NLW employment alternatives that improved, impaired, or had negligible effect on combat outcomes. Effective NLW employment reduced blue personnel casualties by inducing "piecemeal" commitment of OPFOR maneuver units. Ineffective NLW employment significantly increased blue casualties when incapacitated OPFOR units recovered in positions of relative advantage. This analysis was sponsored by the Deputy Undersecretary of the Army for Operations Research.

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"Graceful Degradation" - a Sea Change in System State

At the heart of our understanding of how well a materiel system will perform in use is how likely it is to work when called on. Classical reliability theory attempts to measure this, starting from a basic definition that asserts that a component or system either functions or does not, and a large body of work exists to deal with the implications of this. However, modern combat (and other) systems are increasingly designed to degrade gracefully in the presence of battle damage -- to compensate for component and subsystem failures in such a way as to be able to continue functioning, albeit at a reduced level of performance. This kind of performance does not fit well into the classical reliability paradigm.

However, reliability can also be defined as "the probability of adequate performance", and this definition offers a different approach to measuring and accounting for reliability failures. If the performance of a system in a "partial failure" mode can be projected - by simulation, for example - and combined with the probability of various operating modes - from classical reliability - then the probability of successful performance can be projected.

A convenient formulation for this approach is as a tree diagram with associated probabilities of both following the relevant branch and of adequately performing given that the system is on that branch. This methodology has been successfully applied to a weapon system under test which exhibits a form of graceful degradation in the presence of sub-system failures. It appears to apply to wide range of systems performance issues.

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Near-Term Battlefield Combat Identification System (NTBCIS) Survivability

Approved abstract not available at printing.

Wednesday, 1030-1200

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Analysis and Experimentation Support for FORCE XXI

Approved abstract not available at printing.

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A Baseline Set of Critical Information Requirements for Establishing the Relevant Common Picture for Force XXI

For the past several years, the United States military has been in transition where the traditional roles, missions, and force structure of each branch of service are being reevaluated and redefined. The U.S. Army is stepping forward to embrace this period of change through a bold initiative called the *Force XXI Joint Venture*. In a message to TRADOC Headquarters dated March 8, 1994 the Chief of Staff of the Army (CSA), General Gordon R. Sullivan stated that

"... Force XXI must be organized around information -- the creation and sharing of knowledge followed by unified action based on that knowledge which will allow commanders to apply power effectively."

For military commanders at all levels, making decisions in war or in peacetime has always been a highly individualized, complex process. Important decisions are often based on obscure, partial information to ensure adequate time is available to communicate orders and carry out the action. The problem today is not a lack of information, but that the amount of information available to both commanders and staffs has become overwhelming. What is needed is an information system, designed especially for commanders, to aid in managing battle information which fits how commanders actually assess situations and issue orders in combat.

This paper describes efforts to identify a core set of *commander's critical information requirements* (CCIR) that can be used to develop a Force XXI Command and Control Information System. The main objectives of this paper are as follows: review the literature related to commander's critical information requirements (CCIR) and summarize important results from the survey; suggest a core set of CCIR based on (1) results from the literature, (2) critical information requirements identified from field and technical manuals, and (3) CCIR surveys of current division and corps commanders; and discuss the design and development of CCIR templates that can be used to tailor the CCIR to meet the individual needs of commanders.

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An Architecture for an Information Age Command and Control System

Recent advances in the way the Army collects, communicates and uses battlefield information demand that the Army reexamine its existing command and control systems. Advances in information technologies for managing and distributing information will facilitate the horizontal integration of battlefield functions. Units, command posts and leaders will operate in a more widely dispersed environment. The diversity of operating environments, equipment sophistication, increased tempo and dispersion of forces will place unprecedented demands on future battlefield leaders.

This study follows a systems engineering approach to design an information age command and control system around the flow of battlefield information and based on a core set of battlefield information requirements for commanders and staffs at the division level and below. System design reflects the five operating characteristics of Force XXI: doctrinal flexibility, strategic modularity, tailorability and modularity, joint and multinational connectivity, and the versatility to function in war and operations other than war.

The study makes recommendations concerning the characteristics of the command and control infrastructure which will facilitate the flow of information to support Force XXI operations. It also discusses methods for presenting and accessing battlefield information, processing information using automated intelligent agents, trade-offs between man-in-the-loop and automated information processing, methods of eliminating information and decision making bottlenecks, and information system survivability.

Wednesday, 1330-1500

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Studies of Personnel Attrition Rates in Land Combat Operations: A Status Report

This presentation will summarize the inception and accomplishments of the Personnel Attrition Rates (PAR) studies, describe its current status, and note some of its aspirations for the future.

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Determining the Implications of Unexploded Ordnance (UXO) on the Battlefield Using a Minefield Effectiveness Model

This paper presents the estimates of casualties and vehicle damage incurred by blue forces due to UXO while operating in both battle and after-battle roles. This study is intended to support an Army committee responsible for addressing the UXO problem from both a UXO prevention and clearing/clean-up aspect. This paper will examine the issue surrounding U.S. Army forces encountering U.S. Army UXO as well as encountering UXO attributed to other U.S. Services.

UXO on the battlefield are primarily the result of after-battle residue caused by both red and blue forces' DPICM artillery and multiple rocket barrages. U.S. fixed wing delivered cluster bombs used for battlefield preparation account for the majority of UXO on the ground when early entry scenarios are employed.

The analysis of the UXO problem is based upon the application of the Minefield Effectiveness Simulations (MESIM) Anti-Tank (AT) and Anti-personnel (AP) Model to the case of a deeper and sometimes sparser "dud-field". Study challenges included determining a probability of detonation for various UXO and the modeling of troop movement through a dud-field. UXO densities for this study were obtained from actual Southwest Asia (U.S. sector of Kuwait) contractor clean-up data as well as from authenticated high resolution battlefield scenarios. Design improvements to U.S. ordnance intended to reduce UXO on the battlefield were analyzed for effects on troop and vehicle encounters/casualties/damage.

Conclusions drawn from this study will be used to support efforts to attack the UXO problem from both the prevention and clean-up perspectives. Efforts are on-going to refine study results and to incorporate cost implications of retrofitting Army munitions with self-destruct capability.

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"We Have Met the Enemy and..."

This unclassified, 30 minute presentation addresses the post Cold War trends in terms of global and local conflicts. Threats are discussed in terms of their nature, location and threat perceptions of the range of possible U.S. responses.

Threat forces are further examined in terms of their military capabilities, levels of technological sophistication and their ability to integrate these technologies across the battlefield operating systems. In addition to this examination of combat capability, the realities of regional balance of power equations are also addressed. These realities drive threat weapons acquisition programs as well as their particular view of the world.

The range of OOTW threats is also discussed. Each of the sub topics mentioned above is examined in light of the varying degrees of fidelity that are used to portray threat forces in the current family of models and simulations.

Thursday, 0830-1000

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Advanced Field Artillery System/Future Armored Resupply Vehicle Cost and Operational Effectiveness Analysis

Approved abstract not available at printing.

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Land Warrior Performance Analysis

In March 1994, the U.S. Army Materiel Systems Analysis Agency (AMSAA) was tasked by the Department of the Army Land Warrior (LW) Cost and Operational Effectiveness Analysis (COEA) Study Advisory Group to conduct a performance analysis of LW to supplement the COEA. The AMSAA analysis focused on determining the value of individual items of LW equipment. AMSAA was also requested to conduct a risk assessment, including an independent review of the Program Manager (PM), Soldier's risk assessment and risk mitigation plans.

The Study examined the 1994 baseline soldier equipment, new non-LW equipment available by 1999

and the LW equipment of 2003. The methodology used to support the evaluation included item level models to assess and compare performance to the LW requirements, combat models to examine contribution to battle outcome, and a subject matter expert survey to evaluate areas where quantitative evaluation was not currently possible or to supplement model results.

The performance analysis indicated very high added value results from the thermal weapon sight (TWS), combat identification system (CID), and helmet mounted display (HMD). The added value of the other LW equipment was found to be between moderate to high with the exception of only marginal improvement resulting from the proposed changes to the chemical protective suit and battle dress uniform (BDU). The AMSAA risk assessment basically concurred with the PM assessment that the risk is currently medium-high but by implementing the risk mitigation plan this can be reduced to medium.

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Who's Got the Data? Report on Data Sources Identification Efforts

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Approximations, Assumptions, and Validation

This paper discusses the roles of approximations and assumptions in model building and in the verification and validation of those models. Some persons describe model building as an art. Central to that art is the specification of the relationship among the variables, but decisions about additional appropriate assumptions provide the artistic touch.

Refereeing or assessing the analytical virtues of a model is made difficult by an author who incorporates unstated implicit assumptions in his work. Assumptions are made to simplify real-world problems, and solutions are strongly affected by the things that have been assumed. All assumptions should be explicitly stated but when inappropriate assumptions are made implicitly then the model's user is disarmed and is left unprepared for the results. This is especially true with computer-oriented simulations.

Whether or not an assumption is appropriate is determined by how well the results constitute a reasonable approximation to the real-world situation under study. Hence, the concern with approximations. The paper illustrates: approximations, and arguments that incorporate inappropriate assumptions.

Thursday, 1030-1200

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TAA03 Operations Other Than War (OOTW) Methodology-Force Analysis Spreadsheet Tool OOTW Requirements (FASTOR)

The Office of the Deputy Chief of Staff for Operations and Plans (DAMO-FDF) requested US Army CAA to provide OOTW force requirements for use in Total Army Analysis 2003 (TAA03). OOTW force requirements can be used to assess the impact of OOTW on the Army's ability to execute Major Regional Contingencies. The TAA03 OOTW methodology is an analytically and doctrinally sound process to determine Combat Support and Combat Service Support (CS/CSS) unit requirements. Supporting data and documentation were developed for each of four Defense Planning Guidance (DPG) OOTW illustrative planning scenarios: Peace Enforcement, Humanitarian Assistance, Peacekeeping, and Lesser Regional Contingency-Light.

The **TAA03 OOTW methodology** consists of the following major elements:

(1) Develop operational and logistical support concepts for each scenario.

(2) Develop a Master Sequence Event List to describe the time sequencing of major activities in the scenario.

(3) Conduct workshops with participation by CAA, MACOMs, and Branch Schools to:

a. Identify task requirements using the TRADOC Blueprint of the Battlefield, TRADOC Pam 11-9.

b. Develop and refine logistic and scenario data and assumptions.

c. Develop existence and workload allocation rules to match unit capabilities to task requirements.

(4) Develop a spreadsheet tool to calculate force requirements.

FASTOR is a generalized OOTW force requirements model which allows planners to determine force and sustainment requirements by selecting primary mission forces and defining critical scenario and logistics support data. FASTOR is a generalized model in the sense that its rules of force allocation were derived from the knowledge-base gained from the development of rules for the four DPG OOTW scenarios. An initial cut troop list can be developed in minutes. FASTOR is a spreadsheet tool based on EXCEL version 5.0.

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Special Reconnaissance/Direct Action Missions Study - taken from the Special Operations/Low Intensity Conflict (SO/LIC) Study - Phase 2

Approved abstract not available at printing.

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Source Data Acquisition for the Close Combat Tactical Trainer (CCTT)

With the DoD reduction in funds for the research and development of major weapon systems and the need to continue training soldiers under austere funding constraints, the need for simulators like the Close Combat Tactical Trainer (CCTT) becomes even greater. Information is vital to the effective and economical development of training aids, devices and simulators. As a part of the Army's information management initiative, the Simulation, Training and Instrumentation Command (STRICOM) through its support contractor, Resource Consultants Inc. (RCI) has taken the lead in collecting, collating, recording, storing and distributing information vital to the production of the CCTT. This data will be re-used in the development and procurement of follow-on trainers.

To build training devices like CCTT, the production contractor and the various Government agencies responsible for verification, validation and accreditation of the devices must have detailed data concerning the weapon systems that are to be modeled. To support this data collection requirement, RCI has developed three user oriented data bases. This paper discusses these data bases: the Document Cataloging System (DOCATS), the Equipment Characteristics Data Base (ECDB) and the Combined Arms Tactical Trainer Task (CATTASK) data base. The tremendous cost and schedule savings that accrue by having data available at contract award make this approach viable for follow-on Combined Arms Tactical Trainers as well as other simulations or simulators that need data.

WG 11 — SPECIAL OPERATIONS/OPERATIONS OTHER THAN WAR - ABSTRACTS

Chair: **Greg Jannarone, Consultant**
Cochairs: **Rob Roberson, Argonne National Laboratory**
LTC Robert Smith, USSOCOM
MAJ Andy Yee, USASOC
COL Terry Silvester, USAF Special Operations School
Robert Holcomb, IDA
Advisor: **Ray Stratton, Locheed Martin Corporation**
Room: **Rickover Hall - Room 235**

Tuesday, 1030 - 1200

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Modeling Special Operations in Major Regional Conflicts (MRC), Lessor Regional Contingencies (LRC), Peace Time Operations, and Operations Other Than War (OOTW)

In order to adequately support USSOCOM components, Theater Special Operations Commands (SOC), and the USSOCOM POM process, USSOCOM is developing a new approach to mission analysis. The process focuses on analyzing theater Operation Plans (OPLAN), evaluating current SOF capabilities against present and future theater strategies, tasks, and requirements. The objective is to identify deficiencies, redundancies, and the need for future capabilities to ensure SOF effectiveness in an ever changing global landscape. In addition to establishing a baseline for evaluating SOF in a single MRC or nearly-simultaneous MRC's, excursions are performed to evaluate the effects of changes in organization, leadership, training, doctrine,

or material. This briefing will cover the methodology employed and emerging analytical results.

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SOF Attrition Factors Development and Analysis

Currently, Special Operations Forces attrition factors do not exist. The US Army calculated attrition factors and published them in FM 101-1-1/2. These factors were calculated based on Korean War and WW II data. Concepts Analysis Agency is considering conducting attrition factor analysis but has no plans to include SOF.

Selected SOF missions will be modeled with a high resolution simulation and attrition factors developed from the simulation results. These results will be studied in the Joint Mission Analysis to determine future force requirements for all SOF.

Tuesday, 1330 - 1500

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SOF in the Joint Tactical Simulation

The Joint Tactical Simulation (JTS) is a real-time, interactive, entity-level simulation that may be used for training and site analysis. The program is a combination of the Air Force Security Exercise Evaluation System and 7th Army's Urban Combat Computer Assisted Training System. The conflict simulation capabilities of the model enable it to be used to determine the preferred mix of manpower, weapons, tactics, and technology to assess the effectiveness of large and small unit tactics, plans, and procedures. The model is also an excellent site analysis tool which can be used to identify vulnerabilities and evaluate compensatory measures.

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Impact Assessment of Psychological Operations During Desert Storm

A post-operational analysis was conducted to determine the statistical methods used to measure the effectiveness of psychological operations in Operation Desert Storm. This briefing will analyze how the psychological impact of various media were measured through a post-testing process. This will include an evaluation of the effectiveness of standard post-test methods and field expedient methods. Additionally, a review of how psychological impact indicators might be used in future conflicts will be discussed.

Wednesday, 0830 - 1000

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USSOCOM COEA of the Advanced Multi-Mission Vertical Lift Aircraft (MV-X)

This Cost and Operational Effectiveness Analysis (COEA) was directed by the Secretary of Defense in 1993. It evaluated both the MV-X and the U.S. Navy's Medium Lift Replacement (MLR) to support Defense Acquisition Board deliberations. The COEA examined five alternative sets of aircraft. The COEA team examined ten sample missions or scenarios to determine how well each could be performed by the various sets of aircraft. A system of scoring the operational effectiveness of each alternative was developed rating (1) ability to execute the mission, (2) efficiency, (3) timeliness, and (4) supportability. Life cycle costs of each fleet of alternative aircraft were analyzed within specified OSD constraints. The study concluded that the CV-22 was the only aircraft that met mission positioning and execution requirements in all COEA scenarios. Moreover, the CV-22 was the only alternative that could accomplish the majority of mission requirements for MRCs and NMs, as documented in the Joint Mission Analysis (JMA) data base. Although expensive, it was the only alternative that met the stated need.

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Advanced SEAL Delivery System COEA

A COEA was performed to support the Milestone II decision for the Advanced SEAL Delivery System (ASDS), an acquisition category (ACAT) III program. The ASDS is a long-range, high-performance midget submarine used to insert and extract Special Operations Forces into high threat coastal target areas. The COEA focussed on refining and clarifying the performance requirements and performance objectives for various sub-systems and relating those performance requirements to operationally meaningful Measures of Combat

Effectiveness. Specific requirements that were addressed were:

- Range, Speed and Mission Endurance
- Acoustic and Magnetic Signatures
- Shallow Water Maneuverability
- Payload Requirements
- Communications Requirements
- Strategic Transportability (Air Transportability)
- Human Factors
- Fleet Size and Basing

Subsequent to the COEA, a decision was made to proceed with the ASDS program, incorporating many of the COEA derived requirements and objectives. The first ASDS is under construction and is expected to be launched in early FY 97.

Wednesday, 1330 - 1500

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SOF Joint Applications: SOF Integration into a Joint Synthetic Battlefield Environment

This briefing will describe a demonstration that provides SOCOM with networking mission planning and simulations capabilities from various locations and the ability to integrate several types of mission planning systems into a common planning system within a joint environment. It demonstrates the need to continue efforts using existing networking architectures to link operational units, training facilities and centers, and deployed elements by utilizing current and future training aids, devices, computers, simulations and simulators not only in a training environment, but also during field exercises and operations environments.

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Conceptual Framework to Analyze Contributions of SOF

It is difficult to analyze the contributions of special operations forces (SOF). Analysis at tactical level is difficult due to flexible employment concepts, unique combat actions, and unforeseen employment opportunities. Moreover, there is radical discontinuity between tactical level and operational level outcomes: SOF often exert leverage out of proportion to their combat power. Due in part to these inherent difficulties, currently used computer-based models are inadequate to analyze SOF contributions.

A conceptual framework for analyzing SOF contributions requires 1) objectives to provide a context for evaluation, and 2) a taxonomy of special operations to show employment opportunity.

Objectives are best understood in a hierarchy: national goals, national security objectives, national military objectives, campaign objectives, and operational tasks.

Doctrinal "missions" (counterterrorism, special reconnaissance, direct action, unconventional warfare, foreign internal defense) do not provide a useful taxonomy for analysis of SOF contributions. A useful taxonomy distinguishes four contexts for special operations: national-level tasking, large-force operations, guerrilla warfare, and other use.

Thursday, 0830 - 1000

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Theater Level OOTW Modeling: Applications of Decision Making Theory

Since the end of the Cold War the United States Armed Forces have been repeatedly called upon to perform operations that are not related to winning a full scale war. The frequency of U.S. involvement in these type operations, Operations Other Than War (OOTW), has increased at a rapid pace as the nation becomes more involved with United Nations operations world-wide. As a result, the development of appropriate decision logic to use in models for these type operations is of interest to the U.S. Army.

In this environment, a decision maker must consider the impact of the planned operation on civilians, the public opinion in the U.S., and the host nation. In many instances the political and diplomatic factors outweigh the tactical and military considerations. The problem is to develop a model which will simulate the decision making process of a theater level staff in the OOTW environment. The model must consider as many of the OOTW specific factors as possible, while remaining computationally feasible. The model should be robust enough to handle a wide variety of situations and yet be simple enough to easily see the cause and effect relationships evident in the outcomes.

The decision module uses a decision tree structure and multi-attribute utility theory to solve for the best course of action for a particular region of the theater at a specific time. The decision model produces a course of action for each region in the theater for each decision cycle.

The model was tested using data representative of Somalia in late 1992. The results of this test demonstrated the feasibility of using this type model to capture certain key aspects of OOTW.

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Spectrum, An Operations Other Than War Simulation

Spectrum is a computerized simulation that is being developed by the National Simulation Center to support command and control training for military missions and operations other than war. Spectrum combines conflict, attrition based modeling with a multivariate sociological model to replicate the unpredictable and chaotic environment associated with military missions and operations other than war. In simpler terms Spectrum portrays a thinking, reacting, and unpredictable civilian population and the environmental phenomenon which effect the civilian population. The cause and effect results stimulate the decision making procedures of the military staff, exercising staff coordination and inter-agency coordination and communication. Spectrum further simulates movement over digital terrain, line of sight and observations, logistical problems, and combat operations.

The training audience for Spectrum spans all echelons ranging from strategic policy formulators (National Security Council, Joint Staff, State Department, etc.) to operational planners at the military groups assigned to the embassy in the host nation and the operational and tactical military staffs once deployed to conduct military missions and operations other than war. Exercises can be designed to encompass al training audiences or each respectively.

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Force Facilitator for OOTW Planning and Analysis

In January 1994, TRADOC Analysis Center (TRAC-FLVN) and the US Central Command developed a prototype software program called the OOTW Force Facilitator. The PC-based program provided a database structure to assist planners develop a force list during crisis action planning. Programmers at Ft. Leavenworth continue to develop the program under management from J8, Technical Support and Operations Division. TRAC-FLVN delivered the first prototype to J8 in late January, 1995. The new model, now titled Crisis Action Planning System (CAPS), continues under development. The model is of interest to all the unified commands as a tool integral to crisis action planning. This summary provides an updated status on the program, proposed enhancements and modifications, scope of applicability, and possibly a demonstration of the software.

WG 12 — AIR DEFENSE - ABSTRACTS

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Cochair: **Anita Ontiveros, USAADAS**
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Approved abstracts not available at printing.

WG 13 — ELECTRONIC WARFARE AND COUNTERMEASURES - ABSTRACTS

Chair: **James Oliver, AFIWC**
CoChairs: **Terry Cronin, IEWD**
Don Lewis, Battelle
Fred Levien, NPGS
Advisor: **Roy Reiss, AFSAA**
Room: **Rickover Hall - Room 237**

Tuesday, 1030 - 1200

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Joint TACAIR Electronic Warfare Study

Approved abstract not available at printing.

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C2W Analysis and Targeting Tool

Approved abstract not available at printing.

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Survey of Air-to-Air Threats

Approved abstract not available at printing.

Tuesday, 1330 - 1500

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Flight Path Planning to Support Collection Management

When planning a flight path intended to efficiently collect energy from the electromagnetic spectrum, it behooves a pilot to be knowledgeable about the locations and types of emitters on the terrain beneath him. Some of the emitters may be considered potentially relevant sources of electromagnetic information, while others may be deemed obstacles to be avoided. If a simplifying assumption is made that each emitter emanates energy in a spherical pattern about its location, then each spherical envelope may exhibit isolation, tangency, or overlap with respect to neighboring envelopes. Since there are two types of spherical envelopes (attractors and repellers), there are a total of six possible configurations to consider repellers), there are a total of six possible configurations to consider when constructing an optimal flight path. For example, one arrangement is a repeller contained within an attractor, where it is shown that the optimal path is described by the three dimensional equidistance locus, in this case an oblate spheroid. In fact, for all six configurations, it is shown that the optimal flight path belongs to a family of curves known as the quadric surfaces, which are simply trivariate equations of the second degree.

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Sensor Planning for Elusive Targets

Approved abstract not available at printing.

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Deployment Planning and Analysis for Time Difference of Arrival and Differential Doppler Location Finding Assets

The purpose of this research is to determine techniques and guidelines which may be incorporated into doctrine for the employment of the next generation of Army location finding assets. Current doctrine is based on the use of direction finding assets which use angle of arrival (AOA) techniques to determine enemy emitter locations. The next generation of such systems will use time difference of arrival (TDOA) and differential doppler (DD), improving the accuracy in enemy emitter location estimation. While these systems provide a marked advantage over current systems, the accuracy of a location estimation is heavily dependent on the geometry among the target and the location finding sensors. The methodology used to develop guidelines is based on the fundamentals of response surfaces. The purpose of such a methodology is to determine which factors most effect the accuracy of location finding estimation, what levels of these factors typically produce higher accuracy, and what are the effects of tradeoffs among factors. Developed guidelines should be robust in that slight deviations from a recommended array of sensors should result in "good" location finding accuracy.

Current field manuals provide very general guidelines for the employment of both ground and airborne IEW assets. These guidelines are dependent on the commander's intent and the mission, enemy, terrain, troops and time available (METT-T). However, these guidelines focus on location finding techniques using direction of arrival or AOA direction finding. Doctrine and guidance is lacking for newer, more accurate systems employing TDOA and DD techniques.

This paper describes guidelines for the deployment of these sensors, and the methodology developed to find these guidelines. The methodology includes an iterative sequence of the following:

1. Set up and run a designed series of experiments (computer simulations) that yield measurements of the accuracy in terms of circular error probables (CEPs).

2. Conduct an exploratory data analysis (look at pairwise correlations and variable transformations).

3. Use model selection criteria (cross-validation or predicted square error) to identify a model.

4. Test the model on new data:

   a. If the model is not satisfactory:

      (1.) Go back to step 3 or

      (2.) Adjust the experimental design and return to step 1.

   b. If the model is satisfactory, use the model to construct a new experimental design, determine near optimal settings of the factors considered, determine which of these factors have the greatest effect on accuracy, and analyze the tradeoffs among these factors.

5. Summarize the results obtained as guidelines and techniques for deploying location finding sensors.

Wednesday, 0830 - 1000

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Development of an Automated Catalog of Models and Simulations Including EW and CM Elements

Approved abstract not available at printing.

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Missile Approach Warning System - Navy Force Package III/IV (Operational Effectiveness Study)

The Missile Approach Warning System (MAWS) Study was directed in recognition of current combat aircraft electronic countermeasures limitations against both the radar directed and passive surface-to-air-missile (SAM) threat. MAWS represents a technology advancement, whereby crew members are given detection and warning capability of missiles as they approach the aircraft versus ambiguous electronic/visual indications of launch. Force Package III/IV represent the final in a series of three studies concluded by Air Force Studies and Analysis regarding MAWS. The heart of this study includes a realistic simulation of two representative Missile Approach Warning Systems (MAWS) as evaluated against the full spectrum of surface-to-air (SAM) threats in a 2010 SouthWest Asia campaign scenario. Specifically, the study concentrates on Naval and Marine strike aircraft; to include AV-8B, F-14D, F-18C/D and F-18E/F, from penetration through attack and egress. All aircraft are modeled at full fidelity with regard to ECM pods, chaff and flares, radar-warning-receivers, and defensive maneuvers. Four digital models serve as the basis for analysis. The Enhanced Surface-to-Air Missile Simulation (ESAMS) and Radar Directed Guns (RADGUNS) models are used for one-on-one analysis and probability-of-kill (Pk) determinations. SUPPRESSOR is used to determine probability-of-engagement (Peng) of threat systems by modeling raids against a high fidelity Integrated Air Defense System using specific flight paths and tactics. TAC EC models the same raids coupled with the previously determined Pk and Peng values to determine attrition results over a campaign level effort. Study results provide Naval decision makers with an unbiased perspective of the differences between the underling technologies of two distinct systems while also serving to demonstrate each system's capability to reduce force attrition.

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Practical Lessons Learned in DIS

During 1994, Battelle made a significant investment in both hardware and software to substantially improve our capabilities in Distributed Interactive Simulation (DIS). This process, while successful, was subject to a great deal of technical frustration. This presentation is aimed at documenting our experiences so that others may be spared from climbing the steep learning curve.

The display of the DIS virtual battlefield is heavily dependent on emerging visual simulation (vis sim) technology which currently promises more than most hardware/software can deliver. Battelle evaluated and purchased a number of vis sim/DIS products. Our experiences with these products will be discussed along with a number of suggestions for how we would do things differently next time. The presentation will also discuss the merits of open versus proprietary hardware/software architectures.

Battelle's experiences in converting an Extended Air Defense Simulation (EADSIM) scenario for playback in a DIS environment will also be discussed.

Wednesday, 1330 - 1500

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Ultra Wideband as a Communication Systems Jamming Tool

The broadening of the application of Electronic Warfare to include disruption of communication networks, raises the question of what tools are available to perform this mission. With the increasing popularity of spread spectrum systems in the field of communications, two such systems have been selected for evaluation as to their susceptibility to jamming by Ultra Wideband (UWB) signals.

Cellular radio systems are proliferating in third world countries as the communication system of choice for many military applications. Furthermore, inputs from other sources suggest a possibility the UWB systems may be effective in disrupting cellular telephone traffic. As a companion military system, the widely fielded SINCGARS radio is also chosen for examination in this study.

The effort will include data on commercially available UWB sources as they are employed as a jamming source in both the above systems. Experimental data will be gathered to determine both power level versus effectiveness, and the mechanism of signal disruption.

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Optimization of Shipboard Self-Protection ECM Systems Using SCE Techniques

Shipboard self protection systems play an important role in countering the surface to surface anti-ship cruise missile (ASCM) threat. The use of these systems can alter the flight path of the ASCM causing it to miss the ship completely. Using hardware-in-the-loop ASCM simulator technology, a cost effective tool is maintained for testing and evaluating ECM hardened ASCMs under various tactical conditions. The ASCM simulators have one or more characteristics which when detected by the shipboard self protection system, provide the appearance of an actual ASCM threat weapon system with a prescribed degree of authenticity.

Recently, a ASCM simulator correlation environment (SCE) has been described which integrates the results of various test configurations (e.g., closed-loop in an anciboic chamber, captive carrying on board an aircraft) [1]. This environment allows the effectiveness of the ECM to be calculated numerically across experimental configurations. Using SCE techniques, this paper examines the optimization of shipboard ECM suites against the ASCM threat. ECM parameters such as designation range, and recycle time are quantified to determine the largest miss distance.

[1] P.E. Pace, B.H. Nishimura, C.C. Cooper and R.E. Surratt, "Correlation of anti-ship cruise missile simulator ECM experiments", AOC Joint Western Mountain Region Technical Symposium, April 24, 1995.

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A New Approach to EW Model Development and VV&A

As the geopolitical scene continues to evolve and our technological abilities soar, we constantly find ourselves submerged in a pool of opportunity. In the electronic warfare modeling and simulation community, this opportunity is allowing us to move forward from conjecture based models to knowledge and data based models. This knowledge and data is a direct result of implementing new technology for component and system level exploitation of Soviet designed and built weapon systems, with the intent of constructing high fidelity, short run-time engagement models. With this newly designed process of model development, a different approach to Validation, Verification, and Accreditation must be identified. It must account for the limited resources allocated to weapon system exploitation as well as the small sample size of systems. This paper will discuss the model development process as well as the proposed validation techniques, to include a broad level trend analysis and a reliability study with respect to weapon system components and groups of components.

Wednesday, 1530 - 1700

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The AIM-120 CSS - An All Digital High Fidelity Missile Simulation Employing Tactical OFP

Approved abstract not available at printing.

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Simulation of Foreign ECM System in a High Fidelity All Digital Environment

Approved abstract not available at printing.

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Assessing Weapon System Performance in Complex ECM Environment Utilizing All Digital Simulations

Approved abstract not available at printing.

Thursday, 0830 - 1000

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Joint Advanced Distributed Simulation Electronic Warfare Test

The Joint Advanced distributed Simulation (JADS) Joint Test and Evaluation (JT&E) Program is chartered to investigate the utility of Advanced Distributed Simulation for both developmental and operational test and evaluation. As part of this effort the JADS team is developing a test concept to evaluate the application of advanced distributed simulation to electronic warfare testing. The focus of this effort is on mission level test and evaluation of airborne self protection systems.

This presentation outlines a modified electronic warfare test and evaluation process for self protection systems that uses advanced distributed simulation to obtain a consistent mission level evaluation of system performance throughout the acquisition life cycle. The JADS EW test, designed to demonstrate this ADS enhanced test process, is described in detail. This test evaluates the mission level performance of an existing self protection system in various test configurations that are designed to simulate the acquisition life cycle of a typical EW system. A linked test environment is used to interconnect geographically separated test assets and provide a simulated combat mission environment for the system under test. Areas covered in the presentation include risk factors associated with establishing the linked test environment and conducting the test, fidelity and link latency considerations, and the validation of test results.

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A Constraint-Based System for Siting of Air Defense Missile Batteries

Approved abstract not available at printing.

Thursday, 1030 - 1200

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Line of Sight Algorithms

Approved abstract not available at printing.

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Evolution of Field Line of Sight Collection Techniques and Statistical Analyses

The U.S. Army Topographic Engineering Center (TEC) has been involved in the collection of ground Line of Sight (LOS) data to support Army studies since 1980. This paper describes the evolution of techniques supporting the collection of these LOS data in the field. Ground truth LOS data are used in conducting in-depth analyses of elevation model capabilities and limitations. These data also support various comparative analyses for applications such as terrain visualization, line of sight masking, and associated tactical decision aids (TDAs). Over the years, TEC has employed state of the art technologies such as electronic distance measuring (EDM) equipment, Global Positioning Systems (GPS) in differential and Precise Positioning Service (PPS) modes, GPS controlled photogrammetry, and the most recent TEC system development, On-the-Fly (OTF) GPS (uses rapid kinematic techniques) to collect the field LOS data.

Initially, LOS field work was conducted at Fort Hood, Tx, to support a high resolution Tactical Terrain Data (TTD) prototype evaluation. At that time, EDM equipment was the primary data acquisition tool since the GPS constellation was not fully operational and could not support the required near real time collection of position information. In 1993, additional LOS field work was conducted at Fort Bliss, TX and Fort Irwin, GA. At that point, EDM equipment was still the primary collection tool, though GPS technology and capabilities played a greater role and its potential for future use was clear. As our field measurement capabilities have progressed and matured, more accurate and higher resolution elevation data have surfaced for evaluation. By 1994, GPS technology had become the dominant technology in our ground data collection field work at Fort Irwin, CA, Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), CA, and Yakima Training Center, WA. However, EDM equipment was also employed as a redundant capability. To investigate the relationships between GPS and EDM measurements, statistical analyses were performed on these data. The thrust of one set of analyses was to examine whether the differences in GPS measurements and EDM measurements were statistically significant. Another set of analyses examined the relationship of the "Q" value (an accuracy predictor for the hand-held receiver) to the differences in GPS and EDM distance measurements.

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DSN 281-2411 ext.7599

Propagation Analysis using TIREM

The Joint Spectrum Center (JSC) is responsible for analysis and development of capabilities that are used to ensure the efficient utilization of the electromagnetic spectrum. This responsibility includes the development of propagation models for a wide range of applications throughout the entire electromagnetic spectrum. For groundwave propagation in the troposphere at frequencies from HF through SHF, the Terrain-Integrated Rough-Earth Model (TIREM) is used. TIREM computes the path loss, accounting for the effects of the terrain, using simple solutions to estimate complex interactions. The relatively fast TIREM module is suitable for many-on-many analysis or for contouring performance parameters over large geographic regions. The TIREM model has been used in analysis and simulations throughout the Department of Defense (DoD) for a variety of purposes including communications coverage, weapons systems evaluations, intelligence evaluations and EW assessments. An overview of the TIREM model is provided and includes a discussion of the theory, applications, and associated data bases.

Thursday, 1530 - 1700
James Havens
AFIWC/SAA
102 Hall Blvd, Suite 338
San Antonio, Tx 78243-7020
Phone: 210-977-2427

Radar Dynamic Target Signatures

The dynamic variations, "Scintillation, Glint, and Doppler", of radar target signatures, critically effect a radars performance. Indeed, it is these variations that facilitate signature processing. This is especially true under ECM/ECCM conditions. Modeling and simulation of radars and missiles must include these dynamic variations to meet the requirements of verification, validation, and operational support for the warfighter. The use of static radar signatures for these purposes is not adequate. This is a presentation of a solution to the simulation of dynamic signature modeling, with applications to target detection, acquisition, and tracking in an ECM/ECCM environment.

Dan Reuster, Ph.D.
ARINC MS 5275
2551 Riva Rd.
Annapolis MD 21401
Phone: 410-266-4526

Development of a Low RCS Reflector Antenna System

Approved abstract not available at printing.

Russell T. Frazier
CECOM RDEC Intelligence and Electronic Warfare Directorate
ATTN: AMSEL-RD-IEW-TRE (Mail Stop 41)
Vint Hill Farms Station
Warrenton VA 22186
Phone: 703-349-6911/6910

Electronic Warfare High Frequency Size Reduction Antenna

Approved abstract not available at printing.

WG 14 — JOINT CAMPAIGN ANALYSIS - ABSTRACTS

Chair: **Dr. Cyrus Staniec, OSD(PA&E)**
Co-chairs: **Mr. Richard Morris, McDonnell Douglas**
LCDR Robert Gregg, OPNAV (N81)
Advisor: **James L. Wilmeth, SAIC**
Room: **Rickover Hall - Room 238**

Tuesday, 1030-1200
LCDR Tom Lang
OPNAV Code N812C3
Rm 4A522, Pentagon
Washington, D.C. 20301
703-695-3797

Common Scenario Development in Support of Campaign Analysis

Approved abstract not available at printing.

Mr. Bill Burch, Mr. Carl Carden
ISA, Inc.
Alexandria, VA
(703) 824-0100

Data Consistency for Joint Analytic Tools

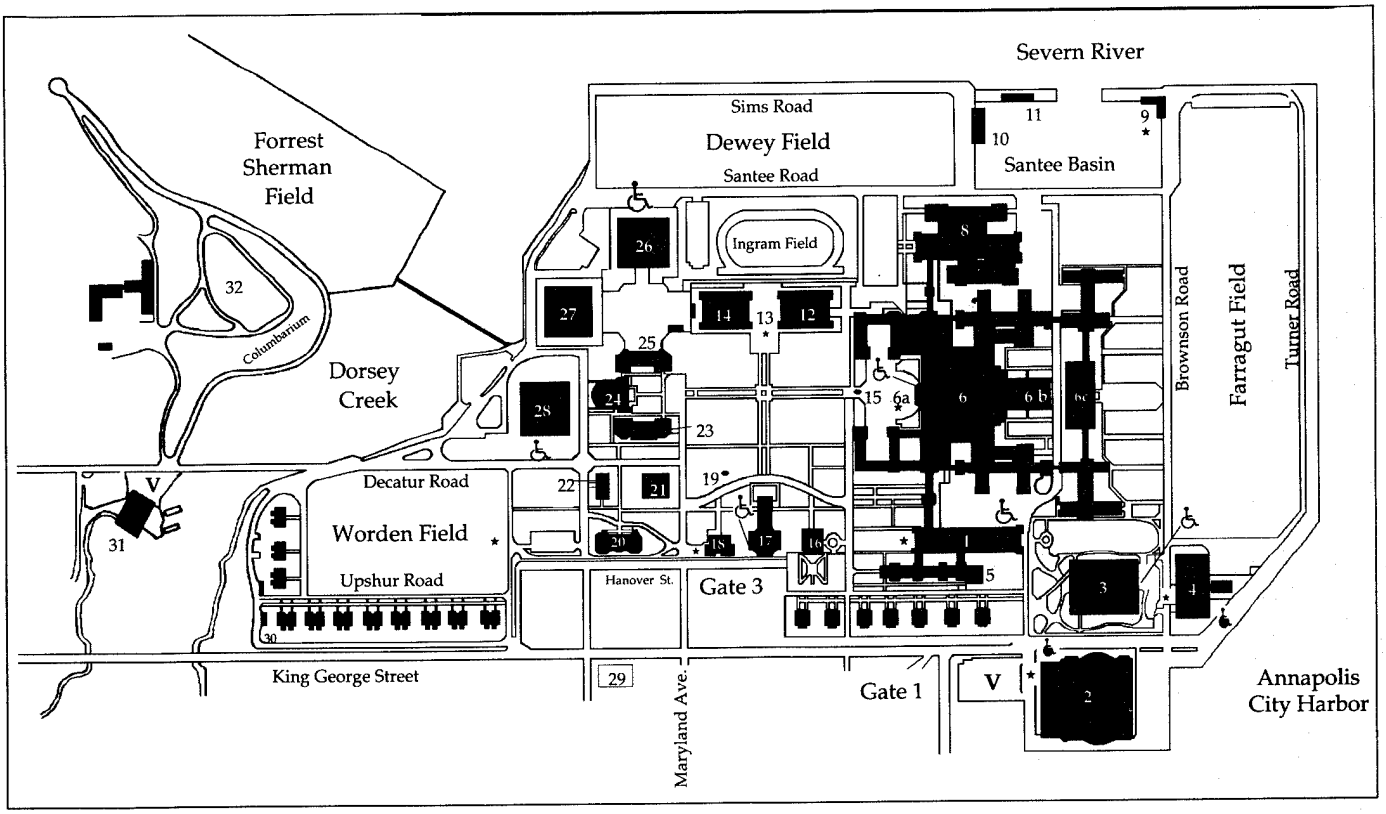
Approved abstract not available at printing.

Tuesday, 1330-1500
Dr. Robert C. Powers
Global Associates, Ltd.
FAX: (804) 422-2781

Joint Campaign Analysis Using Expert In The Loop Modeling Operations

Approved abstract not available at printing.

UNITED STATES NAVAL ACADEMY • ANNAPOLIS, MARYLAND



1. Dahlgren Hall
2. Halsey Field House
3. Lejeune Hall
4. Ricketts Hall
   (Visitors' Center, Senior Enlisted Barracks)
5. Ward Hall
6. Bancroft Hall
   6a. Rotunda and Memorial Hall
   6b. King Hall
   6c. Mitscher Hall
   (Chaplain's Center, All Faiths Chapel and Auditorium)
7. Macdonough Hall
8. Luce Hall
9. Robert Crown Sailing Center
10. Vandergrift Cutter Shed
11. Hendrix Oceanography Lab
12. Chauvenet Hall
13. Radford Terrace
14. Michelson Hall
15. Tecumseh
16. Buchanan House
    (Superintendent's Quarters)
17. Chapel
18. Administration Building
19. Herndon Monument
20. Officers' & Faculty Club
21. Preble Hall
    Naval Academy Museum and Naval Institute)
22. Leahy Hall
    (Candidate Guidance Office)
23. Sampson Hall
24. Mahan Hall
25. Maury Hall
26. Rickover Hall
27. Nimitz Library
28. Alumni Hall
29. Alumni House
30. Officers' Housing
31. Hubbard Hall
32. Naval Academy Cemetery
    (Columbarium)

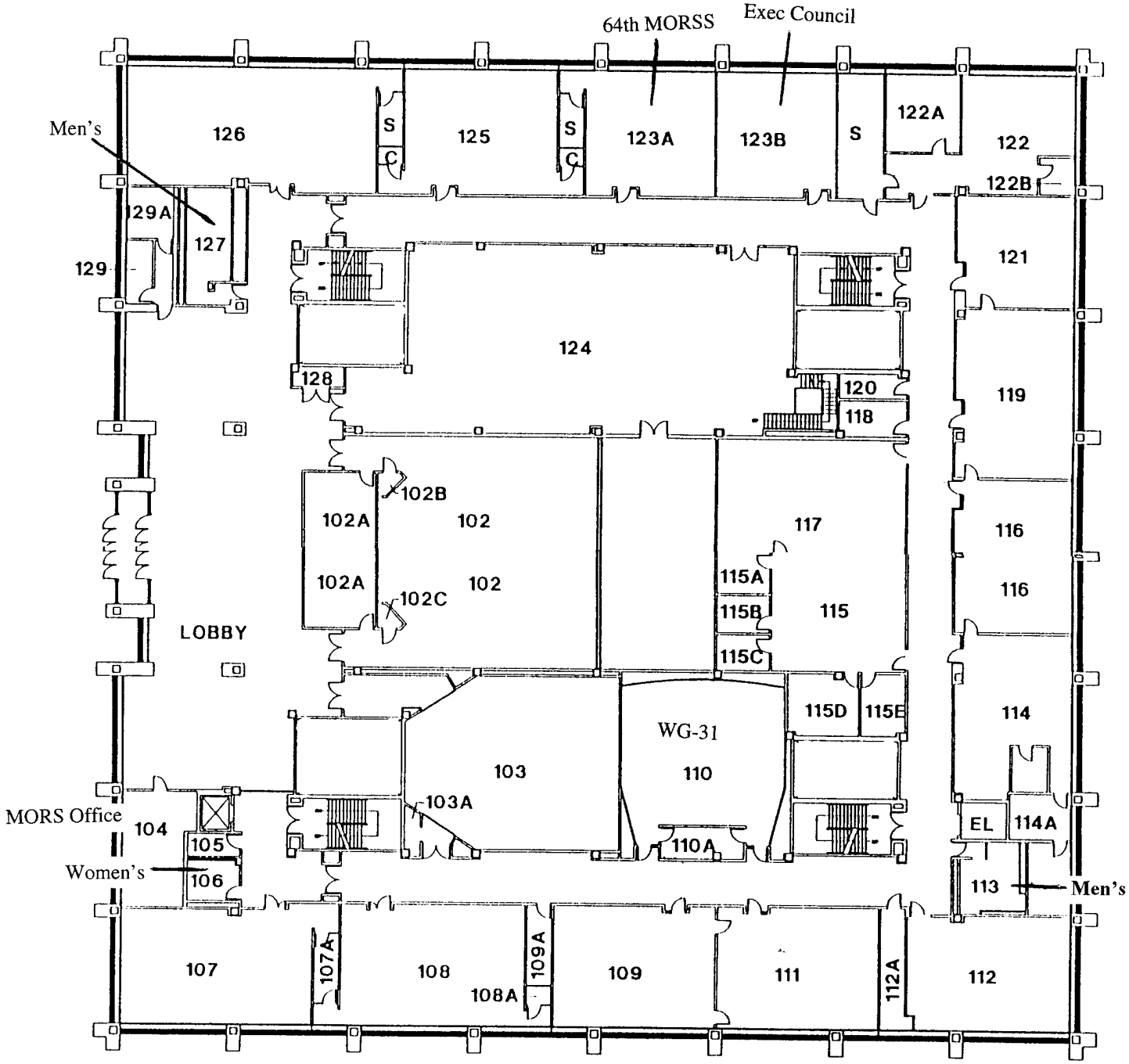
Lost & Found: Gate 3

★ Rest Rooms

Rest Rooms with Facilities for Handicapped

Entrance for Handicapped

V Visitor Parking



Rickover Hall (First Floor)

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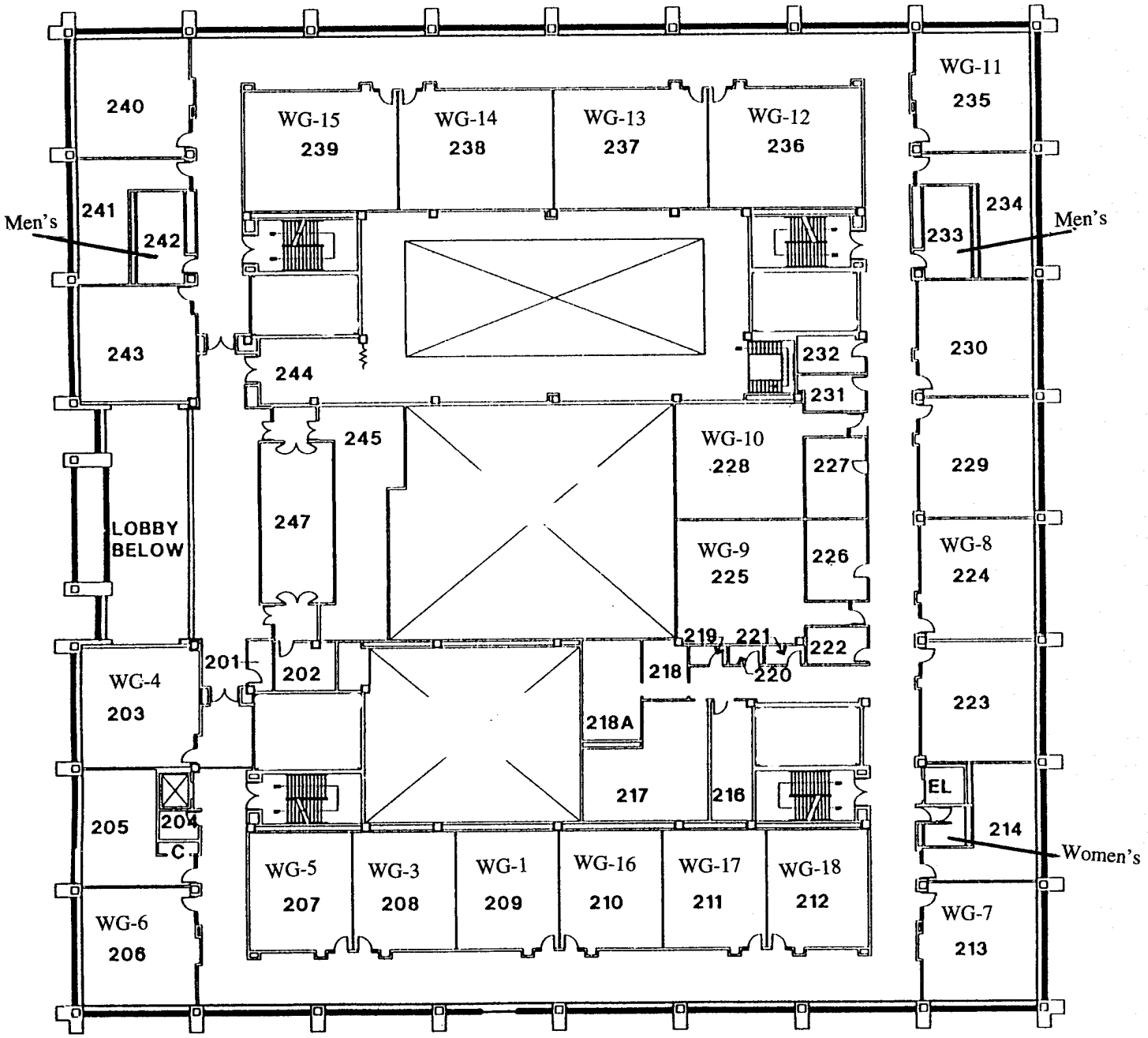


Rickover Hall (Second Floor)

Room designations in program begin with "R"

63rd MORS - AN OVERVIEW

Date	Tuesday June 6							Wednesday June 7							Thursday June 8					
Time	0700-0830	0830-1000	1030-1200 WG I	1215-1315 L&T	1330-1500 WG II	1530-1700 SS I	1715-1900 MIX	0700-0830 THM	0830-1000 WG III	1030-1200 WG IV	1215-1315 L&T	1330-1500 WG V	1530-1700 SS II	1730-2030 SOC	0830-1000 WG VI	1030-1200 WG VII	1215-1315 L&T	1330-1500 SS III	1530-1700 WG VIII	
WG-1	R	P	R209	L	CG-I		M	T	R209	R209	L	R209		B	R209	R209	L	R209	R209	WG-1
WG-2	E	L	C117	U	C117		I	O	C117	C117	U	C117		A	C117	C117	U	C117	C117	WG-2
WG-3	G	E	R208	N	CG-I		X	W	R208	R208	N	R208		N	R208	R208	N		R208	WG-3
WG-4	I	N	R203	C	CG-I		E	N	R203	R203	C	R203		Q	R203	R203	C			WG-4
WG-5	S	A	CG-II	H	R207		R		R207	R207	H	R207		U	R207	CG-II	H	R207		WG-5
WG-6	T	R	CG-II		R206			H	R206	R206		R206		E	R206	CG-II				WG-6
WG-7	R	Y	R213	&	R213			A	R213	CG-III	&	R213		T	R213	R213	W			WG-7
WG-8	A		R224		R224	R224		L	R224	R224		R224	R224		R224	R224	I	R224		WG-8
WG-9	T	A	R225	T	R225			L	R225	CG-III	T	R225		W	R225	R225	T			WG-9
WG-10	I	N	R228	U	R228				R228	R228	U	R228		I	R228	R228	H			WG-10
WG-11	O	D	R235	T	R235			M	R235	CG-III	T	R235		T	R235	R235				WG-11
WG-12	N		R236	O	R236			E	R236	CG-III	O	R236		H	R236		S			WG-12
WG-13		M	R237	R	R237			E	R237	CG-III	R	R237	R237		R237	R237	P		R237	WG-13
WG-14	&	E	R238	I	R238			T	R102	CG-III	I	R238		S	R102	R238	E			WG-14
WG-15		M	R239	A	R239			I	R239	CG-IV	A	R239		P	R239	R239	A			WG-15
WG-16	W	B	R210	L	R210			N	R210	CG-IV	L	R210		E	R210	R210	K			WG-16
WG-17	G	E	R211	S	R211			G	R211	CG-IV	S	R211		A	R211	R211	E			WG-17
WG-18		R	R212		R212				R212	CG-IV		R212		K	R212	R212	R			WG-18
WG-19	C	S	M108		M108				M108	M108		CG-V		E	M108	M108				WG-19
WG-20	H	H	M109		M109	M109			M109	M109		CG-V	M109	R	M109	M109		M109	M109	WG-20
WG-21	A	I	M110		M110				M110	M110		CG-V			M110	M110				WG-21
WG-22	I	P	C116		C116				C116	C116		CG-V			C116	C116				WG-22
WG-23	R		M107		C116				M107	M107		CG-V			C116	M107				WG-23
WG-24	S	M	M111		M111				M111	M111		CG-VI			M111	M111				WG-24
WG-25		E	M112		M112				M112	M112		CG-VI			M112	M112				WG-25
WG-26	W	E	M114		M114				M114	M114		CG-VI			M114	M114				WG-26
WG-27	A	T	M115		M115				M115	M115		CG-VI			M115	M115			M115	WG-27
WG-28	R	I	M116		M116				M116	M116		CG-VI	M116		M116	M116		M116	M116	WG-28
WG-29	M	N	M120		M120				M120	M120		CG-VI			M120	M120				WG-29
WG-30	U	G	M118		M118				M118	M118		M118			M118	M118			M118	WG-30
WG-31	P		R110		R110				R110	R110		R110			CG-VII					WG-31
WG-32			M121		M121				M121	M121		M121			CG-VII	M121			M121	WG-32
WG-33			M119		M119				M119	M119		M119			CG-VII	M119			M119	WG-33
CG-I					R103															CG-I
CG-II			R102													R103				CG-II
CG-III										R102										CG-III
CG-IV										R103										CG-IV
CG-V												R102								CG-V
CG-VI												M117								CG-VI
CG-VII															M117					CG-VII

Facility Notes:

Hall designations are C - Chauvenet, M - Michelson, and R - Rickover
Extra chairs are in the halls outside working group rooms.
Refreshments in Michelson and Rickover lobbies.
Smoking is permitted only outside in designated areas.

Restrooms	Men's	Women's
Chauvenet	H127G	H127L
Michelson	H124G	H124L
Rickover	R127	R106
	R233/R242	R215

MORS Office	104
MORS Exec Council	123B
64th MORSS Committee	123A

Major Events, Lunch Tutorials, and Special Sessions are on the Facing Page!

MAJOR SYMPOSIUM EVENTS

Naval Academy 100th Anniversary Video (On-Going)	R243/M113

Tuesday

Working Group Chairs Warm-Up	Bo Coppedge Room (2nd Floor Alumni Hall)
Regular (Yellow) registration	Alumni Hall
Problem (Green) registration	R104
Plenary and General Membership Meeting	Alumni Hall
Social Mixer	Bo Coppedge Room (2nd Floor Alumni Hall)

Wednesday

Town Hall breakfast for CG and WG Chairs	Leyte Gulf Room, Officer's Club
Dinner	Dahlgren Hall

Thursday

Luncheon	Dahlgren Hall
Working Group Wrap-Up	R102

TUTORIALS - TUESDAY 1215-1315

Neural Networks and Reinforcement Learning	M103
Practical Cost Analysis	M117
Lanchester on Lanchester	R102
The Practicality of Decision Analysis	R103

TUTORIALS - WEDNESDAY 1215-1315

Linking Operations Research and Artificial Intelligence	M117
Data Envelopment Analysis	R103
Presentation Techniques for OR Analysis	R102
How to Run a Winning Working Group	M105
Chaos Theory: Who Needs It?	M103

SPECIAL SESSION I - TUESDAY 1530-1700

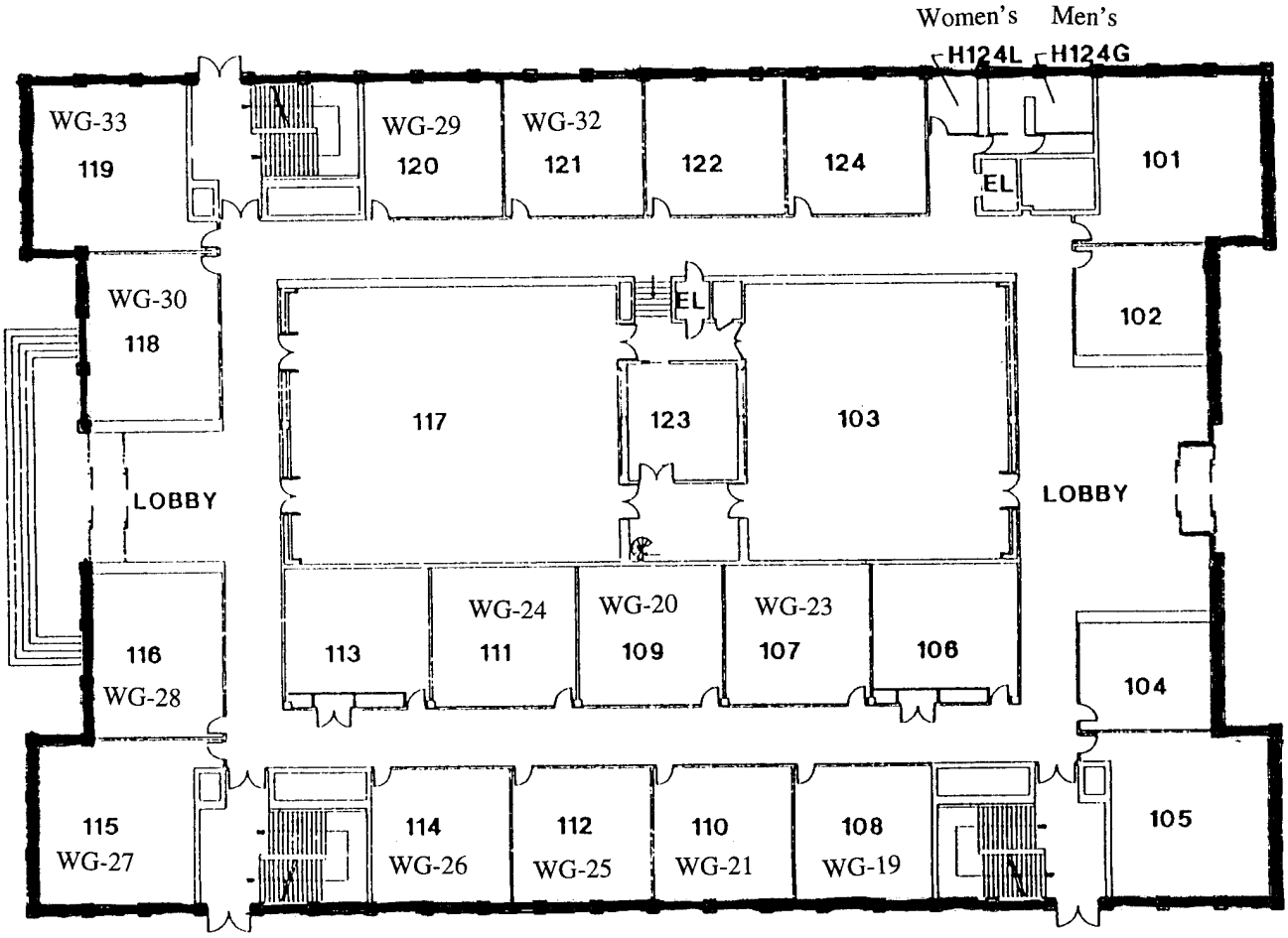
A Workshop Report: SIMVAL '94	M117
Combat ID	R102
Programming for Environmental Compliance Costs	C109/216
Prize Paper Session	M103

SPECIAL SESSION II - WEDNESDAY 1530-1730

Junior/Senior Analyst Session	R103		
Col Thomas Allen	R203	Col Gregory S. Parnell	R213
Seth Bonder	R206	Prof Wayne Hughes	R239
Edward C. Brady	R207	RADM Pat Tracy	R235
Walter W. Hollis	R208	John K. Walker	R236
A Workshop Report: Joint Requirements Oversight Committee			C109/216
Education Session			M117
Readiness Panel Discussion			R102

SPECIAL SESSION III - THURSDAY 1330-1500

A Workshop Report: Simulation Data and Its Management	R103
A NATO Symposium Report: Uncertainty in Defense Decision Making	R102
The Joint Korean Regional Arms Control Project	M117



Michelson Hall (First Floor)

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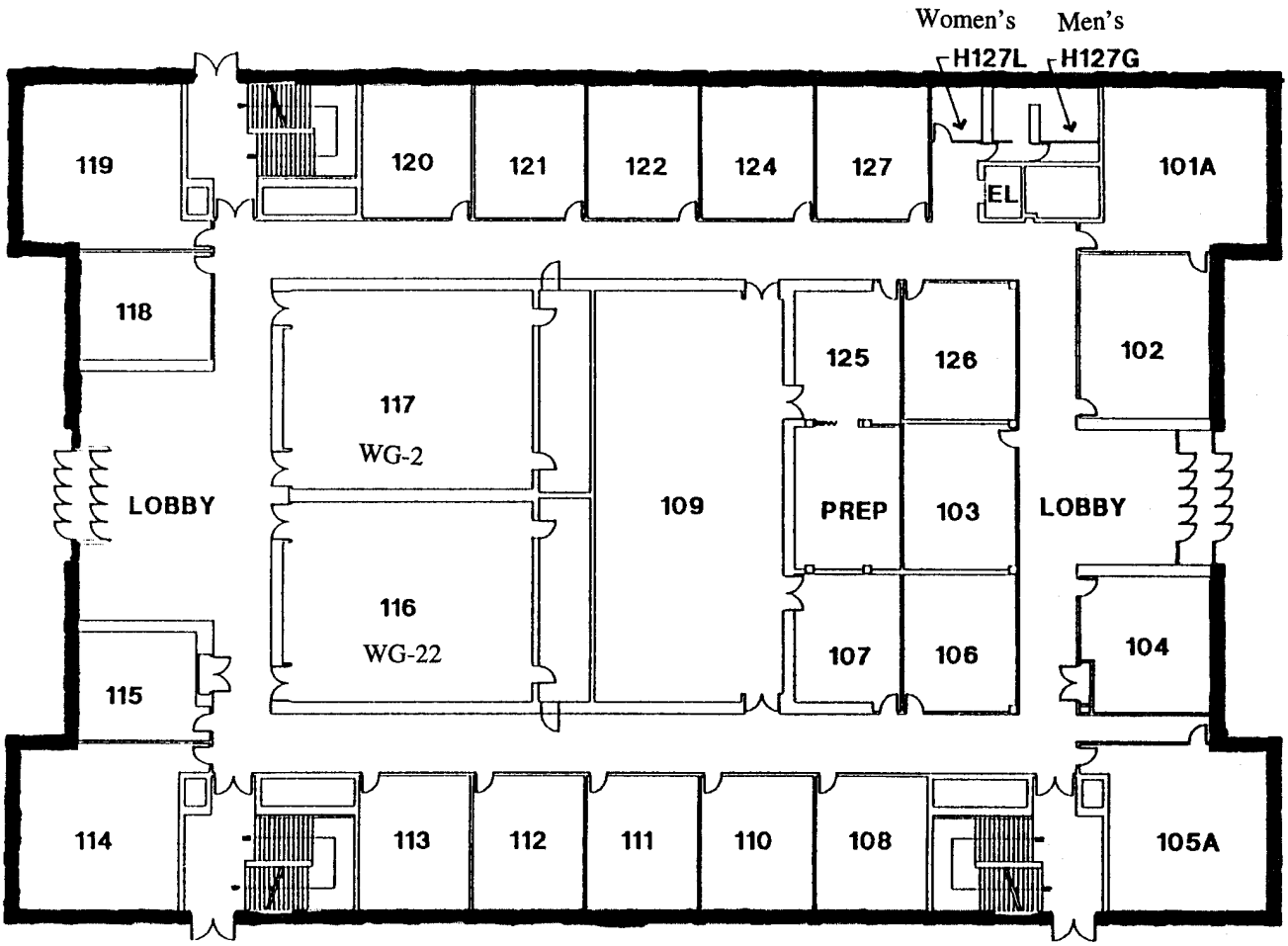
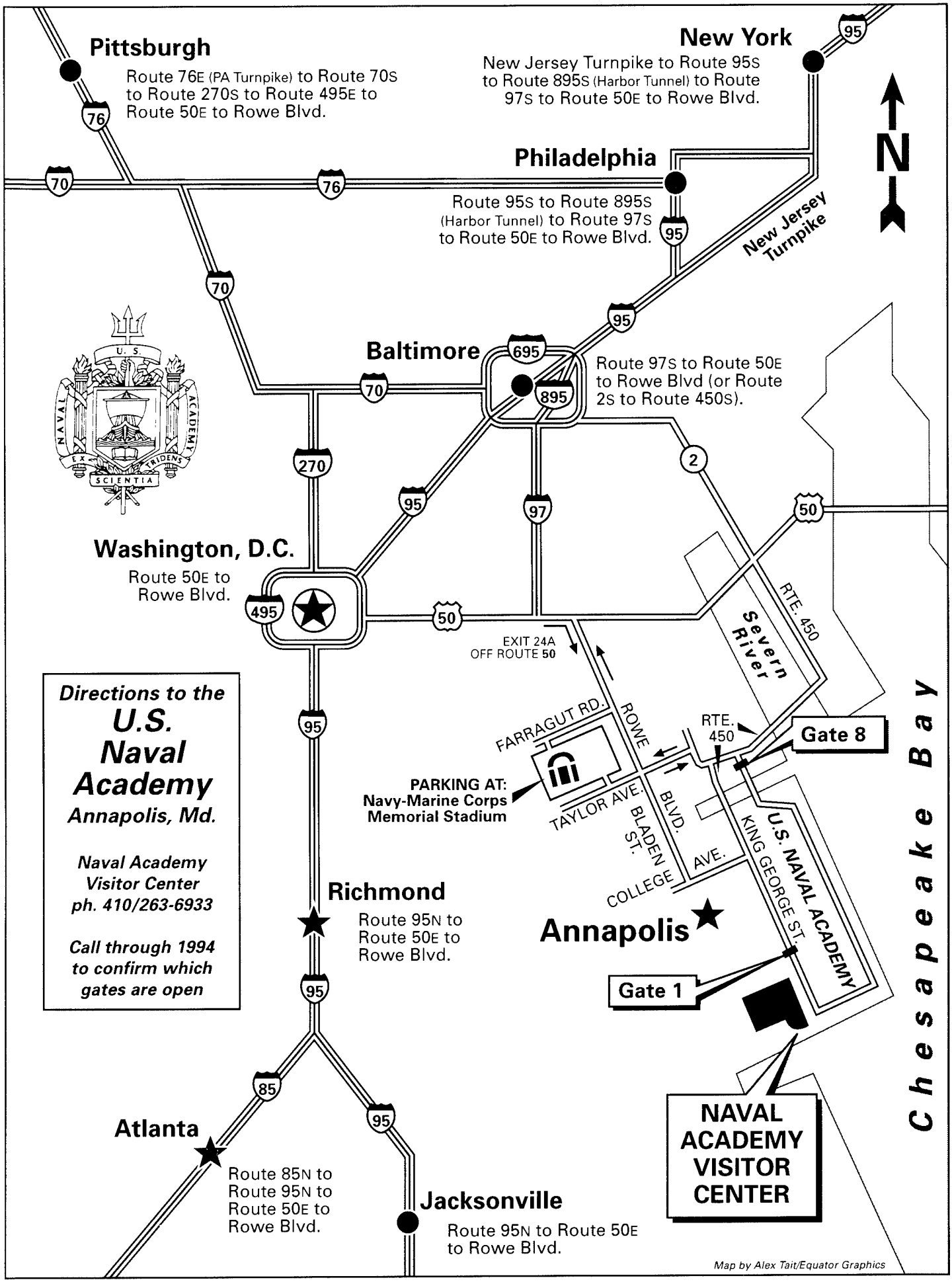


Chauvenet Hall (First Floor)

Room designations in program begin with "C"


Pittsburgh
Route 76E (PA Turnpike) to Route 70S to Route 270S to Route 495E to Route 50E to Rowe Blvd.
New York
New Jersey Turnpike to Route 95S to Route 895S (Harbor Tunnel) to Route 97S to Route 50E to Rowe Blvd.
Philadelphia
Route 95S to Route 895S (Harbor Tunnel) to Route 97S to Route 50E to Rowe Blvd.
New Jersey Turnpike
N
Baltimore
Route 97S to Route 50E to Rowe Blvd (or Route 2S to Route 450S).
Washington, D.C.
Route 50E to Rowe Blvd.
EXIT 24A
OFF ROUTE 50
Severn River
RTE. 450
FARRAGUT RD.
ROWE BLVD.
RTE. 450
Gate 8
PARKING AT:
Navy-Marine Corps Memorial Stadium
TAYLOR AVE.
BLADEN ST.
COLLEGE AVE.
KING GEORGE ST.
U.S. NAVAL ACADEMY
Annapolis
Gate 1
Chesapeake Bay
Richmond
Route 95N to Route 50E to Rowe Blvd.
Atlanta
Route 85N to Route 95N to Route 50E to Rowe Blvd.
Jacksonville
Route 95N to Route 50E to Rowe Blvd.
NAVAL ACADEMY VISITOR CENTER
Directions to the U.S. Naval Academy
Annapolis, Md.
Naval Academy Visitor Center
ph. 410/263-6933
Call through 1994 to confirm which gates are open
Map by Alex Tait/Equator Graphics

Cliff Perrin
McDonnell Douglas Aerospace
Arlington, VA 22202
(703) 412-3947

Two Near Simultaneous Regional Conflicts - 1997 - 2001 - 2005-

This analysis determines results of theater campaigns in near simultaneous Southwest Asia and Korean conflicts occurring near the turn of the century. The analysis uses a McDonnell Douglas developed theater level, multi-warfare analysis model, Air, Land Sea Warfare Analysis Tool (ALSWAT). All aspects of Joint/Combined air, naval and ground warfare are represented in ALSWAT.

Insights relating to Joint warfare issues and implications for new aircraft and missiles are drawn from the quantitative results provided by the conflict simulation. Insights include:

Sufficient build-up time and slight modifications to existing U.S. forces allows the U.S. and its allies to be successful against the postulated threats.

The texture of the conflicts in SWA and Korea are significantly different requiring emphasis on different weapon systems.

Wednesday, 0830-1000

Col Dewey George
JCS J-8, Pentagon
Washington D.C. 20301

Dr. Jim Metzger
OSD(PA&E) Rm 2C270 Pentagon
Washington D.C. 20301

Major David Cox
CENTCOM CAG
McDill AFB, FL 33621

Fighting the Near-Simultaneous MRCs: Part One - Analysis

This first of two "focus sessions" will present the assumptions, analytic process, and some of the observations from three recent analyses of the two near-simultaneous Major Regional Contingencies (MRCs). Included will be a presentation of a unique analytic process used in a recent Joint Staff analysis, observations from the outyear analysis conducted by PA&E, and the analysis conducted by CENTCOM. To find out whose analysis is saying what, come to this stimulating and educational session. Then come back after the break to see what senior leaders have to say about the analyses and the issues.

Wednesday, 1030-1200

COMPOSITE GROUP III SESSION . Rickover 102

Panel Discussion including:

Mr. Fred Frostic, Deputy Assistant Secretary of Defense (Requirements & Plans)

MG Ray Smith, Director, J-5 Plans, CFC Korea

RADM "Mike" Leucke, Director, Plans & Policy, CENTCOM, McDill AFB, FL 33621

BG Robert Hicks, Deputy Director, JCS J-8

Fighting the Near-Simultaneous MRCs: Part Two - Debate

The VIP members of this panel will voice their observations and concerns about the two MRCs and the analyses presented in the previous session. Do the senior decisionmakers think we can do it? What are the possibilities and what are the risks? Find out what is on the minds of OSD, JCS, and the CinCs, and bring your burning questions to ask first hand.

Wednesday, 1330-1500

Major Bill Eliason
Headquarters, USAF
ATTN: XOOC
Pentagon, Washington D.C. 20301

Regional Conflict Model (RCM): A Generic Threat Alternative

Approved abstract not available at printing.

Cpt Tom Cioppa, TRAC-FLVN:
TRADOC Analysis Center - Study & Analysis Center
ATTN: ATRC-SAS
255 Sedgwick Ave.
Ft Leavenworth, KS 66027
comm: (913) 684-9209 DSN 552-9209/FAX 9191
e-mail: cioppa@tracer.army.mil

Early Entry Force Analysis (EEFA)

The Early Entry Force Analysis (EEFA) study was conducted by the Study Directorate of the Training and Doctrine Command's (TRADOC) Analysis Center (TRAC) in support of the Early Entry Lethality and Survivability (EELS) Battle Lab. EEFA examined the Louisiana Maneuvers (LAM) 94 issues of determining how to make light forces more lethal, survivable, tactically mobile and sustainable and determining the potential contribution to the battlefield by middleweight units; light enough for rapid force projection yet tactically mobile and lethal. A new methodology using an expert system (Force Package Planner (FORP)) and spreadsheet Sufficiency Criteria for Realignment Adjustment Processor (SCRAP)) to help determine force packages was developed. An objective lightweight and objective middleweight force package consisting of Army, Marine,

Air Force, and Navy components using this methodology were developed for the European Command (EUCOM) 11 scenario, The Early Entry Force Tailoring Tool (EFFORT), a goal program using the General Algebraic Modeling System (GAMS), was developed to design and tailor force packages rapidly based on the threat/environment/scenario and commander's intent. The Force Tailoring Tools (FORTT) of EFFORT, FORP, and SCRAP offer a new methodology for designing force packages to satisfy any contingency. The analytical insights and conclusions show the improvements which can be made to early entry forces.

Thursday, 0830-1000 ..... **Rickover 102**

Panel Discussion featuring:

Col Gabriel Rouquie, (Chair) USCENTCOM CAG, McDill AFB, FL 33608-6001

Col Henry Cobb, USSOCOM, McDill AFB, FL 33608

Col Robert Graebner, USACOM, 1562 Mitscher Ave, Norfolk VA 23551-2488

Col Carl Johnson, USEUCOM, ATTN: ECCS-AS, APO AE 09128-4209

Analysis Issues in the Warfighting Headquarters

The Unified and Specified Commands face tough analytic requirements every day. Continuing a theme initiated last year, the CinCs' senior analysts will present an overview of the issues that demand answers in their commands, and tell us what problems they face in accomplishing their missions. Have we made any progress on last year's problems - or do we have a crop of new ones? The audience will have a chance to contribute or query the panel members during the question and answer period.

Dr. William G. Lese, Jr.
Deputy Director (PA&E) /Theater Assessments and Planning
Rm 2E330, Pentagon
Washington D.C. 20301-1800
(703) 695-7341

The DoD Joint Analytic Model Improvement Program

Deputy Secretary John Deutch and Admiral William Owens have taken a personal interest in upgrading the quality of the models used in the Department of Defense for joint analysis. Current campaign models cannot do enough (joint operations are an afterthought), do not do well what they can do, and are interoperable through a military analysis operation known as the "cludge." To rectify the situation, Dr. Deutch has chartered a new program which is pursuing a three-pronged approach: (1) Nearterm upgrades to existing models, (2) Rapid development of a midterm joint model based on current developments, and, (3) Longer term development of a fully capable suite compatible with the DoD High Level Architecture for advanced distributed simulation. This talk will describe the overall approach, the participants, the timetables, and the goals of each effort.

Thursday, 1030-1200

LCDR Todd Morgan
USACOM, J73
1562 Mitscher Ave. Suite 200
Norfolk VA 23551-2488
Phone: (804) 444-1806; FAX 445-9267

Joint Campaign Analysis Using the Integrated Theater Engagement Model (ITEM) in USACOM

The USACOM analysis cell recently employed ITEM to meet two diverse simulation requirements. ITEM provided the analytical foundation to examine the force structure adequacy for a CinC's major OPLAN in a primarily blue water scenario. The analytic focus examined whether the apportioned Navy ed Air Force forces in the plan were sufficient or excessive in light of a declining threat force structure. The scenario was first examined and validated in a seminar wargame with participation by representatives from all subordinate commands who provided friendly force actions and reactions to the threat portrayed by the Atlantic Intelligence Command. The force interactions resulting from the seminar game provided the combat interactions modeled in ITEM. ITEM added the analytical rigor to check the qualitative military judgements made by the seminar wargame participants. Excursion cases allowed examination of various force combinations as OPLAN apportioned forces were reduced.

ITEM was also used during the OPLAN development phase of a major CINC training exercise as a course of action analysis tool. This scenario was primarily land-based in Southwest Asia. The analysis focused on course of action decision support to an Army Corps serving as a Joint Task Force Headquarters. Following selection of one course of action, the analysis then considered numerous excursions. The excursions considered changes to the force disposition, sequencing of forces into the battle, priorities, and force tradeoffs based on fixed lift assets.

Presentation will briefly show the results of each study, and then discuss the utility of ITEM as an effective analysis tool,, by comparing and contrasting the model's strengths and weaknesses.

LCDR Jeffrey Cares
Commander, USFK
FKJ3-PL-OA, Unit #15237
APO, AP 96205-0010
DSN 315-723-8279/ FAX 8244 COMM: 011-822-7913-XXXX
E-MAIL CFCD-PL-OA-N@emh7.korea.army.mil

Naval Theater Level Model (NTLM)

One of the workhorse analytical combat models used in the CINCs' analysis centers for theater-level analysis of the airland campaign is the TACWAR combat model. The Operation Analysis Branch of HQ UNC/CFC, for example, uses TACWAR for OPLAN development and course of action analysis as part of the deliberate planning process. In addition, CFC OAB provides realtime support for theater-level warfighting decisions by deploying a TACWAR suite to CINC's wartime command post, integrating TACWAR analysis with the 24-hour Planning, Decision, and Execution (PD&E) cycle in the Battlefield Coordination Working Group.

Since CFC OAB is both a joint end combined organization, there is a requirement for both joint and combined theater-level campaign analysis. TACWAR, unfortunately, has never had a naval module. Important joint issues such as the effect of submarine interdiction of logistics flow on FEBA movement or the result of delaying an amphibious landing while awaiting mine clearance could not be analyzed simultaneously and in balance with analysis of the rest of the theater.

This paper describes the Navy Theater-Level Model, a naval enhancement to TACWAR designed by CFC OAB in partnership with the ROK JCS Operations Analysis Center, ROK Naval Headquarters, and Korean Institute for Defense Analysis to correct this analysis shortfall. It describes the theory, methodologies, and algorithms which comprise the submodules, some of which are the result of recent pioneering developments in naval combat theory. The paper also details the use of joint and combined analysis in decision making at the CINC level. Additionally, the paper outlines the type of joint and combined theater-level analysis made available to warfighters and planners by the Navy Theater Level Model.

Peter C. Byrne, LtCol John O. Yanaros, Jr.
Joint Staff J-8/Warfighting Analysis Division
Pentagon, Rm lD940, Washington, D.C. 20318-8000
(703)-693-3248 or (703)-614-4767 (DSN 22x)
FAX (703) 614-6601

Joint Air Campaign Analysis Using The TACWAR Simulation Tool

The Joint Staff Directorate for Force Structure, Resources, and Assessments (J-8), and the theater Commanders-in-Chief, use the low resolution theater model TACWAR as an analytical tool to conduct joint campaign analysis. This deterministic models, although data intensive, provides quick run times to investigate theater ¢conflicts, involving ground and air combat units. TACWAR is the primary warfight model for the Joint Staff and has been used by military experts in assessments such as the Mobility Requirements Study (MRS), Bottom-Up Review (BUR), and MRS BURU (BUR Update) for the Secretary of Defense and annual Joint Military Net Assessments for the Chairman, Joint Chiefs of Staff (CJCS). Additionally, the model has been the cornerstone in the CJCS Two Major Regional Contingencies Wargame, Nimble Dancer. The focus of this presentation is on the air portion of the joint campaign analysis, as played in TACWAR. USA, USN, USMC, and USAF, as well as allied/coalition air assets are used. Measures of effectiveness, as described in essential and key elements of analysis outlined. Force beddowns, flows (from Midas or Force Deployment Estimator models), apportionment, allotment and allocation for missions, weapons availability and employment, attrition of aircraft to air-to-air, surface-to-air, and surface-to-surface threats, and airbase/carrier operations are discussed. Missions flown include airbase attack, interdiction against units, SSMs, chokepoints (and with logistics turned on: convoys, supplies, and apods/ ports), close air support, air superiority and air defense, escort, end SAM suppression. The ability of coalition air forces to defeat the enemy's air and ground forces are realized in the destruction of enemy air bases, aircraft, armor, mechanized and infantry forces, as well as surface-to-air defenses.

WG 15 — COMMAND, CONTROL, AND COMMUNICATIONS (C3) ABSTRACTS

Chair: **Patrick Allen, Cubic Applications Inc.**
Cochairs: **Zach Furness, MITRE**
Bill Kemple, Naval Postgraduate School
Ed Cesar, Consultant
Advisor: **Donald Kroening, TRAC/OAC**
Room: **Rickover Hall - Room 239**

Tuesday, 1030-1200

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Coalition C2 in Peace Operations

"Coalition C2 in Peace Operations" was drafted under contract to the Center for Advanced Command Concepts and Technology (ACT) at the Institute for National Security Studies of the National Defense University (INSS/NDU). It compares lessons learned from comparison of C2 experiences in Desert Storm/Desert Shield, Somalia, Rwanda, and former Yugoslavia (Bosnia, etc.) with (a) classic formulation of U.S. doctrine and process, (b) the practice and doctrine of foreign military establishments, and (c) measures of effectiveness for accomplishing missions. The results include the development of "Principles for Coalition

Peace Operations Command Arrangements;" a variety of practical guidelines for designing better C2 in these complex situations, and the elements of a measurement system for monitoring their performance.

Two major papers will support the analysis. The first, a 70-page-draft, deals with the broad U.S. experience in coalition warfighting operations, and the differences between principles of war and principles of peace operations. It explores the experiences in Somalia, former Yugoslavia, and Rwanda for lessons learned; examines the range of missions that can arise in the context of peace operations (peacekeeping, peace enforcement, peace imposition); and posits how command arrangements can be crafted for successful coalition peace operations. The second paper, to be completed by April 1995, will explore detailed implications for U.S. peace operations.

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Information Warfare Modeling Methodology

Approved abstract not availabe at printing.

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Communications Performance and Shortfalls in Operations Desert Shield/Desert Storm

Approved abstract not available at printing.

Tuesday 1330-1500

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Battalion-Level Command and Control at the National Training Center

This paper reports the results of RAND research on command and control (C2) of battalions during exercises at the National Training Center (NTC). This study had three primary tasks: (1) identify systemic C2 problems at the battalion task force (TF) level and below; (2) identify C2 problems whose resolution could be assisted by technology; and (3) identify C2 problems that can be solved by better home-base training and recommend training improvements. Using a series of sources, the author reached two major conclusions: (1) TF staffs have difficulties generating adequate plans, managing battle preparation, and influencing the execution of the battle; and (2) reporting on the TF command net is inadequate. As a result, the author recommends enhancing the home-base training of the TF staff, digitizing the planning and preparation process, and enhancing and simplifying the reporting systems. The new equipment should also be designed to enhance the home-base training.

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The Army Theater Missile Defense Tactical Operations Center

Approved abstract unavailable at printing.

Wednesday 0830-1000

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Modeling Joint Theatre-level C3I: Joint Stochastic Warfare Analysis Researchat NPS

Approved abstract not available at printing.

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Performance and Cost Considerations in theTactical Use of Commercial COMSATs

Approved abstract not available at printing.

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Military Applications for Proposed LEO Communications Satellite Systems

Approved abstract not available at printing.

Wednesday 1330-1500

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Modeling and Simulation in the Leading Edge Environment

Approved abstract not available at printing.

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The DIS-Compliant SINCGARS Radio Model

Approved abstract not available at printing.

Thursday 0830-1000

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Analysis of Nonlethal Weapon Employment Effects on Command and Control

This analysis investigated the effectiveness of nonlethal weapon (NLW) employment methods using the Eagle combat simulation in its debut at the U.S. Army Concepts Analysis Agency. The analysis team developed a generic model of a NLW incapacitation effect to compare alternative employment methods that could be applied in a mid-intensity heavy force scenario. The approach contrasts with other NLW studies that have focused on specific weapons, technologies, or operations other than war. In the base case, a U.S. Army armor-heavy brigade conducted offensive operations without employing NLW against a defending opposing force (OPFOR). In the excursions, the brigade employed NLWs to attack OPFOR battlefield operating systems (e.g., command and control, fire support, maneuver), to disrupt OPFOR plan synchronization, and to shape the battlefield. NLW incapacitation effects were temporary; effect duration was varied as a parameter. The analysis compared fractional exchange ratios and blue personnel casualties to determine NLW employment alternatives that improved, impaired, or had negligible effect on combat outcomes. Effective NLW employment reduced blue personnel casualties by inducing "piecemeal" commitment of OPFOR maneuver units. Ineffective NLW employment significantly increased blue casualties when incapacitated OPFOR units recovered in position of relative advantage. This analysis was sponsored by the Deputy Undersecretary of the Army for Operations Research.

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Information Readiness: Preparing for Information Warfare in Peacetime

Operation Desert Storm has been called the first "information war." Although highly successful in many ways, problems occurred with the timeliness of information distributed to friendly forces, primarily because the information distribution flows had not been previously practiced during peacetime. That experience called attention to the need to achieve information readiness during peacetime, in order to be ready to perform effective information warfare in future conflicts. In this presentation, we define "information readiness" as the peacetime practice of the methods and procedures necessary to swiftly, efficiently, and securely obtain and distribute relevant information to support both current and potential operations. Information readiness allows us to train as we plan to fight in the "information war." One facility specifically designed to support this function is the newly forming Research Analysis Center (RAC) and Research Analysis Anchor Desk (RAAD) at the USCINCPAC J533 Gaming and Simulation Facility. Equipped with on-line information resources and high-speed communications, the anchor desk is designed to quickly provide requested information to users theater-wide. Maintaining and supporting essential elements of information lists by user is a critical part of peacetime information readiness. If this experiment is successful at USCINCPAC, additional facilities could be funded for all major CINCs.

Thursday 1030-1200

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A Bayesian Perspective of Dominant Battlefield Awareness

Approved abstract not available at printing.

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The Effects of Decisionmaking Quality and Timeliness on the Response Surface of a Simple Combat Simulation

Past experiments with a three-sector Lanchester Square Law simulation with simple C2 have shown non-monotonicity of a chaotic nature in response to small variations in initial conditions. Small changes in initial force dispositions can cause very large differences in battle outcomes. This nonmonotonic behavior is caused by the nonlinear impact of decisionmaking, and the nature of the response varies dramatically with the modeled attributes of C2 processes.

This paper extends the work previously reported at the 61st MORS by varying the timeliness of intelligence and the quality of decisionmaking based on it. Preliminary results show that if decisionmaking is just based on current rather than on projected battlefield conditions in the various sectors, improving information timeliness can actually have a negative effect, as forces may spend more time reacting than fighting. The work underway is intended to demonstrate whether this is true if the fidelity of the decisions made can be improved. The C2 model quality is improved to reflect projected conditions and projected outcomes. This is expected to actually decrease the stability of the system, increasing opportunities for both bad and good outcomes. The timeliness of the information is then expected to have a greater impact, especially where the decisionmaking qualities of the two sides differ.

WG 16 — MILITARY ENVIRONMENTAL FACTORS - ABSTRACTS

Chair: **Eleanor Schroeder, NAVOCEANO/N53**
Cochairs: **Warren Olson, IDA**
Kathy Cooper, ODPA&E (DC&L)
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Tuesday, 1030-1200

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The Effects of Different Line-of-Sight Algorithms and Digital Terrain Elevation Resolutions on Combat Simulation

Approved abstract not available at printing.

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Line-of-Sight Data Sets for Comparative Studies of the Twenty-Nine Palms Range 400 Elevation Data Set

Approved abstract not available at printing.

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Visibility-based Terrain Analysis

Approved abstract not available at printing.

Tuesday, 1330-1500

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Operational Test Visualizer (Demo/Presentation)

Approved abstract not available at printing.

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Use of Transportation Infrastructure Planning and Assessment in Military Operations

Approved abstract not available at printing.

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Weapons and Obstacles Synergism During the Obstacle Planning Process

Approved abstract not available at printing.

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Janus Desert Hammer Extrapolation

Approved abstract not available at printing.

Wednesday, 0830-1000

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Environmental Effects for Distributed Interactive Simulation

Approved abstract not available at printing.

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Master Environmental Library for Modelling and Simulation

The realistic simulation of joint service military operations requires realistic, multiscale, environmental information which provides a consistent characterization of the near-space, atmosphere and oceans. The individual Department of Defense services maintain and provide various archived ad real-time environmental information in support of military operations as well as for modeling and simulation. Environmental data are also generated and archived by other federal agencies, academic institutions and private organizations. However, no standard atmospheric, oceanographic, or near-space data bases exist today which provide detailed, consistent, natural environmental data in a common format and in an accessible library that meet the special needs of the DOD modeling and simulation activities. The Master Environmental Library (MEL) project intends to: (1) develop, demonstrate, and verify and validate in a 4-dimensional, digital, prototype DOD library of environmental data for modeling and simulation, (2) populate the MEL with an initial set of standard data bases for demonstration, and (3) provide recommendations on the structure and initial contents of a long-term, 4-dimensional, digital MEL with a common interface, usable by all DOD M&S components. The year-one demonstration will focus on the southwest United States and adjacent waters. The MEL project was initiated by the Defense Modeling and Simulation Office in January 1995 and is aggressively pursuing the above objectives. The workshop presentation is intended to inform potential users of the data base of the plans and activities of the project, and to obtain additional information that will help the MEL meet the needs of the M&S community.

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Joint Warfare Environmental Analysis and Prediction Systems - An Integrated Academic and Research Program at NPS

Approved abstract not available at printing.

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SWOE Synthetic Scene Generation Process

The Smart Weapons Operability Enhancement (SWOE) program is a four-year Joint Test and Evaluation (JT&E) program sponsored by the Office of the Secretary of Defense to enhance the performance of smart weapons through an effective application of knowledge of the environment. Specifically, the two objectives of the SWOE JT&E effort are to 1) validate the SWOE scene generation process and 2) collect a selected data set for use by the DoD community. This presentation provides an overview of the major SWOE scene generation model components including the basic equations for the surface energy budget and radiometric models, the required model input parameters, and results from the scene generation process.

The SWOE synthetic scene generation model uses an integration of measurements, information databases, numerical models, and rendering to replicate a wide range of environmental conditions. The process uses physics formulations to simulate the dominant energy exchange phenomena that impact smart weapons system performance. Existing diagnostic models are used to compute the thermal characteristics and radiances for specific combinations of environmental factors. The modeling techniques are used to generate infrared scenes for short and long-wave spectral bands.

Wednesday, 1330-1500

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Joint Oceanographic Support of Littoral Warfare: Wave Modelling

Approved abstract not available at printing.

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Joint Oceanographic Support of Littoral Warfare: Tide Modelling

Numerical models are a key technology for nowcasting and forecasting the environment. Models are also used to build synthetic environments for mission planning, weapon system evaluation, and other purposes. Rather than "reinvent the wheel", the U.S. Navy's Naval Oceanographic Office (NAVOCEANO) is leveraging research executed within the U.S. Army civil works program to support littoral warfare.

Tides are an important aspect of littoral warfare and civil works. The U.S. Army Engineer Waterways Experiment Station (WES) has developed the ADvanced hydrodynamic CIRCulation mode (ADCIRC) to numerically model depth-averaged tides and storm surge for civil works applications. NAVOCEANO has an on-going collaboration with WES to implement ADCIRC in areas of naval interest.

Model results are presented. The model is robust to changes in grid resolution and bathymetry. The resolution of the model's finite element grid ranges from over 100 km in open ocean areas to less than 100 m near Panama City, FL. Good agreement between modeled tidal elevation and tidal station data is also shown. The application of ADCIRC to construction of a synthetic environment is also discussed.

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Dynamic Meteorological Modeling for Field Artillery Effectiveness Studies

Too many Field Artillery effectiveness studies have been completed using static meteorological scenarios. Global wind profiles have been defined and are used to evaluate performance and to derive developmental accuracy requirements for weapon systems. Generally the atmospheric conditions are not standard, and vary with respect to the region, terrain, season, height, and diurnal conditions. Using average and static environments to characterized a weapon system's performance leads to results which only apply to average or "fairweather" conditions represented in the selected environment. The documented system characteristics may then be significantly different then those experienced during actual field testing. The Army Research Laboratory (ARL), Battlefield Environment Directorate has developed algebraic models that derive the expected atmospheric wind, temperature, and density variability as a function of influencing parameters. A 155-mm howitzer accuracy and effectiveness analysis is used to compare its midlatitude global scenario results with new results derived from actual data collected in the desert and mountains of southern New Mexico. Tabular and graphical comparisons reveal that simulated artillery effectiveness studies need to include dynamic meteorological scenarios in deriving more realistic results.

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Battlefield Environment Directorate Battle Weather Testbed Technology Initiatives for Army Weather Support

The weather, when understood and its effects known, can be used as an effective force multiplier to gain advantage over threat forces from theater-level operations down to surgical- strike maneuvers. Tactical decision aids and weather forecaster tools are being developed and refined for use by the highly mobile U.S. Army which has evolved in recent years. Scientists and engineers at the U.S. Army Research Laboratory, Battlefield Environment (BE) Directorate are active in research and development (R&D) efforts to make weather "user friendly" to both battlefield decision makers and to trained military weather personnel. This presentation will focus on BE Directorate Battle Weather Testbed R&D efforts to provide state-of-the-art weather support capabilities to the Army during peacetime exercises and in operations requiring U.S. military presence worldwide.

Thursday, 0830-1000

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Synthetic Environment Data Representation Interchange Specification (SEDRIS)

Achieving true interoperability among heterogeneous simulations requires ensuring that each simulation has a consistent view of the simulated environment, as well as the properties and actions of each of the players. ALSP and DIS provide frameworks for achieving these ends for the domains of constructive and virtual simulations, respectively. These frameworks are based on comparable sets of protocols for communicating simulation entity state information. Both frameworks assume that a shared initial synthetic environment (terrain, features, etc.) exists for all simulation entities, and require that simulation entities then maintain consistent views of the evolving environmental state throughout the exercise. However, neither framework ensures the proper exchange of the initial synthetic environment.

Simulation heterogeneity introduces a difficult challenge in ensuring that simulations with different interests in the synthetic environment receive correlated views of the single "true" initial environment. The process of receiving, or interchanging, a starting environmental state is a necessary, but not sufficient, precondition to achieving simulation interoperability and correlation. Standardizing this environmental data interchange process is a critical problem currently facing the simulation community.

The environmental interests of simulations can be loosely divided into three classes; those of sensing and moving, problem solving, and abstraction. Each introduces a requirement for differing views of the same environmental object or data element, which must be correlated. Sensors and movers require either polygonal surface decompositions of the terrain and the 3D objects upon it, or volumetric decompositions of the ocean and atmosphere. Sensors often characterize surfaces not only by local properties, but also by higher-detail renditions represented as textures (e.g. typical forest canopy, or an aerial photograph of a target area). Problem solvers require the division of the environment into meaningful objects and their relationships, which are often expressed in terms of spatial primitives in a topologic framework. Some problem solvers are external to the simulation (i.e. "man-in-the-loop") and require maps, charts, and other traditional representations of the environment. Finally, many simulations (particularly real-time or faster than real-time) require the ability to manage their performance by reducing the environmental "level of detail" (or fidelity) by abstracting environmental objects, elements, or partitions. Successful data interchange requires that these potentially conflicting views of the same environmental object or
element be integrated into a single, coherent, data representation.

We have characterized this integration problem in terms of two principal requirements: "representational polymorphism" and "correlated levels of detail". SEDRIS, a new initiative by ARPA and STRICOM, addresses these requirements through the specification of a neutral interchange mechanism based on a data model, a feature data dictionary, and an access language (i.e. API). SEDRIS is intended to support the interchange of synthetic environment data sets among heterogeneous simulations across the full range of M&S functional activities.

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Selected Wheeled Vehicle Mobility in Sand

Approved abstract not available at printing.

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Rainfall as a Contributing Factor in Military Operations/Mobility

Approved abstract not available at printing.

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Development of a Theoretically Based Soil Moisture Model to Support Military Operations Worldwide

Approved abstract not available at printing.

Thursday, 1030-1200

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Range Capacity and Utilization Model

As the U.S. military continues downsizing, consolidating, and reorganizing, a key issue facing the Services is how to more effectively employ Department of Defense (DOD) range and airspace resources to support test and training programs. Ironically, at the same time that the DOD is downsizing, increasingly sophisticated weapon systems and platforms require more extensive test and training capabilities to accommodate, for example, faster aircraft and stand-off weapons. In addition, the DOD's approach to training now emphasizes more realism and multi-service composite force exercises - "train like we fight". In assessing the ability of DOD ranges and special-use airspace to support these trends, it is difficult to find a consistent, meaningful measure of range capacity, how that capacity is utilized, and what factors affect it.

This paper presents a new model developed specifically to measure range capacity and utilization. The model uses systems dynamics software to quantify utilization based on range-specific conditions and users. The capacity of a range varies by type of mission; the demands of a joint exercise, for example, differ from those of a single aircraft sortie. Measuring utilization by number of hours or sorties does not capture the differences among missions. The range capacity model measures the ability of a range to support specific mission types or mix of missions, and can therefore examine the effects of altering the type of missions or adding new missions on a range capacity. It also identifies peak utilization patterns, so that opportunities for increasing range capacity can be identified and evaluated.

The paper includes a review of two case studies where the range capacity model was used. It describes how the model was adjusted to address the differences between the two facilities and identifies how the findings can be applied in range planning. Potential applications include identifying infrastructure improvement needs, determining whether a range can absorb a new mission, establishing a baseline for environmental impact analysis, and assessing a range's carrying capacity, given its specific capabilities and constraints.

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Integrating Conservation and the Military Mission

Approved abstract not available at printing.

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Military Training and the Environment

This paper examines the effects of environmental regulatory requirements and public concerns on military training. As increased emphasis is placed on more realistic and composite force training, the Department of Defense (DOD) is finding that environmental constraints and public opposition can limit the effectiveness and flexibility of military training. In some cases, training assets are simply not adequate to support the new requirements, having been designed to provide a specific, discrete type of training environment. In other cases, the natural or human environment in and around training areas may not be tolerant of changes in training activities. DOD units find themselves having to adjust their training plans and compromise on realism in response to these conditions. To what extent do these compromises impact the effectiveness of training, and what can be done to improve training in the face of environmental and other constraints?

This paper reviews situations where environmental constraints or public opposition have inhibited training capabilities and examines tools that can be used to improve planning to avoid potential conflicts. The paper discusses issues related to training activities that can have environmental or social impacts (e.g., impacts from chaff and flares countermeasures) and issues related to locations where training is conducted (e.g., threatened and endangered species). It describes some predictive models and other analytical tools being developed to assess, in advance, the potential for environmental impacts, so that mitigation measures can be incorporated early in the planning process for training programs.

WG 17 — OPERATIONAL CONTRIBUTION OF SPACE SYSTEMS - ABSTRACTS

Chair: **Gary Streets, SWC/AES**
CoChairs: **Jim Huttinger, Booz Allen & Hamilton**
Corinne Wallshein, AFSAA/SASS
David Glen Taylor, RAND
Advisor: **Dr. David Finkleman, USSPACECOM/AN**
Room: **Rickover Hall - Room 211**

Tuesday, 1030 - 1200

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SPACECAST 2020: Projecting Future Military Space Technology

We describe the study process and key results of SPACECAST 2020, a major Air Force study of future military space systems. The study's purpose was to identify and conceptually develop high-leverage space technologies and systems that will best support military operations in the twenty-first century. The study team was composed of faculty and students from Air University, Air Command and Staff College, and the Air Force Institute of Technology, and the study was conducted over the course of academic year 1993-94. A great effort was made to open the study to original and innovative thinking. Noted futurologists, scientists, science fiction writers, and other visionary thinkers were consulted. Ideas were solicited and received from various Government agencies, from industry, and from the general public both in the U.S. and abroad. A conceptual model was built of the possible political, economic, and technological world of the year 2020. The important emerging concepts were refined in 18 white papers, each of which described a major aspect of 21st-century space warfare. These concepts were made concrete by identifying 19 specific systems contained in the white papers. The final step in the study was an Operational Analysis, in which the 19 systems were evaluated and rated according to their potential contribution to military effectiveness. The high-value systems and their enabling technologies were identified.

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SPACECAST 2020: The Operational Analysis

SPACECAST 2020 was a major Air Force study of future space systems. Its penultimate product was a set of 19 proposed 21st-century space systems. We describe how the potential operational utility of these systems was evaluated on a quantitative scale in an objective, traceable, and robust manner, so that the systems could be compared and the most important ones identified. Also, the systems' enabling technologies were evaluated to determine the technologies whose advancement will do the most to make the high-priority systems a reality. The method used was to develop a hierarchical value model based on Department of Defense policy documents and the practical operational judgments of Air University faculty and students. The Operational Analysis was completed within an extremely tight deadline and received wide acceptance within the Air Force.

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Force-on-Force Analysis to Assess The Operational Contribution of Space Systems

Approved abstract not available at printing.

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Autonomous Battle Damage Assessment Study: BDA for Space and Electronic Warfare

The Autonomous Battle Damage Assessment study is a research project tasked to identify a core set of measures of effectiveness that can be utilized to assess battle damage and to provide estimates of operational effectiveness in a Space and Electronic Warfare (SEW) or joint battlespace where target set includes the adversary's command and control (C2) systems and information infrastructure. The approach recommended is suitable for developing BDA for Information Warfare operations.

The study identifies the operational requirements for developing battle damage assessments of adversarial C2 systems and information infrastructure and specifies common sets of systemic and operational attributes that can be measured and/or observed and that are sufficiently consistent to be exploited. The study concludes that BDA is as much a warfighting concept as it is a warfighting operation. BDA for the emerging battlespace is a tasked, interactive information collection and systems analysis process that supports a wide range of warfighting activities and battlespace environments. The study recommends that SEW BDA should be developed as a family of stand-alone systems of systems tailored for the battlespace. The kind of BDA employed is determined by systems, technology, weapons, warfighting mission, battlespace environment, and target sets. The study

presents a technology roadmap and offers recommendations for leveraging critical technologies.

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Space Based Infra-Red Sensor System Architecture Analysis

A demanding set of requirements for missile launch detection is emerging due to proliferation of the threat, the need for global warning, and the data necessary to support both active and passive ballistic missile defense. A new, space based sensor system is being planned and should have some initial capability during the next decade. We have examined a candidate architecture consisting of four geostationary satellites and two satellites in highly elliptical orbits. This system was analyzed for coverage, robustness, and tracking capability. Parametric evaluations provided insight into the importance of stereo viewing geometry, sensor frame rate, and sensor pointing accuracy. This allowed us to draw broad, general conclusions about the strength and weaknesses of the system architecture and the degree to which it could satisfy the emerging requirements.

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Communication and Information Architectures to Support Evolving Joint and Coalition Operations in an Information Warfare Environment

Approved abstract not available at printing.

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Demand Assignment Multiple Access (DAMA) for Satellite Communications: Ways to Improve It's Robustness and Efficiency

Approved abstract not available at printing.

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STRATC2AM: ***A Strategic Communications Model Recast as a Tactical Communications Model***

The challenges associated with recasting a strategic communications model into a tactical one are numerous. STRATC2AM was designed to handle communications associated with full scale nuclear war under Cold War threats. Over the past several years, as this threat has diminished and the threats to tactical C3I have increased, the model has been "tacticalized" and the graphic output improved. A critical model upgrade is "protocol rules" governing the receipt, transmission, and processing of messages. To test these new applications, Theater Missile Defense of Korea was adopted as a tactical communications scenario. Using ACC and BMDO documentation, a data base of friendly and enemy communications assets was built by AFSAA and OSD/PA&E. Due to the complexity of this scenario, much effort went into scaling the scenario to produce a "working" model. Measures of Effectiveness (MOEs) centered on node and system throughput, and describing key message paths visually and numerically (how long a typical message might take), and evaluating sensor to shooter message transmission time. Progress will be discussed, as well as current findings. Although "tacticalized," model processes regarding nuclear and jamming threats were maintained during the model upgrades. As an example of this, SKYMAP (a member of the STRATC2AM family) visually characterizes effects of absorption, scintillation and/or noise loss in decibels from nuclear burst(s) on satellite communications.

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Military Use of Commercial Remote Sensing Satellites: Operations and Economic Considerations

Approved abstract not available at printing.

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The Application of Supervised Spectral Classification of Remotely Sensed Earth Imagery to Determine Optimal Airlift Dropzones for Large Regions - An Example

Approved abstract not available at printing.

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Analyzing GPS Effectiveness via Modeling and Simulation

The Global Positioning System (GPS) first saw widespread use during Operation Desert Storm. There, it proved its utility in an operational environment for a range of navigation and timing applications. GPS use by the footsoldier to pilot was established and precision guided munitions (PGM) applications were introduced. Following Desert Storm, the pros and cons of GPS use and dependence on GPS became an important topic. In order to help characterize GPS use and support analysis to quantify its contribution to operations, SAF/AQL requested the AF Information Warfare Center (AFIWC) build a GPS End to End Model (GLEEM) to support the study of GPS capabilities and vulnerabilities. The GPS Joint Program Office and the Joint GPS Working Group's (JGWG) Simulation and Modeling Working Group (SIMOWG) are major proponents of GLEEM's development because it will help them analyze and quantify GPS contributions and help decision makers make better informed choices. This presentation will provide details of GLEEM's capabilities and review preliminary analytical results.

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Weighting Scheme for the Space Surveillance Network Automated Tasker

We address the problem of finding the most efficient settings for parameters governing the operation of the Space Defense Operations Center (SPADOC) Sensor Tasking Prototype. This software is run on a daily basis to assign space objects to sensors (mainly radars and telescopes) in the USAF Space Surveillance Network. The sensors make observations on assigned objects, and the observations are used in astrodynamical calculations to keep track of space objects, including U.S. and foreign satellites and potentially hazardous pieces of debris. The problem was formulated as a numerical optimization problem and was solved using a Simulated Annealing algorithm. The Sensor Tasking Prototype parameters were the independent variables. The function to be maximized was an objective function devised to measure the goodness of a given tasking. The scale of the problem resulted in various technical challenges, which were overcome to produce an estimate of the optimum parameter settings, resulting in an increase in the number and quality of observations that the Space Surveillance Network can provide. These results have already been implemented in SPADOC operations.

WG 18 — OPERATIONS RESEARCH & INTELLIGENCE - ABSRACTS

Chair: **Peter Shugart, USATRAC-WSMR**
Cochairs: **Allan Rehm, MITRE**
Advisor: **John Milam, BDM**
Room: **Rickover Hall - Room 212**

Tuesday, 1030 - 1200

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Intelligence Issues and Air-To-Ground Modeling: Methods For Modeling Intelligence Issues In Determining Conventional Munitions Stockpiles

Approved abstract not available at printing.

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An Improved Target Assessment Model for U.S. Marine Corps

Seismic Sensors Unattended ground sensors can provide a tremendous amount of information about battlefield targets, but for the most part, this potential has been unrealized. To help tap this potential, the U.S. Marine Corps has recently fielded the Phase V, Tactical Remote Sensor System, comprised primarily of unattended seismic sensors. These sensors are more sensitive than any of the previous versions, and their potential to provide detailed target information is correspondingly increased. But, the target classification and description model currently in use was developed for 1960's sensors. It is deterministic and ignores the variance in sensor performance due to target type, target velocity, soil composition, and other factors.

Moreover, we have determined that key parameter values used in the model are not valid for the new sensors. This presentation describes an improved, probabilistic, target classification and description model that accounts for the variance discussed above and provides the user with bounds that describe the credibility of the estimates. It is based on data from a field experiment
that we designed and conducted at Camp Pendleton California.

Tuesday, 1330 - 1500

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Design Of Data Exploitation Tools For Intelligence Analysts

INTRODUCTION: Analysts employ decision-making processes of multiple formats in daily operations. Data processing includes information and sensor fusion (both visual and non-visual data). Virtual environments may enhance analysis through natural "immersion" of the operator.

METHOD: The human factors requirements for synthetic human-system interfaces, and integration into a supportive workspace for data exploitation will be described.

CONCLUSIONS: Complex tasks requiring high data throughput and fusion pose unique demands upon intelligence analysts. Enhanced data visualization capabilities such as virtual reality may be used to support analysts decision-making tasks.

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AA-10a/c 6-DOF Digital Model

Approved abstract not available at printing.

Wednesday, 0830 - 1000

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Nonlinear Science and the Lanchester Equations

Approved abstract not available at printing.

Introducing Nonlinear Science Into Military Research and Analysis: The Threat Spectrum Model

Approved abstract not available at printing.

Wednesday, 1330 - 1500

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Russian Views On Electronics and Information Warfare

According to Russian military experts, the nucleus of future war consists in combat "supersystems" such as reconnaissance-strike systems that will mutually influence each other without the need for contact of friendly forces. These combat systems can operate only with highly effective, real-time information support. Indeed their success and the success of the new, reconnaissance-strike operation lie above all in information support.

Russian experts thus assert that future war will be a war for information dominance. Destruction of the information resources of a state and of its armed forces is possible not only by using weapons, including precision weapons, but also by using means of special programmed effect, such as computer viruses, whose use can be of a depersonalized nature.

This can lead to a situation wherein the formula for effect in modern battle will acquire approximately the following form. Initially, winning superiority in the information system, the struggle for information resources.

The second phase will be connected with winning air superiority, and only subsequently in the third phase can

the ground troops and naval forces be put into action. Thus, information warfare provides for a substantial revision of military-political, strategic, and operational-tactical views on the content and nature of warfare under present conditions.

According to Russian experts, Liddell-Hart's strategy of indirect approach is today characterized by a different content, changing forms, and non-traditional actions: the strategy of indirect approach by means of the information struggle -- especially as exemplified in Desert Storm. Warfare has indeed shifted from being a duel of strike systems to being a duel of information systems.

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Modeling the Impact of Joint Theater-Level Intelligence: Joint Stochastic Warfare Analysis Research (J-STOCHWAR)

The Naval Postgraduate School is conducting research into methodology to support Joint Warfare Analysis (JWA), with a specific focus on representation of the operational intelligence and command and control processes, using stochastic representations to explicitly treat uncertainty and decisionmaking under uncertainty. The current generation of operational analysis models has been deterministic with little representation of C3I at the operational level.

Newer models have attempted to represent some communications and information flow, but the decisionmaking has been restricted to immediate (short time horizon) decisions such as targeting and initiating preplanned maneuver, generally based either on ground truth or a single distorted subset of ground truth without reference to the degrees of certainty or uncertainty associated with battlespace awareness. Although these models can be used to analyze joint warfare if the decisions are scripted and no analysis of the possible variation in outcomes is desired, they cannot be used to demonstrate the effectiveness of variations in C3I capabilities or show the outcomes of information warfare in a joint campaign. Models developed to assess the effectiveness of C3I systems can show the behavior of the system itself under various conditions but cannot show the impact of the system on the joint warfighting capability.

J-STOCHWAR has focused on developing models simulating the collection, processing, and fusion of intelligence at the operational level; representing the perception that can be developed (with quantifiable uncertainty) at the operational level, both of the current battlespace and of enemy intent; and showing the effect of various strategies to develop or confound that perception as it influences operational decisionmaking, thus having major effects on the outcome of joint campaigns. The models are intended to be useful for a range of joint warfare analysis, and can be incorporated into specific theater- level simulation models if desired. NPS has developed an experimental prototype simulation to demonstrate and evaluate the models developed in research. This software (the Joint Warfare Analysis Experimental Prototype, or JWAEP) can be used in either a wargaming model or a closed analysis mode to explore various alternatives in joint C3I supported by the models developed to date.

This presentation will focus on the models developed for perception and inference and how they relate to theater-level warfighting outcomes.

Thursday, 0830 - 1000

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Estimating the Relationship Between Information and Combat Results

We investigated the effects on combat results of varying levels of information a combat commander has about his adversary. We performed an experiment in which individual subjects, playing the role of combat commander, provided detailed plans for conducting operations against an enemy defender.

The combat commanders prepared five combat plans in sequence, all in the same attack scenario, but with increasing levels of information about the enemy's intent and disposition. These information levels were designed to correspond closely to doctrinally realistic levels faced during the planning process: (1) only a topographic map and orders; (2) a doctrinal template; (3) a situational template; (4) results of scouting and reconnaissance carried out in response to the commander's Priority Intelligence Requirement PIR); and (5) full information about the enemy disposition and intent.

We implemented each plan in the JANUS combat simulation model, and ten battles were fought with each plan. A variety of Measures of Effectiveness (MOEs), such as casualty exchange ratio and Blue losses, were computed for use in assessing the combat effectiveness with each combat plan. We estimated the relationship between level of information and MOE value for each subject in the experiment.

Several methods of representing level of information possessed by the commander were used, and these are compared and contrasted. These methods include: (1) nominal stage number; (2) subjective measures; (3)

number of enemy vehicles detected; (4) entropy. Plots of MOE versus information level for various subjects, together with the variance observed in repeated JANUS runs, reveal within- and between-subject variance, and illustrate the relationship between information level and combat results.

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Intelligence Requirements For Economic Modeling In Support Of Targeting Analysis

MITRE is developing prototype economic models to support targeting analysis in wargames. The models attempt to show the economic consequences of damage, and in particular, the mutual interactive consequences of damage to one sector of an economy for other sectors. The paper discusses the models, their intended uses, and the data requirements, particularly those not normally contained in targeting data bases. The models are of most interest for relatively advanced economies with complex interdependencies between industries, and the paper addresses the question of the choice of key economic factors/industries to model.

The models are intended to assist in finding efficient target sets to collapse an enemy economy by treating targets as linked interacting networks rather than simply as independent point targets. The models are used to estimate the virtual damage above the actual physical damage to the targeted economic system. The paper stresses the importance of intelligence to efficient targeting of economic systems and cites examples of past problems in this area.

Thursday, 1030 - 1200

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First Principles and Soviet Perceptions Of Silo Vulnerability: Implications For Cold-War Deterrence and Stability

Approved abstract not available at printing.

WG 19 — MEASURES OF EFFECTIVENESS

Chair: **John M. Green, Lockheed Martin**
Cochair: **Robert Meyer, Naval Air Warfare Center, China Lake**
Room: **Michelson Hall - Room 108**

Tuesday, 1030 - 1200

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Miss Distance to PK: Endgame Measures of Effectiveness

Approved abstract not available at printing.

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Some MOEs and Modeling Techniques Used to Evaluate Proposed AEGIS AAW System Improvements.

Approved abstract not available at printing.

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Joint Analysis Methods to Measure How Well We Get the ID to the Shooter

Approved abstract not available at printing.

Tuesday, 1330 - 1500

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Information Warfare in Gaming and Simulation: A Critical Look at MOEs

Approved abstract not available at printing.

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Measures of Effectiveness for Information Warfare

Approved abstract not available at printing.

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Give MOE another job? How Study MOEs Drive VV&A Requirements

Approved abstract not available at printing.

Wednesday, 0830 - 1000

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Association of Old Crows Measures of Effectiveness Study

Approved abstract not available at printing.

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Measures of Effectiveness for Civil Emergency Management Planning and Peacekeeping

Since 1989, the United States' national security strategy has changed significantly. The many models and measures of effectiveness (MOEs) used to consider tradeoffs in different large force on force scenarios are now of little significance in the varying roles and mission of the post cold war era. To support analysis in the post cold war era, research investigating the objectives and corresponding MOEs for traditional peacekeeping and civil emergency was undertaken.

Part I: Civil Emergency Management Planning

The JANUS model and simulation was modified to support civil emergency management training as part of the PLOWSHARES program. As part of that program, the need was identified to conduct after action reviews to support meaningful training of emergency operations center personnel. Towards that end, a post processor term JETS (JANUS Evaluator's Tool Set) was developed to support both JANUS and the PLOWSHARES derivative that allows the user to specify MOEs. A study was conducted simulating a hurricane in the Orlando, Florida area. MOEs for the various county agencies interest in training for such an emergency (police, ambulance, public works, etc.) were identified and tested using the scenario.

Part II: Peacekeeping

Research was undertaken to quantify MOEs as a function of objectives for traditional peacekeeping. Using the treatise that force design cannot be conducted independent of the political process, a hybrid systems dynamics and combat simulation model (JANUS) were used to capture the political and force design process. Scenario specific MOEs from the combat model were used in the systems dynamics model to see the effect on the political process. This proof-of-principle demonstration was conducted to determine if this methodology could provide insight into the force design and political processes surrounding traditional peacekeeping missions.

Wednesday, 1030 - 1200

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Developing Measures of Control of Combat Ground Units

Approved abstract not available at printing.

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Defender's Advantage as a MOE

This presentation will define the defender's advantage parameter, explain how it is motivated by Lanchester's square law of attrition, and present historical data supporting its applicability to measuring the degree to which the defender has an advantage over the attacker in land combat operations.

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Stochastic MOEs for Conventional Strategic Weapons

Approved abstract not available at printing.

Wednesday, 1330 - 1500

COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830 - 1200

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The Value of Electronic Warfare: In Search of the Magic Metric

Approved abstract not available at printing.

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Joint Combat Search and Rescue Joint Test and Evaluation Issues, Measures, and Analytic Framework

Approved abstract not available at printing.

Thursday, 1030 - 1200

WORKING GROUP WRAP-UP

WG 20 — TEST AND EVALUATION - ABSTRACTS

Chair: **Dr. Ernest R. Montagne, BDM Engineering Services Company**

Co-Chairs: **Maj Larry Dubois, US Army Operational Test and Evaluation Command**

Ms. Michelle D. Kirstein, HQ AFOTEC/TSL

Mr. Bard K. Mansager, Naval Postgraduate School

Capt Bruce G. Mitchell, HQ AFOTEC/WE

Advisor: **Dr. Marion Williams, HQ, AFOTEC**

Room: **Michelson Hall - Room 109**

Tuesday, 1030 - 1200

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Test and Evaluation Enhanced by Modeling (TEEM)

This report documents a particular approach to the test and evaluation of high value systems. The approach, dubbed "Test and Evaluation Enhanced by Modeling (TEEM)," has been applied to the Trident II weapon system and, in simulation mode, to the Army Tactical Missile System (TACMS) to:

- Quantify actual or hypothesized instrumentation systems' performance
- Quantify system testing requirements
- Integrate system, subsystem, and component test products
- Provide quantified confidence in test-based estimates of system accuracy
- Predict system accuracy performance under untested conditions (within the operational environment)

TEEM in this context utilizes **modeling and simulation**, along with modern estimation theory, to maximize the value of, and information from, tests. Use of modeling and simulation significantly enhances the test and evaluation process and can reduce dependence on full-up testing. However, it is important to note that testing systems, subsystems, or components is necessary to provide information to the modeling and simulation process.

When applied for the purpose of measuring and understanding accuracy performance, this approach quantifies the capability of candidate flight test instrumentation suites relative to a stated technical evaluation objective. It demonstrates how maximum information can be derived from flight tests in order to require **fewer flight tests** while providing increased understanding. It shows how information from non-flight tests such as component test information can be integrated with flight test results and yield improved understanding and reduced dependence on full system level testing.

TEEM, as demonstrated on the Trident II system, has benefited test planning, test design and selection, instrumentation selection, and accuracy evaluation and estimation.

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Simulation Drives Operational Testing

Operational testing of command, control, communications, and intelligence (C3I) systems is absolutely dependent on realistic stimulus. This stimulus must replicate the flow of information anticipated on the modern battlefield. These diverse information sources include other C3I systems, sensors, and reports from soldiers and command posts. During testing of the Army Tactical Command and Control Systems (ATTCS), that requirement means that a broad variety of information (manual and automated) must be supported or simulated if the battlefield commanders and their staffs are to be adequately and realistically challenged in their use of ATCCS. TEXCOM and the Army Experimentation Site (AES), at Fort Lewis, WA, have developed a suite of simulation techniques, utilities, and interfaces for the Corps Battle Simulation (CBS) to provide this battle stimulus. These tools provide the capability to create ATCCS databases, stimulate ATCCS during controlled and free-play exercise test phases, and capture CBS game truth data for post-test analysis. The stimulation tools are also providing robust prototypes of the tools required to support collective training using families of C3I systems, such as ATCCS. Lessons learned from development of the simulation interfaces and utilities will also be used to guide development of future training simulations, such as the Warfighter Simulation 2000 (WARSIM 2000).

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The Role of Simulations in Weapon System Space Testing and Evaluation

The BAT Submunition is a brilliant self-guided weapon that can autonomously locate, attack and destroy armored targets in excess of 100 km behind the FLOT. This submunition is designed to be dispensed from the Army Tactical Missile System (ATACMS). Other potential carriers include the Tactical Munition Dispense (TMD) from a tactical aircraft of bomber, the Multiple Rocket Launch System Rocket, and the Tomahawk from ships or submarines, The BAT submunition employs both acoustic and infrared technology in defeating its threat. The acoustic seeker decreases the sensitivity to system delivery error and aides in the allocation of the submunitions, while the IR seeker provides precise aimpoint guidance in attacking the armored vehicle on a highly vulnerable area. This paper discusses the prominent role of simulations in the BAT program and how in conjunction with captive flight and flight testing, they are used to validate that the weapon system meets its required performance.

BAT relies heavily on its high fidelity computer simulations for the development and evaluation of the weapon system. The key functions of BAT requiring verification are that the acoustic seeker can reliably locate, allocate and guide to the target array sufficient for handoff to the infrared seeker. Weapon System Verification is required in a wide range of environmental and countermeasured scenarios. Since the BAT system involves multiple submunitions deployed against a multiple target element array, the number of tests to evaluation the BAT under all conditions is quite large and costly. Therefore, accurate modeling is required to predict the system effectiveness of the system. Metrics for evaluating confidence in the simulations and to identify test data shortfalls have been created.

This paper examines the integral role that simulations must play in the test and evaluation of smart weapon system. A discussion of the Model-Test-Model approach and the validation methodology used by the BAT program is included. This approach relies heavily on the use of test data against which the simulation models are compared. A description of the confidence level ranking used a validation metric with examples of the use of test data for simulation validation is given. The test program approach and results are overviewed with emphasis given to the application of test results to the subsystem and system modeling.

Tuesday, 1330 - 1500

Eric Keck
Joint Advanced Distributed Simulation Test Facility

The Utility of Advanced Distributed Simulation to the Test and Evaluation Process

Approved abstract not available at printing.

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Validation of a Surrogate Battlefield Scene Simulation Capability

Reliable and predictable performance of smart weapon systems is a Department of Defense (DoD) mandate. Consideration of battlefield environmental conditions is critical to smart weapon system testing, to understanding the observed performance of a weapon system, to quantitatively comparing the performance of competitive developmental

weapon systems, to making decisions for selection of the best tactical deployment for a weapon system, and to determining exactly what information is needed and will be effective in combat.

Full-scale tests typically relate the performance of each weapon system to a limited range of surrogate battlefield conditions. Tests encompassing all relevant conditions for multispectral, all weather, day and night, ground to ground, air to air, air to ground, ship to shore, ship to ship, air to ship, etc., are very difficult and expensive to conduct and seldom, if ever, fully accomplished. More comprehensive and less expensive ways to test and evaluate weapon systems is required. The Smart Weapons Operability Enhancement (SWOE) synthetic scene generation capability can be used to solve parts of this problem.

However, without comprehensive validation over a pertinent range of surrogate battlefield conditions, the SWOE capability will be of questionable utility to DoD decision makers. Key to this validation approach is a random sampling procedure, which was implemented at two field test sites, Grayling, Michigan and Yuma, Arizona. This approach compares the distributions of radiance values for corresponding synthetic and measured images using statistical inference techniques. It is assumed that the two images (measured and synthetic) were randomly sampled from the same surrogate battlefield environment.

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A Real-Time Open Air Mission Level Analysis System

The need to ensure that advanced weapon systems can meet theater objectives and perform joint operations demands the capability for evaluating mission effectiveness under varied conditions. New approaches are required to improve the utility of electronic combat open air ranges (OAR's) to meet these demands associated with developmental and operational testing. This is due to the lack of mission level realism which undermines the advantages afforded by a live open air testing environment.

These deficiencies are addressed with the creation of a real-time open air mission level analysis system. Fundamental components include an accepted constructive simulation based architecture with networking of distributed elements, user interfaces, and interactive real-time or near real-time analysis capability. Project development includes the Naval Air Warfare Center (NAWC) - China Lack Electronic Combat Range (ECR) and Eglin Electromagnetic Test Environment (EMTE) with proposed system integration at both sites following testing at ECR. Proposed distributed site capability is to be proved by Patuxent River Air Combat Environment Test and Evaluation Facility (ACETEF), government and contractor man-in-the-loop (MITL) simulators, and China Lake F/A-18 Weapon System Support Facility (WSSF).

The baseline architecture can simulate, manage, and report on tactical events including real-time kill removal while serving as the hub for live, virtual, and constructive participation. User interfaces are provided for test rehearsal, visualization, and replay. OAR test analysis or constructive simulation sensitivity analysis will be provided in near real-time providing mission level measure of effectiveness.

The paper details the proposed system design and the development process which will provide this mission level test and evaluation capability.

Tuesday, 1530 - 1700

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Testing to Validate Modeling of Foreign Rocket Motor Responses to Ballistic Impact

Surface-to-Air Missile (SAM) systems are currently operational with the former Soviet Union forces and at least 25 independent countries. These threat systems are prime targets of concern for Lethal Suppression of Enemy

Air Defense (SEAD) weapon development efforts. Analyses of various Air Defense Units indicate the potential for significant damage contribution from unlaunched missiles. The missiles in the SAM systems represent the largest single presented area item with the potential to cause a catastrophic kill. The target vulnerability community lacks test data on conventional and emerging kill mechanism effects on threat missile propellant and rocket fuel and has no accurate response models.

This paper presents the results of subscale and full scale testing of the SA-6, SA-8, and SA-13 missile rocket motors versus a spectrum of kill mechanisms to provide data for development of response models used in tri-service target vulnerability analyses. Review of the test results of these rocket motors indicate a new understanding in the phenomenology surrounding foreign energetic materials subjected to ballistic impact. All rocket motor testing was conducted by the Joint Munitions Test and Evaluation Program Office (CHICKEN LITTLE) at Eglin Air Force Base with tri-service working group involvement.

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Parametric Study of Warhead Pk Versus CEP for Surface-to-Air-Missile (SAM) Targets

The Joint Munitions Test and Evaluation Program Office (46th Test Wing, Eglin AFB FL) is assisting ASC/LKG in the Lethal SEAD (Suppression of Enemy Air Defenses) Mission Area in a conceptual study of smart munition warhead designs and delivery conditions to optimize lethality of the munition to produce hard kills on threat SAM targets. Results of this work are being used to support ASC in concept exploration phase of their Lethal SEAD Pre-Emptive Destruction development program and will also support related Air Combat Command (ACC) COEA being conducted by AFSAA. This paper presents results of this study for target engagement radar(s) and TEL(AR)s of the SA-6, SA-8, SA-12 and ZSU-23-4 air defense units (ADUs). Warhead classes addressed include explosively formed penetrators (EFP), multiple-EFP (MEFP), unitary blast-fragmentation, flechette and shaped charge warheads (with and without fragmentation wrap). The effects of warheadkill mechanism, warhead fuse, aimpoint, and delivery accuracy characteristics, in terms of circular error probable (CEP) hit distributions, are parametrically studied to produce various metrics useful to munition designers. Products of this study for each munition variant and target include target P(K/H) matrices versus attack aspect, and 1x1 results such as average single shot probability of kill (SSPK) versus CEP for Mobility(M), Firepower(F),Catastrophic(K) and Hard(H)Kill metrics.

Eugene Dutoit, Dismounted Battlespace Lab

The Status of a Model-Experiment-Model Procedure in an Advanced Warfighting Experiment

Approved abstract unavailable at printing.

Wednesday, 0830 - 1000

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Framework for Assessing the Validity of Field Experiments

Operational test agencies are often asked "Is this a valid test?" or "Is your test still valid if XXX is no longer available?" To resolve these questions, test officers receive a list of do's and don'ts (for example, compute sample size requirements, use production representative systems, and avoid "golden crews") based on accumulated lessons learned. Thus far there is no comprehensive framework to address questions concerning the validity of an operational field test or experiment. This paper offers such a framework based on the methodological formulations of Cook, Campbell, and Stanley.

The components of an experiment and the meaning of validity are examined. An experiment is conducted to determine the truth or falsity of a causal proposition: Does Treatment "A" cause a change in Effect "B." The treatment is usually a new system and the effect is some measure of performance (MOP) or measure of effectiveness (MOE). A validity experiment is one where the conclusion "A caused B" (System X increases effectiveness) is based on evidence and sound reasoning.

Evidence of causality in an experiment can be divided into four major components of validity which logically follow the sequence of establishing causality. (1) Statistical validity is concerned with the ability to correctly detect a change in B, the MOP or MOE. (2) Given that B changed, design validity is concerned with whether A or some other variable was the agent of change. For example, were changes in B due to the new system or due to learning effects. (3) Given that B changed and that A alone probably caused the change, construct validity is concerned with whether A and B are representative of real-world treatment and effects. (4) Given that the above three conditions are met, operational validity is concerned with whether the results of the field test are applicable to actual Army operations.

These four components of field test validity provide a heuristic framework for categorizing 28 threats to validity listed in this paper and also provide a framework for comparing alternative field test designs. These 28 threats are discussed in detail and a field test validity checklist is provided.

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Non-Traditional C4I Systems Impose T&E Challenges for the '90s and Beyond

Traditional long term acquisition programs have given way to Commercial-Off-The-Shelf (COTS) systems, fielded prototypes and incremental developments, especially in the Command, Control, Communications, Computer and Intelligence arena. An added complexity is the fact that most of these systems are software intensive, running on existing commercial hardware platforms. Current Test and Evaluation (T&E) strategies are characterized by long term planning, coordination, and execution cycles that simply cannot support these new acquisition paradigms. Current T&E planning also requires a stable baseline, one that does not change between the various phases of test. Incremental developments and the fast paced commercial world are fluid by nature and do not support such rigid baseline requirements. The purpose of testing and the use of the expected results also impose a challenge. Results of traditional formal testing, particularly Initial Operational Test and Evaluation (IOT&E), were used to support milestone decisions before millions of dollars were spent for production. With the new prototype and incremental software intensive systems, the bulk of the investment occurred prior to the test. This paper discusses these and other issues that the test community must embrace in order to keep pace with the fast moving changes to the acquisition of new systems.

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T&E Test Plan and Acquisition Program Documents Linkage

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Test and Evaluation Strategy for Evolutionary Information Systems

When dealing with evolutionary Command and Control (C2) information systems, the Test and Evaluation (T&E) process, procedures, and strategies must be tailored to the evolutionary nature of maturing C2 systems. Key ingredients in this tailoring should be the focused use of test as a collector of maturing C2 systems. Key ingredients in this tailoring should be the focused use of test as a collector of data not available from other sources, and increased use of evaluation by including data assets from other functional activities, such as configuration management, design, independent verification and validation, quality assurance, previous test data, and system integration. The tailoring objective is to ensure that the essential information needed for prudent management decisionmaking is supported by data with integrity and sufficiency (Figure 1).

Typically, the nature of evolutionary C2 systems maturation results in a coordinated phasing of satisfying project requirements definition and implementation, with incremental functional software releases (FSRs) to the users for their use and feedback (Figure 2). To ensure that this process retains credibility, it is imperative that operational test and evaluation (OT&E) be incorporated into the process while retaining OT&E's independence. To do this, the T&E strategy should involve the Operational Test (OT) activity in the early stages of contractor testing (CT) to independently observe developmental test and evaluation (DT&E), integration testing (IT), Independent Verification and Validation (IV&V), and Site Acceptance Testing (SAT) activities This ensures the integrity of all data assets and the conduct of an Operational Assessment (OA) for each FSR.

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Operational Evaluation Metrics and Associated Criteria for Mission-Level Evaluation of Automated Information Systems

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Testing and Reliability of Information Systems

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Wednesday, 1530 - 1700

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System Understanding and Statistical Uncertainty Bounds from Limited Test Data

In many DoD test and evaluation (T&E) programs, it is necessary to obtain statistical estimates for parameters in the system under study. For these estimates to provide meaningful system understanding, it is also required that uncertainty bounds (e.g., confidence intervals) be attached to the estimates. Current methods for constructing uncertainty bounds are almost all based on theory that assumes a large amount of test data.

Such methods are not justified in many realistic T&E environments where only a limited amount of test data are available. This is especially true in light of reduced DoD budgets for certain T&E programs. This suggests a need for sound methods of uncertainty bound calculation from a small sample (and this will be demonstrated) that such a sound method will allow one to extract more information from the limited sample than the traditional approaches that incorrectly assume a large amount of data; this is obviously very important in light of the costs involved in conducting a T&E program.

This paper presents a method for constructing uncertainty bounds for a broad class of statistical estimation procedures when faced with only a limited amount of test data. The estimates of concern here are those based on minimizing or maximizing some criterion, including, for example, least squares estimates and maximum likelihood estimates (these two estimation procedures are probably the most commonly used methods in practice). The approach is built around characterizing the probability distribution of the statistical estimate of the parameter vector of interest. Such a distribution can then be used in constructing uncertainty bounds such as confidence intervals. (Current approaches to constructing uncertainty bounds are also based on the probability distribution of the estimated parameter vector, but differ critically from the small-sample approach here in requiring a large amount of test data.) The approach will be illustrated on a problem motivated by a Navy T&E program related to missile accuracy, where each test is very expensive. This example will illustrate how the small-sample approach is able to obtain more information from the limited sample than traditional approaches such as asymptotic approximations and the bootstrap.

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Optimization Techniques used by the 445th Flight Test Squadron in Radar Software Development Testing

The 445th Flight Test Squadron Radar Branch conduct F-15 DT&E for software upgrades, which must integrate multiple Operational Flight Programs among sub-systems with the radar Operational Flight Program. This is a complex mission, involving contractor/sub-contractor controlled development, local USAF controlled DT&E evaluation, increasing system complexity, and reductions in both funding and manpower, evaluation, increasing system complexity, and reductions in both funding and manpower.

445 FLTS has managed within the constraints through implementation of productive management techniques, efficient planning both for and during each test phase; optimal use of flight test resources; report techniques that are centralized and reduce redundancy; and a very powerful, flexible, and cost efficient data analysis system. Though many steps have been implemented in order to optimize radar flight test, the most effective tool in flight test optimization has been effective team interaction and communication between USAF, Contractor, Sub-contractor, and System Project Office. This paper will discuss some of the optimization techniques user by 445 FLTS in radar software development testing, their effectiveness in practice, and in a few cases their perceived future in an environment of increasing system complexity and decreasing budgets.

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Estimating Uncertainty Using the Bootstrap Technique

The importance of reporting the degree of uncertainty associated with a particular measure has been stressed time and again in the military operations research community. Confidence intervals can be calculated quite easily for many parameters having well-known statistical distributions, such as the binomial, normal or exponential distributions. For such parameters, the confidence intervals have a "closed form:" an equation into which test-demonstrated values can be substituted. In today's world of highly complex measures of effectiveness (MOEs) and measures of performance (MOPs), such

statistical information is often analytically impossible to obtain. The "bootstrap" is a powerful technique which allows analysts to estimate statistical confidence for virtually any quantitative MOE or MOP. Examples are given of using the bootstrap technique when: (a) it is impossible to calculate statistical confidence analytically; (b) it is incorrect to assume normally distributed data.

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Cost-Effective Test and Evaluation Methodology and Techniques

The search for reliability in the U.S. Army product has undergone profound changes through the years. The 1950s saw vague specification requirements and undefined test and evaluation parameters. The 1960s saw the emergence of improved military and contractor documentation and the resultant restructuring in the T&E concept. The 1970s saw the birth of the reliability growth techniques and the test-fix-test philosophy. The 1980s presented the U.S. Army with the fruits of the improved reliability techniques. The procured combat and tactical vehicles were superb and aided in the eventual peaceful victory of the cold war. The 1990s, however, present a backlash of this victory. The existing peace and decreased resource require a development of a cost-effective approach to the specification and demonstration of reliability.

With this in mind, The Tank-automotive and Armaments Command has implemented a number of initiatives. One of the initiatives addresses the total concept of reliability design, test and demonstration. The thrust is to utilize state-of-art tools as represented by virtual reality, simulation, and other mathematical techniques to raise the values of initial reliability and to expedite its growth to the desired objectives. Another initiative concentrates on identifying the weak links of fielded equipment and create programs to implement technology insertion. A major new technique utilizes expert engineer to ear down foreign equipment, to compare the equipment to U.S. equipment reliability and maintainability values. The end result present the design engineer with potential reverse engineering candidates, and the wargaming modelers with eliability/ maintainability values to insert in the appropriate models.

Another new technique consists of comprehensive measurement of the terrain energy levels and the adaptation of this knowledge, and the velocity aspect of the vehicles to develop accelerated testing profiles. In this manner, the shock and vibration parameters can be increased 10 t0 100 times, and the tests conducted to evaluate fatigue induced durability failures shortened proportionally.

The presentation discusses these TACOM initiatives with the specific objective of recommending these techniques for cost-effective and RAM evaluation applications.

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CHICKEN LITTLE: A Model for Cost Effective Test and Evaluation

The Joint Munitions Test and Evaluation Program Office, commonly referred to as CHICKEN LITTLE, has been conducting multi-participant/multi-objective test and evaluation activities since its inception in 1984. By conducting captive flight tests (CFTs) with multiple participants in various locations throughout the country, test objectives for a variety of participants can be satisfied in a synergistic and cost-effective manner. Through optimization of test matrices, understanding objectives of the various participants, and interleaving test activities in an optimum manner, CHICKEN LITTLE has provided both a cost savings, and better than anticipated return on investment for test participants. Unique approaches to satisfying test requirements such as using Developmental warhead tests in a novel way to satisfy LIVE FIRE legislation requirements, and using warhead firings to collect signature data in support of Battlefield Damage Assessment objectives have become the hallmark of CL's capabilities to support a multitude of test and evaluation requirements. This paper will provide an overview of the CL program, specific examples of multi-service and multi-objective DT/OT test events, and actual examples of cost savings realized and independently computed by test participants.

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Testing So As To Minimize Expected Cost

Operational testing in this cost constrained age is in a bind; it must test enough that the testers can judge well the

merits and demerits of the system being tested, but not so much that the costs of test are excessive. This paper presents a model for testing one shot devices. Parameters associated with the model are the threshold probability of functioning which the system must exceed to pass and two kinds of costs, the cost of a test and the costs of the various outcomes of testing. The model, for given inputs, generates a least expected cost strategy for testing; indicating for any past test history whether testing should continue, stop with system pass, or stop with system failure. Some instructive sensitivity analyses are included.

Thursday, 1030 - 1200

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The Continuous Evaluation Database System (CEDS) Supporting the Need for a Common Knowledge Base for Materiel Acquisition Systems in the Operational Evaluation Command

The Operational Evaluation Command (OEC) conducts continuous evaluation of the effectiveness and suitability of Army Materiel Acquisition Systems. System development often spans several years and several evaluators before an operational test and full production decision. Operational requirements developed by users evolve as well. BDM has developed a relational database called CEDS (Continuous Evaluation Database System). CEDS serves the needs of evaluators by providing a common base of knowledge of a systems status throughout its life cycle. It is in use now for several systems at OEC, including the Unmanned Aerial Vehicle, Paladin howitzer, Reserved Component Automation System (RCAS), and the Family of Medium Tactical Vehicles, among others. The database provides a comprehensive relational structure, a user friendly interface, and a wide variety of useful reports, including a Baseline Correlation Matrix of system requirements. Types of data stored in CEDS include:

- Requirements data from operational requirements documents, mission needs statements, operational concept
- Test and Evaluation Master Plans, etc.,
- A complete library of system related materiel acquisition documents,
- Results from technical tests, early user tests, or other observations,
- Critical Operational Issues and Measures of Performance.

CEDS provides many useful output reports, including:

- Baseline Correlation Matrix,
- Requirements, arranged by category
- Test results for each measure of performance
- Lists of operational requirements which have been met/not met
- Unresolved problems or issues for various issues (e.g. performance, RAM, MANPRINT, Software, etc.)

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Summary of the Development and Implementation of the Transportable Integrated Data Analysis and Management System (TIDAMS) and Relative Approaches to Improve T&E Effectiveness at the 46th Test Squadron - EGLIN AFB, FL

Considerable uncertainties exist within the T&E community amidst the rash of budgetary reductions and downsizing of the DOD in recent years. However, one thing that remains certain is that the T&E mission must continue if military superiority is to be maintained. Given the circumstances, we in the T&E community are left with no other alternative than to seek out and take more economical and innovative approached to how we conduct our T&E activities. The 46th Test Squadron at Eglin AFB, FL has reconsidered its T&E philosophy to reflect emphasis on customer service and compression of the T&E process in terms of time and cost. The physical manifestation of this change in philosophy is the development and phased implementation of the Transportable Integrated Data Analysis and Management System (TIDAMS). TIDAMS seeks to optimize the performance to testing, data reduction, relational database generation, analysis, and quick-look reporting concurrently from within the on-site test environment. TIDAM's underlying concept is to enable "next day test planning through same day test results". The purpose of this paper is to generally promote the need for improved T&E methodologies and to introduce TIDAMS as a viable option to that end. The 46th Test Squadron's T&E philosophy and TIDAMS' current and projected capabilities will be discussed.

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Software Configuration Management in Operational Testing

The Armed Forces are rapidly moving toward "paperless" operations. This capability involves using computers to replace paper forms of various types. These computers need to be linked together to provide data real-time and be able to communicate via various communications means. This entails using computer systems that are "software intensive". These software intensive systems undergo many software revisions throughout the acquisition process. Before these systems are produced and fielded to its users they must undergo an operational test to demonstrate their readiness for production and to ensure the user is getting a quality product. In order for the tester to conduct a viable test, these software revisions must be managed. To manage these revisions, TEXCOM has created a Software Configuration Management Plan (SCMP). This plan not only benefits the independent tester, but also the independent evaluation, the operator trainers, the technical evaluators, and other Program Managers in assessing any potential negative impacts that software revisions may create.

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Airborne Instrumentation and Analysis System for Electronic Combat Test and Evaluation

Testing of EC equipment on military aircraft has been hampered by numerous data collection and analysis problems. Instrumentation of operationally representative aircraft is often difficult, expensive and intrusive; therefore, they are often not instrumented at all. While flying at low altitudes and performing high-g maneuvers, these aircraft are also difficult to track using ground radars or optical trackers. Together, these limitations have produced a lack of consistent system performance data and aircraft TSPI data. Further compounding these problems from an OSD perspective is a lack of inter-program and inter-service communication, resulting in incompatible evaluations, even for similar systems. Finally, when data are available, results often require weeks or months to analyze. These factors make early characterization, performance tracking during testing, and comparisons across programs difficult or impossible. To improve this situation, a multi-service, multi-platform, multi-system instrumentation package that is non-invasive, flexible and easy to use, and can provide quick-look results is needed. Beginning in FY94, OSD/DOT&E has funded, through CTEIP/REP, the design, construction, and testing of the Airborne Instrumentation System (AIS). AIS consists of two aircraft instrumentation packages (TIP and ADAS), a flightline computer for data upload/download, and data reduction and analysis software (CAPS and MARS). Together with test range threat emitter instrumentation, these components form a complete system for T&E of EC systems. AIS is currently undergoing flight testing and validation; it will be used for assessment of the AN/ALR-67 (V)2 RWR during FY95, the AN/ALR-67 (V)3&4 RWR during FY95-96, and for T&E of other EC systems. The design concept, preliminary test results, and potential test applications of this system are described in this paper.

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Data Injection and Monitoring Unit: A Multipurpose Test Tool

The Data Injection and Monitoring Unit (DIMU) is a multipurpose test tool which has proven invaluable in the operational testing of the Cheyenne Mountain Upgrade (CMU) Program. The DIMU is a low-cost, portable, laptop computer capable of injecting messages/data into systems, collecting/monitoring data, and doing the initial data reduction/analysis automatically.

The DIMU is based on both the hardware and software of the Milstar Terminal Loader/Monitor. The DIMU follows the System Integration Office (SIO) STD-1200A definition of the Advanced Data Communications Control Protocol (ADCCP) level 2 protocol. The DIMU software converts validated scenarios to injectable messages. It then injects messages from a sensor site while simultaneously monitoring the message traffic. Before injection, the DIMU verifies the annotation of the message, calculates and inserts transmission time, calculates the cyclic redundancy check (CRC); provides

full ADCCP support; and injects the processed messages into the system. The DIMU can also monitor and record the injected data including the re-verification of each message's annotation. The DIMU can monitor and collect all data sent and received on the communications link.

After transmission, the DIMU collects data as events and as clear text data. Certain messages are recognized and logged. Message statistics are also logged and displayed on the terminal screen in real-time. After data collection, the DIMU can perform highly automated post test analysis on all of the DIMU recorded data.

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IPT Flight Test Management Database

This presentation describes a simple database system used to manage the Integrated Product Team (IPT) flight test operations which involve different discipline engineering databases and joint testing data linkages. This database system can be used for a multi-user Dbase IV networking environment. It is menu driven and user friendly. This system will link among Test Point Matrices, Flight Logs, Test Plans, and Discrepancy Data files to a unique database without compromising the integrity and security of the data in those files. The Test Point Matrices data file allows IPT members which represent radar, avionics, instrumentation ,project, and operation engineers from the lead support agency, contractors, and the customer to add, change, remove, display, print, and search test point data. The Flight Log data file provides similarly edit features, data file will combine and link the Flight Log and Test Point Matrices data files to generate a flight test database equipped with similar edit features. The Discrepancy Data file generates a service report database which features the link between the Flight Logs data files and provides a Memo filed to file a Multi-Command Form - 37 with details of product discrepancy and recommendations.

WG 21 — UNMANNED VEHICLES

Chair: **Brad W. Bradley, USAMSAA**
Cochairs: **Robert E. Bowen, Potomac Systems Engineering**
CPT Ed Kleinschmidt, USA/USMC
Frederick Cancilliere, USN/NUSC
MAJ Gerald Diaz, USAF Studies and Analysis
Room: **Michelson Hall - Room 110**

Approved abstracts not available at printing.

WG 22 — COST AND OPERATIONAL EFFECTIVENESS ANALYSIS - ABSTRACTS

Chair: **Dr. Patricia Sanders, OSD(ODTSE&E)**
Cochairs: **LTC Bob Clemence, (OSD(ODPA&E)**
Lt Col Dean Illinger, AF/XOME
Advisor: **Dr. William G. Lese, Jr., OSD(ODPA&E)**
Room: **Chauvenet Hall - Room 116**

Tuesday, 1030-1200 - **Methodology**

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Ordinal Ranking Methods for COEAs: Avoidance of Independence and Subjectivity Requirements

The effectiveness portion of a COEA often requires that alternatives be ranked based on the computed scores for a number of criteria. The class of all ranking methods can be divided into two basic categories: cardinal methods and ordinal methods. Cardinal methods include multiple attribute utility theory and the analytical hierarchy process, and they are used when decision-makers express their degree of preference of one alternative over another. Ordinal methods are used when only the rank order of the alternatives is known for each criterion. In a COEA application, ordinal methods have the following advantages: independence assumptions are not needed for the criteria; subjective assessments (such as for constructing utility curves) are not needed; and the scores for individual criteria are not weighted and combined into an overall score. This paper addresses five ordinal ranking methods (Borda, Bernardo, Cook-Seiford, Kohler, and Arrow-Raynaud), compares their theoretical properties, and shows the results from applying them to two different COEAs.

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Nonnuclear Consumables Annual Analysis (NCAA) Target Values/Priorities

Conventional munitions' requirements for the U.S. air Force have been determined for the past 20 years using a process called the Nonnuclear Consumables Annual Analysis (NCAA). The core of this process is an optimization of target value destroyed in order to

determine allocation of aircraft and weapons to targets. Key to this optimization is an assessment of the value of each target's destruction to the conflict. Historically, the NCAA has relied on theater planner judgment to assign values to the targets that reflect the warfighter's concept of operations. Recently, however, the use of these values to support COEAs and other studies has highlighted the need for a formal. reproducible methodology to determine target values. In 1993, Air Combat Command Studies and Analysis Squadron tested an Analytical Hierarchy Process (AHP) model during the NCAA theater conferences. The results of that test encouraged the Air Staff to continue development of a target value process for incorporation in the NCAA. The new process relies on a strategies-to-task framework to establish relative importance of operational objectives and a characterization of the degree that destruction of each target contributes to the satisfaction of each objective. The process, programmed in Visual Basic, serves as a critical element in reflecting theater commander's intent in the determination of conventional munitions' requirements for the Air Force.

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Advanced Field Artillery System/Future Armored Resupply Vehicle Cost and Operational Effectiveness Analysis

The TRADOC Analysis Center conducted the Advanced Field Artillery System (AFAS) Future Armored Resupply Vehicle (FARV) Cost and Operational Effectiveness Analysis (COEA) as tasked by Headquarters, Department of the Army, to support a Milestone I decision review by the Defense Acquisition Board. The primary decisionmaker issue addressed by the COEA was whether the current M109A6 Paldin howitzer and M992 Field Artillery Ammunition Supply Vehicle (FAASV) could be replaced by a new start system.

The AFAS FARV COEA compared alternative systems for performing direct artillery support to maneuver forces engaged in combat. Operational analysis was conducted to evaluate each alternative's contribution to combat effectiveness. Primary modeling and simulation tools used in the COEA were the Vector-in-Commander (VIC) combat model and the Target Acquisition and Fire Support Model (TAFSM). Systems were examined in various operational environments.

The operational effectiveness results were integrated with the results of the logistics personnel, and cost analyses to provide an assessment of the alternative howitzer and resupply vehicle systems.

Tuesday, 1330-1500

JOINT SESSION - WORKING GROUP 2 & 3

Increasing the Relevance of COEAs to the Acquisition Process

Panel Discussion:

OSD Perspective

Dr. Mike Gilmore, OSD(ODPA&E)

Service Perspective

Mr. John Riente, USA DCSOPS

Program Manager Perspective

Colonel Bob Garner, USMC, V-22 Program Office

Wednesday, 0830-1000 - **Non-Traditional Applications of COEAs**

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Suppression of Enemy Air Defenses (SEAD) - Costs and Benefits of Using Lethal SEAD at the Mission Level

One objective of the Joint Direct Attack Munition (JDAM) Milestone II COEA was to include the costs/benefits of employing lethal suppression of enemy air defenses (SEAD) at the mission level. This was accomplished by examining the impact of SEAD in a South West Asia (SWA) scenario employing the AGM-130, GBU-24, JDAM, Maverick and general purpose bombs. Wild Weasal sortie and HARM costs required to reduce attrition was calculated by weapon/profile/target type combination. This study answered the question "is it cheaper to build dumb bombs that require significant SEAD support or Smart/longer range weapons that require less or o SEAD support?" Preliminary results indicated SEAD requirements and associated cost differences between weapon types. This presentation sheds light on this problem from the target type through the theater level. The mission level analysis discussed the following SEAD approach:

(1) Using the EADSIM average weapon/target type attrition data for the F-15E in SWA without SEAD assets, identify when average sortie attrition is

unacceptable. If the attrition was below this value, SEAD assets were not applied. Over fifty Non-Nuclear Consumable Analysis (NCAA) target types with over 2000 specific locations were examined.

(2) Employing a "reasonable amount" of HARM assets to reduce the attrition was based on the number of HARM delivery aircraft and missiles that are expected to be available in SWA, HARM Pk data, Wild Weasel tactics, and force structure against the surface-to-air threats were provided by ACC/DRFA. an iterative approach using the EADSIM model to calculate the target type attrition was used.

(3) Calculating and comparing the costs to kill each target type with and without SEAD are summarized.

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Precision Strike Capability/Joint Attack Munition (JDAM), Product Improvement Program (PIP), Accuracy Requirements Study

The value of precision strike can only be understood in light of the needs for specific forms of weapon accuracy on the battlefield. Currently accuracies required to effectively destroy targets for certain military regions had not been fully determined, nor were the impacts of various combat factors on weapon accuracy requirements completely understood. the purpose of this study was to provide insights into the accuracy requirements needed to destroy regional-specific targets and to ascertain the factors that influence these requirements. Presented are the analyses of the accuracy requirements for the application of aircraft delivered 2,000 pound class unitary warheads employed in two different regions. It incorporated the optimal use of these weapons based initially on least number of munitions necessary to achieve threshold destruction of each respective target set and then on minimized cost to accomplish the same mission. Sensitivity analyses and excursions are described which investigated causality in shifts of the requirements, more fully bounding the value of the results. Three measures were used in this study. First, the Circular Error Probable (CEP) value required to attain the desired destruction per target--this was the largest integer CEP value needed to accomplish the mission with the minimum number of munitions. Secondly, the number of bombs required per CEP value to destroy the target set--this measure was used to characterize the target set and to evaluate the impact of various driving factors. Finally, the total number of bombs (by type) needed to destroy the target set--this was the "greater perspective" measure which was used to describe weapon quantity shifts due to selection of alternate munitions.

Wednesday, 1030-1200 - **Integrating Cost and Effectiveness Analysis**

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Do These Costs Make Any Sense? The Use and Abuse of Costs in Defense Acquisition Analysis

Since 1991, the Center for Naval Analyses (CNA) has provided leadership and staffing for a number of cost and operational effectiveness analyses (COEAs) required by the Navy and Marine Corps. In addition, CNA has conducted COEA-like studies for various components of the Department of the Navy for many years. This paper, which draws from the collective experience of that work as well as from longer-standing principles of defense systems analysis, identifies and discusses certain issues that appear to be common to all COEAs. each issue relates in some way to the use or misuse of cost information in the analysis.

This presentation begins with an overview of the role of COEAs in the acquisition process and a general discussion of the objectives of these studies and how they are put together. It then focuses on the following issues: (1) system versus decision alternatives, (2) integrating cost and effectiveness results, (3) wartime costs, (4) discounting, (5) risk and uncertainty analysis, and (6) affordability. While making no claim to have found final solutions for the many problems surrounding these issues, the authors believe that the insights gained and lessons learned will prove useful in subsequent work of this type.

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Cost and Effectiveness Integration

Approved abstract not available at printing.

Wednesday, 1330-1500

COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830-1000

JOINT SESSION
WORKING GROUPS 22 & 23 ..... Chauvenet 116
COEAs for Joint Acquisition Programs

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Joint Studies: A Joint Stars Example

Joint Cost and Operational Effectiveness Analyses (COEAs) are a challenge. Combining service procedures in order to provide a truly joint product takes thought and planning far beyond single service COEA methodologies, not to mention the time necessary for joint service coordination and approval. The Joint Surveillance Target Attack Radar System (STARS) COEA is an example of a study intending to combine service methodologies, share data and model information, and provide a single report with Air Force and Army results integrated into a single conclusion on the Joint STAR System.

Services are structured differently to perform COEAs. The Army has centralized its analytic resources to attain experience in performing COEAs. The Air Force places the COEA responsibility on those who have the system experience and represent the user. Standard approaches in COEA methodologies differ between services. The Army develops issues and sub-issues called essential elements of analysis (EEA). The Air Force develops a study scope and centers its analysis around functional objectives which represent system capabilities and functions. Differences between Services also exist in scenario availability and data supply.

Understanding the differences between Services is critical in planning joint studies and developing timelines. Lessons learned will be provided from the Joint STARS COEA which will be useful in planning future joint studies.

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Joint Stars COEA - OT&E Linkage

OSD policy calls for a linkage between the COEA and operational test and evaluation (OT&E). In order to satisfy the requirements for linkage the COEA should address the following: the quantitative relationship between COEA and OT&E measures, the impact of test limitations, and the effect of test results. These are referred to as the three elements of linkage. This briefing illustrates the difficulty in trying to satisfy these three elements of the Joint STARS COEA and the Multiservice OT&S (MOT&E). A major problem is the time available. For example, rerunning the COEA with MOT&E results cannot be accomplished within the constraints of the program schedule. Also, in order to conduct even a moderate sensitivity analysis, the effort would have to have been started almost a year before the ADM (which called for the COEA) was issued. This is not a problem that will be unique to Joint STARS. If we are to meet the intent of OSD policy, we need to develop innovative approaches to linkage. It will also be important to insist upon early involvement by the OT&E agency.

Thursday, 1030-1200 - **Jointness in COEAs**

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The Joint Context with Army Cost and Operational Effectiveness Analyses

During FY94 the TRADOC Analysis Center conducted 14 major Army Cost and Operational Effectiveness Analyses (COEAs) supporting $64 Billion in acquisition programs. Although the systems studied were primarily Army systems, the Operational effectiveness Analyses evaluated the systems in the environments in which they would be expected to fight. This environment included Army as well as other service systems. The representation of other service systems is the Joint Context within Army COEAs.

The milestone decision, the Mission Needs Statement (MRS), and the system alternatives establish the Joint Context of the study. It is also based on where the system falls among the levels of war--strategic, operational, or tactical. This process is overseen by the Senior Advisory Group and implemented by the study team at TRACE. The Joint Context is then achieved through the choice of: scenarios, data, and models.

Depending on the milestone decision and the system's intended role on the battlefield, the analysis represents appropriate other service systems and thus forms the Joint Context of the study. The process is founded on DoD 5000, sound logic, and over 20 years of experience.

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Problems Associated with Joint COEAs

The process involved with conducting a single service COEA is clearly complex and time consuming. However, in today's world of constrained budgets and intraservice mission emphasis, most major acquisition programs are done jointly. Placing a joint requirement on the already complex COEA process considerably expands the amount of effort necessary to get the COEA done in support of the milestone decision. This presentation will identify the lessons learned and problems associate with managing and performing Joint ACAT I COEAs from the total systems perspective. The briefing will address managerial, organizational, technical, modeling, and political issues i producing a Joint COEA that is analytically sound and satisfies DoD COEA requirements. The lessons learned and problems associated with Joint COEAs were drawn from the presenter's experience as an analyst and/or program manager of the AX, JDAM Milestone I and II, and JSOW COEAs in support of HQ ACC Director of Requirements (DR).

WG 23 — WEAPON SYSTEMS ACQUISITION - ABSTRACTS

Chair: **James C. Kolding, Teledyne Brown Engineering**
Cochairs: **Terry Cooney, Veda, Inc.**
LCDR Pat Crotzer, OCNO
Room: **Michelson Hall - Room 107**

Tuesday, 1030 - 1200

Captain Gregory K. Cohen
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Centralized Procurement: Mapping Resources to Operational Assessments

The current acquisition process required each service to develop and fund for equipment using a dollar amount provided by the Department of Defense (DoD). The amount allocated by DoD is usually a percentage of previous years' funding levels and does not consider any type of DoD wide assessment of likely operations or to any priority based on the likelihood that those operations will occur. During the cold war military planners could easily concentrate resources on preparing for a global conflict. In fact, while the likelihood of a global conflict was slim, it was the driving force for military planners and therefore the method that was used to allocate resources. Now that the cold war has ended, it is time for resources to be allocated based on a different methodology.

The paper proposes that a centralized procurement account be established and that each of the services' programs compete for funding against the other services' programs. The paper examines the funding provided to the Marine Corps during and after the cold war and compares it against the types of operations that are currently occurring and on the likelihood that future operations will occur. The case is made that current funding levels are still based on a cold war mentality that funds unnecessary programs at the expense of other services' programs and that the current system does not consider the needs of DoD as a whole.

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An Analytic Framework for Strike Operations

Approved abstract not available at printing.

Tuesday, 1330-1500

JOINT SESSION
WORKING GROUPS 22 & 23 . . . . . Chauvenet 116
Increasing the Relevance of COEAs to the Acquisition Process

Panel Discussion:
OSD Perspective
Dr. Mike Gilmore, OSD(ODPA&E)
Service Perspective
Mr. John Riente, USA DCSOPS
Program Manager Perspective
Colonel Bob Garner, USMC, V-22 Program Office

Wednesday, 0830 - 1000

Bard Mansager
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Linking Requirements to Technologies is one of the Current Analytical Challenges

Approved abstract not available at printing.

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Analysis of the Advanced Field Artillery System (AFAS)

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Wednesday, 1330 - 1500

COMPOSITE GROUP V SESSION .. Rickover 102

Thursday, 0830-1000

JOINT SESSION
WORKING GROUPS 22 & 23 . . . . . Chauvenet 116
COEAs for Joint Acquisition Programs

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Joint Studies: A Joint Stars Example

Joint studies are a challenge. Combining service procedures in order to provide a truly joint product takes thought and planning far beyond single service methodologies, not to mention the time necessary for joint service coordination and approval. The Joint Surveillance Target Attack Radar System (STARS) COEA is an example of a study intending to combine service methodologies, share data and model information, and provide a single report with Air Force and Army results integrated into a single conclusion on the Joint STAR System.

In recent history, joint systems are normally created from already existing duplicate efforts between services. Requirements analyses have normally been done in the beginning prior to the system becoming joint. A history of Joint STARS requirements will be provided along with discussion on how this may have been jointly performed. Regardless of the analyses performed, there exists certain differences in the services and their approach to analyses. The Joint STARS COEA will be used as an example of these differences. Approaches to joint studies can often depend on how the system itself is created. For Joint STARS, different services are responsible for different components of the system. However, how can a study be managed when there are competing systems from different services to be selected for the single joint system buy? How do you manage a study when a single system is to serve different purposes within the services?

Understanding the differences between services is critical in planning joint studies and developing time lines. Lessons learned from performing the Joint STARS COEA will be provided with opportunity to discuss establishing studies, specifically requirements work, in the joint arena.

Thursday, 1030 - 1200

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Joint Requirements Analysis in the CR-UAV COEA

The Close Range Unmanned Aerial Vehicle (CR-UAV) Cost and Operational Effectiveness Analysis (COEA) was recently completed. The COEA had Army and Marine Corps participation, a Marine Corps Study Director, and reported to a Department of the Navy Oversight Board. Discussion will be provided on the interaction between the analysis performed in the COEA and the Operational Requirements Document (ORD) with emphasis on the determination of performance parameters.

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Precision Strike Capability/Joint Direct Attack Munition (JDAM), Product Imporvement Program (PIP), Accuracy Requirements Study

The value of precision strike can only be understood in light of the needs for specific forms of weapon accuracy on the battlefield. Currently accuracies required to effectively destroy targets for certain military regions had not been fully determined, nor were the impacts of various combat factors on weapon accuracy requirements completely understood. The purpose of this study was to provide insights into the accuracy requirements needed to destroy regional-specific targets and to ascertain the factors that influence these requirements. Presented are the analyses of the accuracy requirements for the application of aircraft delivered 2,000 lb class unitary

warheads employed in two different regions. It incorporated the optimal use of these weapons based initially on least number of munitions necessary to achieve threshold destruction of each respective target set and then on minimized cost to accomplish the same mission. Sensitivity analyses and excursions are described which investigated casualty in shifts of the requirements, more fully bounding the value of the results. Three measures were used in this study. First, the Circular Error Probable (CEP) value required to attain the desired destruction per target, this was the largest integer CEP value needed to accomplish the mission with the minimum number of munitions. Secondly, the number of bombs required per CEP value to destroy the target set, this measure was used to characterize the target set and to evaluate the impact of various driving factors. Finally, the total number of bombs (by type) needed to destroy the target set, this was the "greater perspective" measure which was used to describe weapon quantity shifts due to selection of alternate munitions.

Thursday, 1330 - 1500

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Role of Experimentation in Streamlining Acquisition

Approved abstract not available at printing.

WG 24 — SOFT FACTORS IN MILITARY MODELING AND ANALYSIS - ABSTRACTS

Chair: **William M. Pugh, Naval Health Research Center**
Cochairs: **Ronald Laughery, Micro Analysis and Design**
Sally VanNostrand, ARL
Advisor: **Eugene P. Visco, SAUS-OR**
Room: **Michelson Hall - Room 112**

Approved abstracts not available at printing.

WG 25 — SOCIAL SCIENCE METHODS - ABSTRACTS

Chair: **Maj George (Mark) Waltensperger, AL/CFHP**
Cochairs: **Dr. Jock O. Grynovicki, USARL**
LCDR Mark T. Sandvigen, Naval Space Command
Ensign Craig Arndt, USNR
Advisor: **Dr. James C. Geddie, USARL**
Room: **Michelson Hall - Room 112**

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Validation of Energy Expenditure on the I-Port Mobility Platform

Approved abstract not available at printing.

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Improving Team Coordination: A Case for Behavior-Based Training

This paper integrates the findings of three studies focused on improving team performance in a military aviation setting. Two studies investigate d the effect of exposing subject aviators to standardized, behavior-based training for improving team coordination and performance. A third study investigated the effect of increased intrateam familiarity (battle rostering) on team coordination and performance. In these studies, we measured effect in terms of attitudinal change, coordination behavior change, and team task performance change. The general findings suggest that standardized, behavior-based training produces superior team coordination and performance to that achieved through battle rostering. Findings also demonstrate that behavioral change is a more reliable marker of training impact than attitudinal change.

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The Use of Nonparametric Statistics in Marine Corps Mission Area Assessments

Currently the Marine Corps conducts assessments to determine its current deficiencies in specific warfighting capabilities. The process concludes with a prioritized list of deficiencies that are used by personnel involved in the Marine Corps Combat Development Process (CDP). The key to the assessment has been to take subjective and qualitative data and convert it into a prioritized list. Not only must the subjective and qualitative data and convert it into a prioritized list. Not only must the subjective and qualitative analysis be defensible, but the quantitative process used to prioritize the data must also be defensible and most importantly it must represent the actual views of those taking part in the process.

The process chosen by the Marine Corps to quantify the assessments is a two step process that first determines if there is a statistical difference between Mission Area deficiencies and then prioritizes the deficiencies using ordinal data obtained from conference attendees. Friedman's nonparametric test is used to determine statistical difference and Thdurstone's Law of Comparative Judgment is used to prioritize the deficiencies. The use of these two procedures allows the Marine Corps to use quantifiable procedures to prioritize warfighting deficiencies and it allows those who are involved in the Combat Development process to focus scarce resources on the priority programs.

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Analyst Tool for Forecasting Political Instability

This project focuses on developing a generalized tool for analysts to assess the likelihood of political instability within the next six months, including the form it may take and the changes that may occur in response. The formal model uses expert knowledge, elicited from intelligence analysts, and focuses on unhappy groups within the society, their grievances with the government, and their political capacity in relation to that of the government. Using these data, the model suggests the form instability may take (internal war, turmoil, conspiracy, peaceful change) and the changes that may occur (changes in policy, head of state, revolution etc.). Analysts can provide the data through an on-line questionnaire that immediately produces the six-month forecast. The model is currently in the validation stage and is being applied to sixty countries with data input from analysts throughout the intelligence community.

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Using the SHIPCAS Projection System to Simulate Casualty and Illness Rates Among Forces Afloat

Accurate forecasts of the injury and illness incidence likely to be sustained during naval combat operations allow sufficient medical resources to be programmed to treat expected patient flow while minimizing over allocation of resources. A planning tool called the shipboard casualty projecting system (SHIPCAS) has recently been developed to forecast shipboard cassualty incidence. SHIPCAS is a forecasting tool that projects WIA (wounded-in-action), KIA (killed-in-action), and DNBI (disease and non-battle injuries) incidence among naval surface forces. By simulating naval combat , SHIPCAS provides medical planners with the injury and illness estimates required to assist in de terming the needed medical resources. The SHIPCAS system models casualties afloat by allowing the planner to define a specific scenario in terms of task force composition, expected battle intensity, and length of the operation. The model then produces graphical and tabular information detailing the total number of casualties across the operation, the daily average number of casualties, the maximum daily number of casualties, and the casualty rates per 1000 strength per day. In addition to projecting numbers of ships hit and resulting casualties, SHIPCAS also provides estimates of the temporal points in the operation during which shipboard strikes are most likely.

Two major components are essential to shipboard casualty projections: 1) calculations of the rate of hits that ships would be subject to under various combat situations, and 2) the casualties which would result from a strike on a surface vessel. In order to provide operationally-relevant projections, historical data were extracted and analyzed in terms of hit rates and resulting casualties. Studies conducted at the Naval Health Research Center examined the frequencies and rates of casualties sustained during various World War II naval operations. Data from these investigations provided a basis to segregate the operations into definable battle intensities, within which statistical parameters could be individually analyzed. Five separate battle intensities were assigned (no combat, light moderate, heavy, intense) and ship attack rates, WIA and KIA frequencies, and distributions of weapons and ship types were then examined for each battle intensity. Shipboard DNBI rate projections are based solely upon ship type because, while DNBI rates were found to vary by size of ship, combat status had but a light impact on illness incidence.

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A Combined Methodology for Combining Modeling, Simulation, and Demonstrations in Assessing Operational Effectiveness

The Air Force is conducting a pre-Milestone I assessment of potential enhancements to surveillance and attack platforms to improve their capabilities to detect, tract, identify, attack and destroy theater missile (TM) systems. These Attack Operations or counterforce enhancement concepts are focusing in on improvements to the sensors and target acquisition support subsystems. A unique approach, combining engineering analyses, mission- and campaign-level effectiveness modeling, man-in-the-loop simulation experiments, and laboratory and flight demonstrations, is being followed to quantitatively assess the contribution to operations effectiveness that improved sensor and automatic target cueing and recognition (ATC/ATR) technologies might provide.

An Interim Evaluation was conducted to scope the avionics concepts. Over 100 sensor/ATC/ATR potential concepts were screened and 32 were selected for further analysis. Criteria were selected in conjunction with the Warfighting Command in three major evaluation categories: performance, cost, and technology availability. The Warfighting Command provided weighting factors for both the evaluation categories and the individual criteria within each category.

The core of the operational effectiveness assessment is mission-level effectiveness modeling using the Extended Air Defense Simulation (EADSIM) model. EADSIM requires detailed, lower-level , performance data as input. Engineering analyses and engagement-level effectiveness modeling are supporting the EADSIM input data generation process.

Part-task, man-in-the-loop simulation experiments are being conducted to complement the engineering and engagement-level analyses. In one study, image generation code is being used to support a study of the effect of synthetic aperture radar (SAR) resolution on operator performance in a target acquisition task. These results will be used as input to the engagement-level modeling which will apply the effects of aircraft tactics, terrain masking, weather, etc., in estimating the probabilities required by the EADSIM model.

Flight demonstrations are being conducted to obtain imagery to support ATC/ATR algorithm development and higher fidelity operator performance experiments. This imagery will be used to support two operator performance studies. The imagery will also be used to train and refine ATC algorithms. When ATC data becomes available, it will be exploited in conjunction with the imagery in a man-in-the loop study of ATC-aided TM acquisition performance.

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Comparing Information Requirements for BMD C2 Centers

Ballistic Missile Defense Command and Control Centers (BMD) C2) are characterized by the rapid input, processing, and output of information by command staffs and automated b battle management software to plan and direct missile engagements. At issue for human operator processing is whether adequate and appropriate information is available and properly displayed to support effective decision-making for the short timelines available in missile defense scenarios. This effort describes a series of laboratory experiments specifically designed to elicit, categorize, and prioritize information required for key missile defense decisions at both national and theater level C2 centers.

Using a combination of comparative judgment techniques and multivariate scaling analyses, information items were assessed by domain experts for National Missile Defense (NMD) command and operations centers and for operators in the Theater High Altitude Area Defense (THAAD) tactical operations center. Information networks and taxonomies, representing the varying Òcognitive mapsÓ for each C2 center or role, were developed from the iterative judgment data and the statistical scaling algorithms.

The NMD C2 groups showed high level similarities in overall categories of information required (e.g., threat data, weapon, and sensor status data, et c.) , but marked differences in data detail requirements and data needed for specific decisions. The two operators in the THAAD C2 center showed a clear difference in the information required distinguished by who was attending to the immediate engagements in the threat queue, and who was assessing the threat and current resources for future engagements. These detailed information item maps and corresponding item priorities for C2 decisions were tabulated into requirements matrices which specify interface design options and recommended alternatives.

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Localization of Acoustic Beacons in a Free-Field Listening Environment

Approved abstract not available at printing.

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Human Engineering for the Force XXI Assessssment Process

The US Army Operational Test & Evaluation Command (OPTEC) has developed a concept and methodology for the Force XXI assessment process. The concept is called the Baseline Assessment Strategy (BAS). The methodology is called the model-experiment-model-validate (MEMV) approach. BAS and EMEV are driven by the requirement to provide independent, Òhonest brokerÓ assessments of Force XXI efforts to organize, equip and train the Army for the information age. The pace, complexity and scale of Force XXI precludes business-as-usual in operational testing and evaluation (OT&E); hence, we have BAAS, MEMV and assessment processes, not OT&E); hence, we have BAS, MEMV and assessment processes, not OT&E. Human engineering for the Force XXI assessment process is proposed because so many pieces must be linked and so many trade-off decisions made to satisfy so many stake-holders. Beyond the human system integration (HSI) and MANPRINT goals of insuring that soldiers are well served by Force XXI systems, human engineering can facilitate the Force XXI assessment process, itself. The concept is to combine electronic meeting systems, generically called groupware, with multivariate case study research methods and to coach soldiers in their use. Doctrine, tactics, leadership, organization, material and soldiers (DTLOMS) can be built into the assessment process by examining soldier-in-system-loops up through the chain of command at successive levels of responsibility. Working groups representing each chain-of-command level can be used to develop coaching methods and the groupware case study assessment process. Early developmental experience will be reported.

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Modeling the Auditory Detection of the Squad Automatic Weapon Magazine

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Verification, Validation, and Accreditation of a Soldier Modeling Tool: HARDMAN III (Hardware vs. Manpower III)

As directed by regulation and more importantly, as required for continued effective and timely use, the suite of soldier-system analysis tools collectively known as Hardware vs. Manpower III (HARDMAN III) was submitted to a formal verification, validation, and accreditation (VV&A) process. The first phase of the HARDMAN III VV&A was completed in December 1994. It comprised the core task network modeling capability and the effects implemented as additions to or modifications of the task data in the network model, namely, mental workload estimation, environmental degradation effects, and personal characteristics and training frequency effects. The Accreditation Review Board, made up of representative users, policy-makers, technical experts, and soldier proponents, established eight acceptability criteria. The criteria covered configuration management, software verification, documentation and help, specification of data input requirements, model granularity, the validity of the modeling techniques and embedded algorithms, output, and analysis timelines. All the criteria were satisfied. The principal conclusions with respect to the validity criteria were several: T ask net work modeling is a sound approach for modeling soldier-system performance. The workload estimation techniques in HARDMAN III is solidly based in research and is appropriate for this use. Although the environmental stress algorithms all warrant updating, the basic approach of degrading performance on a task-by-task is supported. For estimating personnel and training requirements, the existing data source is sufficient and remains the best available data source. Finally, through the VV&A process itself, data collection, co-development, and further validation opportunities were suggested. Formal accreditation was granted with only limited caveat s.

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The Influence of Load Mass and Load Distribution on the Road March Performance of Special Operations Forces Soldiers

Fifteen Army Special Operation soldiers performed six road marches in which they carried three load masses (34, 48 and 61 kg) using two different pack systems. Pack systems were 1) the large All Purpose Lightweight Individual Carrying Equipment (ALICE) pack with frame and 2) an experimental double-pack. The double-pack distributed the load mass equally between the front and back of the body. Marches were 20 km in length and soldiers were asked to complete the distance as rapidly as possible. Results showed that march times increased as load mass increased and soldiers were faster with the ALICE pack than with the double-pack. Heart rate while marching was lower for the double-pack even after adjustment for march time, suggesting a lower energy expenditure for the double-pack. The double-pack resulted in less low-back discomfort and a lower incidence of foot blisters at the highest load. However, the double-pack also resulted in more discomfort in the neck and hips and more heat illness-type symptoms. Neither load mass nor load distribution affected soldiers post-march performance on a marksmanship t ask, a grenade throw for accuracy or a cognitive task (Synthetic Work Environment). However, there was an overall post-march increase in vertical shot group dispersion on the marksmanship task. This investigation suggests that the load carried by soldiers affects maximal effort march times but has minimal influences on the performance of some common military tasks after the march. The concept of distributing the load more evenly around the center of mass of the body has both positive and negative aspects and deserves further investigation.

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The Effects of a Computer-Aided Teleoperation Technology on Operator Workload and Performance of Concurrent Tasks

The feedback limited control system (FELICS) is a computer-aided teleoperation (CAT) technology that enables the remote operator to designate an extended path that the vehicle will automatically follow. This paper describes the methodology and results of a study designed to quantify the effects of this technology on remote driving performance and operator workload during both single and dual task conditions. In the dual task condition, the operatorÕs ability to detect and identify targets while driving was also measured. These data were compared with those obtained when the same vehicle was operated in the standard mode of remote driving.

The study was conducted on an indoor test course consisting of five segments: straight-aways, turns, serpentine, figure 8, and obstacle avoidance. Generally, for most segments of the course, greater speeds and fewer errors ($p < .001$) were achieved by subjects who drove the vehicle in the standard mode. In the CAT mode, subjects rated the effort they expended higher ($p < .05$), and there appeared to be a relationship between driving effort and the subjectsÕ assessment of their performance and level of frustration on some segments of the course ($p < .05$). During dual task conditions, the subjectsÕ ratings of mental and temporal demands increased in the standard mode ($p < .05$); however, except for a reduction in speed on straight-aways, driving performance was relatively unaffected. In the CAT mode, speed on straight-aways also decreased ($p < .05$), and driving errors on some segments of the course increased ($p < .05$).

In this paper, the design of the specific CAT system being studied, along with problems generic to similar CAT systems and concepts, are implicated in a discussion of the potential causes of these and other differences in performance found between the two modes of remote driving.

WG 26 — LOGISTICS - ABSTRACTS

Chair: **Clarke J. Fox, USAMSAA**
Cochairs: **Alan Cunningham, TRAC-LEE**
Sal Culosi, LMI
Room: **Michelson Hall - Room 114**

Tuesday, 1030 - 1200

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Navy Logistics Requirements - A Wholesale Level Perspective on Support Issues

DORO has developed a DLA Asset Sourcing and Sustainment Model (DASSM) to identify DLA managed items that might impact the readiness of service weapon systems in crisis-action situations. This model was recently applied to a logistics war game for the U.S. Navy.

The DASSM model sources expected service contingency requirements by individual NSN's against current DLA assets and due-in quantities. Model input includes a requisition file based on service force structure and expected operating tempo, a header file with descriptive supply and weapons system information for each NSN, a due-in file, and an asset file. Output consists of a transaction listing of requisitions filled and backorders established that can be analyzed by a series of post-processors. The DASSM model plays procurements, Direct Vendor Deliveries (DVD), and industrial base planning (IBP), although for this exercise IBP was turned off and evaluated off-line under a reconstitution analysis.

Fourteen ship types and thirteen aircraft types "participated" in the 1994 exercise. Shipboard items were selected based on actual demand histories for each hull type. Aircraft component were selected by weapon system codes that indicated whether the NSN's appeared *only* on the aircraft involved and not on any other system. As a result, we captured 131,000 NSN's for ships and 130,000 NSN's in the original pool of aircraft candidates. Almost all of the ship NSN's and about 59,000 of the aircraft NSN's experienced requisitions during the exercise. Representative "wartime" usage rates were estimated based on Operation Desert Storm and adjusted for the 150-day duration of the dual Major Regional Conflict (MRC) based on the density of ships participating at different intervals during the MRC.

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Evaluation of Statistical Demand Forecasting (SDF)

Approved abstract not available at printing.

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Warfighting Assessment and Requirements Model (WAR)

Approved abstract not available at printing.

Tuesday, 1330 - 1500

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Battlefield Distribution for the Future: An Analytical Excursion

Approved abstract not available at printing.

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Asset Redistribution Model

The Asset Redistribution Model (ARM) was developed to determine how best to use excess retail assets to fill requisitions placed on any supply echelon. The methodology of ARM is to determine the present value of relevant costs: the present transportation costs incurred, as well as the future inventory costs eliminated and/or deferred. Additionally, the model optimizes subject to management imposed operational constraints.

ARM's major feature is the joint consideration of transportation cost and present and future inventory cost. Not all excess has the same "value" to the inventory system. One must consider the future impacts of shipping excess units now from the various possible donors. Based on a dynamic programming algorithm, ARM determines the exact optimal solution given transportation costs, inventory costs, and management imposed operational constraints.

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Availability of Army Line Haul Trucks

For years the Army has used a line haul truck availability of 75 percent to determine the capabilities and requirements for transportation truck companies. This availability, now called Task Vehicle Availability Rate (TVAR), represents the percentage of trucks available, on average, for taskings at any given point in time. Research has shown that no particular scientific method or analysis was conducted to derive an availability rate of 75 percent. Instead, based on years of field experience, Army transportation experts have estimated this percentage.

The Army Chief of Transportation tasked the Training and Doctrine Command Analysis Center-LEE (TRAC-LEE) to analyze and determine TVAR for line haul trucks. This presentation includes the results of the TVAR study conducted by TRAC-LEE. It also provides some interesting insights into the historical evolution of truck availability.

TVAR is used in the allocation rules that provide input to the Force Analysis Simulation of Theater Administrative and Logistics Support (FASTALS) model. FASTALS is used to provide input into the Total Army Analysis (TAA), which determines future force requirements for the Army.

The analysis of TVAR uses the Extended Combat Sustainability (ECS) model developed by the Army Materiel Systems Analysis Agency (AMSAA). This repair shop model is responsive enough to conduct an agile analysis and flexible enough to conduct sensitivity analysis of some of the key components/elements of TVAR.

This presentation will show the results of the ECS model based on input data from AMSAA and the Combined Arms Support Command (CASCOM). It will also show the sensitivity of TVAR to its components.

Wednesday, 0830 - 1000

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Maintenance Modernization System (MMS)

The Maintenance Modernization System (MMS) was developed for the U.S. Army 37th Transportation Command (37th TRANSCOM) by Data Systems Research and Development (DSRD) Program, managed and operated by Martin Marietta Energy Systems, Inc, for the Department of Energy, Oak Ridge Operations (DOE-ORO). MMS is an information management system that collects and uses information generated and maintained in multiple Unit Level Logistics Systems (ULLS). MMS consolidates supply and maintenance information and accumulates historical data to provide higher headquarters with timely access to subordinate unit ULLS information in a variety of report formats and management applications. MMS allows higher headquarters to consolidate data from subordinate units, view record data files on repair parts stockage, monitor maintenance and supply activities, and generate historical data for trend analysis and problem solving. MMS includes the communications interface capability to link multiple stand alone ULLS machines with higher headquarters. Data periodically received from ULLS updates previously recorded MMS information. MMS consists of a site module installed on the unit ULLS machine, and a headquarters module that provides access to all collected ULLS data. A distribution module is incorporated into both the site and headquarters modules for use with both Local Area Networks (LAN) and Wide Area Networks (WAN). From the unit perspective, there are no new procedures or changes to existing ULLS operations other than activation of the MMS data transmission function. Data transmission is via asynchronous modem connection supporting both LAN and WAN environments, and back-up capability via floppy diskette transfer.

The value of MMS lies in its ability to provide higher headquarters readily available and easily tailored information in a variety of usable reports and formats. The MMS database query and data table view capabilities, coupled with automated report functions, provide higher headquarters significantly enhanced supply and maintenance management capabilities. Numerous tests and demonstrations have proven MMS' capability to receive ULLS data from subordinate units and provide requisite reports and data query. MMS was tested in a controlled environment in Oak Ridge using sample data, at selected 28th Transportation Battalion units using European communications and existing WAN, and at the 240th Quartermaster Battalion at Ft. Lee, VA. Suggested improvements and lessons learned from test and demonstrations have been incorporated into the latest version of MMS currently being used by all 37th TRANSCOM units in Germany. MMS has been proven effective through battalion to brigade levels. Capability exists to accumulate data to the division and corps levels as well.

System status is proven technology that can be readily adapted to a joint or combined command. The system is government owned and currently DOE-ORO supported. The system can be adapted, installed and tested within one to three months to meet specific requirements

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Secondary Reparable Maintenance Concept Analysis

Approved abstract not available at printing.

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A DLA Perspective of the Air Force Wing Commander's Test

The Air Force conducted a local purchase test, known as the Air Force Commander's Test, to enhance their acquisition options for obtaining materiel managed by central activities. This test was executed in support of the Defense Acquisition Regulatory (DAR) Case 91-908-01. Authority to proceed with the test, which is being conducted under two phases, was granted by the DAR Council.

The Defense Logistics Agency (DLA), as a member of the DAR Council, was an active participant in the Air Force test. This paper will look at the results of the first phase of the test from a system-wide vantage point. This approach is required if the test results are to be properly understood from a total DoD cost and readiness perspective.

Participating in the test were ten bases representing Active, Air Guard, and Air Reserve Wings. Site visits were conducted with the Air Force Logistics Management Engineering Team (AFLOGMET) to assess installation procurement procedures under both local and central purchase alternatives. Results of the first phase had significant implications with respect to readiness and cost.

Some of the key findings which emerged from this phase of the test included the fact that readiness could be enhanced by local purchase which was, on average, eight (8) days faster than the central system. However, this increase in responsiveness was acheived for a substantial increase in cost as compared with a central purchasing system. Additionally, there was an increased risk under local purchase with respect to the purchase of "look alike" items that might not measure up to required product specifications.

Wednesday, 1030-1200

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TAA03 Operations Other Than War (OOTW) Methodology, Force Analysis Spreadsheet Tool OOTW Requirements (FASTOR)

The Office of the Deputy Chief of Staff for Operations and Plans (DAMO-FDF) requested US Army CAA to provide OOTW force requirements, at Standard Requirement Code (SRC) level of detail, for use in Total Army Amalysis 2003 (TAA03). OOTW force requirements can be used to assess the impact of OOTW on the US Army ability to execute Major Regional Continguencies. The TAA03 OOTW methodology is an analytically and doctrinally sound process to determine Combat Support and Combat Service Support (CS/CSS) unit requirements for OOTW. Supporting data and documentation was develioped for each of four Defense Planning Guidance (DPG) OOTW illustrative planning scenarios: Peace Enforcement, Humanitariona Assistance, Peacekeeping, and Lesser Regional Contiguency-Light.

The TAA03 OOTW methodology consists of the following major elements:

(1) Develop operational and logistical support concepts for each OOTW scenario from DPG IPS.

(2) Devlop a Master Sequence Event List to describe the time sequencing of major activities in the scenario.

(3) Conduct workshop with participation by CAA, MACOMs, and Branch Schools to :

a. Identify task requirements using the TRADOC Blueprint of the Battlefield, TRADOC Pam 11-9.

b. Develop and refine logistic and scenario data and assumptions.

c. Develop existence and workload allocation rules to match unit capabilities to task requirements for each scenario.

(4) Develop a spreadsheet tool to calculate CS/CSS requirements.

FASTOR is a generalized OOTW force requirement model which allows a planner to determine force and sustainment requirements by selecting primary mission forces and defining critical scenario and logistics support data. FASTOR is a generalized model in the sense that its' rules of force allocation were derived from the knowledge-base gained from the development of rules for the four DPG OOTW scenarios. An initial cut troop list can be developed in 30 minutes. FASTOR is a spreadsheet tool based on EXCEL version 5.0.

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Army War Reserve - Decision Support System (AWRDSS)

The Army War Reserve-Decision Support System (AWRDSS) is an automated decision support system which enhances planning, coordination, and control of materiel assets assembled from a variety of sources to meet contingency requirements. The system consists of several subsystems, with components of modules of the Combat Equipment Group, Europe (CEGE) Accountability, Planning, Execution System (CAPES) and the Maintenance Modernization System (MMS). These systems were developed for the U.S. Army by Data Systems Research and Development (DSRD) Program, managed and operated by Martin Marietta Energy Systems, Inc, for the Department of Energy, Oak Ridge Operations (DOE-ORO).

The AWRDSS capabilities include: comparing an authorization or requirements document with available

resources to determine quantity of fill and current location. System provides realignment instructions and schedule for efficient relocation of materiel. The system has "What-if" analysis and decision support tolls for force projection and impact analysis, equipment realignment and reallocation of available assets during contingency planning and execution; with ongoing asset visibility and readiness reporting. The system's value lies in its ability to rapidly identify the required materiel, the current source of that materiel, and then track it until delivered in theater to the on-site commander. The system's interface with several STAMIS and related management information systems provides a dynamic tool for planners, suppliers, and executors to respond to changing requirements or changes to previously identified materiel assets or sources of supply.

The system status is implemented technology. A prototype has been developed for a portion of the system for the CEGE, 21st Theater Army Area Command in Germany. The MMS has been completed and is being used by 37th TRANSCOM in Germany. The system is government owned and can be adapted, installed and tested within three to six months to meet specific requirements.

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Thursday, 0830 - 1000

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Analysis of Joint Logistics Over the Shore (JLOTS)

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Analysis of the United States Army's Ability to Execute Port Construction Operations

This study, developed and executed in support of the United States Army Engineer Center at Fort Leonard Wood, Missouri, is designed to assess the active Army's ability to accomplish its wartime port construction requirements.

As the current National Military Strategy of force projection is implemented, our reliance on port operations increases. Only one active Army Port Construction Company is currently in the force structure and it is scheduled for inactivation on 30 September 1995. The loss of this unique capability in the Active Component of the Army prompted this study.

The study's methodology was to obtain the maximum information possible from historical data, future Army doctrine and current subject matter experts (SME's). SME's from both the Engineer and Transportation communities were queried for input to the analysis. TRAC-Lee analysts collected the information and analyzed it with respect to the Army Strategic Mobility Plan (ASMP) and the National Military Strategy. The results of this analysis will determined the impact of removing the last remaining Port Construction Company from the Active Component.

A likely scenario was developed based on input obtained from the SME's and data searches. Alternatives were limited by force reduction policies and the uniqueness of the unit's mission. Specific skills and equipment needed in port operations reduced the pool of alternative unit types to those found in a Combat Heavy Engineer Battalion.

The initial phase of the study included a two-day working group session to produce a feasibility assessment and quick turnaround analysis of possible alternatives. Experts in force integration, combat development and port operations participated in the working group and assisted in the preparation of the interim results. The final phase of the study began upon review and approval of interim results by the Engineer School Commandant.

Thursday, 1030 - 1200

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Cost-Effective Test and Evaluation Methodology and Technique

The search for reliability in U.S. Army products has undergone profound changes through the years. The 1950s saw vague specification requirements and undefined test and evaluation parameters. The 1960s saw the emergence of improved military and contractor documentation and the resultant restructuring in the T&E concept. The 1970s saw the birth of the reliability growth techniques and the test-fix-test philosophy. The 1980s presented the U.S. Army with the fruits of the improved reliability techniques. The procured combat and tactical vehicles were superb and aided in the eventual peaceful victory of the cold war. The 1990s,

however, present a backlash of this victory. The existing peace and decreased resources require a development of a cost-effective approach to the specification and demonstration of reliability.

With this in mind, the Tank-automotive and Armaments Command has implemented a number of initiatives. One of the initiatives addresses the total concept of reliability design, test, and demonstration. The thrust is to utilize state-of-art tools as represented by virtual reality, simulation, and other mathematical techniques to raise the values of initial reliability and to expedite its growth to the desired objectives. Another initiative concentrates on identifying the weak links of fielded equipment and create programs to implement technology insertion. A major new technique utilizes expert engineers to tear down foreign equipment, to compare the equipment to U.S. equivalent baselines, and in this manner, estimate the foreign equipment reliability and maintainability values. The end results present the design engineers with potential reverse engineering candidates, and the wargaming modelers with reliability/maintainability values to insert in the appropriate models.

Another new technique consists of comprehensive measurement of the terrain energy levels and the adaptation of this knowledge, and the velocity aspect of the vehicles to develop accelerated testing profiles. In this manner, the shock and vibration parameters can be increased 10 to 100 times, and the tests conducted to evaluate fatigue induced durability failures shortened proportionally.

The presentation discusses these TACOM initiatives with the specific objective of recommending these techniques for cost-effective test and RAM evaluation applications.

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Reliability Projection Metrics

This paper presents reliability metrics that use failure mode time to occurrence data and assessments of corrective action effectiveness. The projection metrics can be used to determine whether future reliability goals appear achievable and to scope out resource requirements. The projections utilize data generated over an initial test time period [0,T]. These include, for t>=T, (1) system failure intensity; (2) expected number of distinct problem failure modes surfaced (termed B-modes in the literature), (3) rate of occurrence of new B-modes, and (4) the fraction of the initial system B-mode failure intensity expected to be surfaced over [0,t]. We show that management should focus on this set of reliability projection metrics instead of attempting to assess the number of problem failure modes remaining in the system.

WG 27 — MANPOWER & PERSONNEL - ABSTRACTS

Chair: **David Rodney, CNA**
Cochairs: **Maj. David Clement, USAF AFMPC/DPMYAP**
Judy Curtis, OCNO N-81
Herbert Shukiar, RAND
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Tuesday, 1030 - 1200

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Air Force Recruiting Service Quality Standards

What is an appropriate quality level for Armed Forces recruits ? The Air Force expects accessions to be 50% Test Score Category 1 and 2 on the AFQT. Some see this standard as too selective. In today's recruiting environment, Air Force senior leadership is repeatedly asked to defend our standard with cold, hard facts. The services are currently involved in an extensive study addressing the question -- the Job Performance Measurement Project. Although not nearly as in-depth as the Job Performance Project, our analysis provides a degree of confidence in our quality standards and allows our leaders to defend those standards today.

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Planning Resources Optimization Model

Approved abstract not available at printing

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The Compensatory Screening Model

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Navy Recruiting Command's New Contract Forecast Models

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Tuesday, 1330 - 1500

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Supply and Demand for Pilots in a Changing Environment

Approved abstract not available at printing

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Requirements Analysis and High-level Architecture Definition for ODCSPER Manpower System Re-Design

Approved abstract not available at printing

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Queuing Manpower Model

Approved abstract not available at printing

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Documenting Personnel Resources

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Wednesday, 0830 - 1000

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Initial Assignments of USAF Academy Graduates Using a Modified Stable Marriage Algorithm

Each year the USAF Academy graduates and places approximately 1000 second lieutenants in their first assignment. This process seeks to match the desires of the new second lieutenants with the needs of the Air Force while accounting for the qualifications of the lieutenants. Given the nature of this process, there is considerable room for gaming the system, which could generate suboptimal results from the perspective of both the Air Force and the individual officer.

We developed a PC-based assignment model that incorporates the attributes of a stable marriage algorithm -- the assignment matrix is stable because there are no mutually beneficial trades. However, this model was modified to account for the administrative costs of assessing the qualifications of the candidates for each position and for the limited time available to place each candidate. In making these adjustments we introduced some limited opportunities for gaming. This paper reviews the basic elements of the model and examines the results to assess the tradeoff between administrative efficiency and optimality.

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Navy Job Advertising & Selection System (JASS)

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Optimal Distribution of Army Commissioned Officers

This paper describes how the Army distributes Army Competitive Category officers to the major commands world wide. The Army does not have enough officers to fill its jobs. That is, there are not enough officers to fill some career fields and there are more jobs than officers by grade. Therefore, the Army must decide which jobs to leave vacant. PERSCOM uses the transportation model to solve this problem. The approved plan is called the Officer Distribution Plan (ODP). This paper describes how we keep the model simple with a create use of a

super supply and with wimple upper bounds. This model has over 80,000 variables and can be solved on our small workstation in under five minutes. This allows us to run many different scenarios quickly and to perform sensitivity analysis.

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Who is Joint? How many can be Joint? Reevaluating the JDAL

Approved abstract not available at printing

Wednesday, 1030 - 1200

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Choosing Force Structures: Modeling Interactions among Wartime requirements, Peacetime Basing Options, and Manpower & Personnel Policies

Approved abstract not available at printing

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Manpower, Personnel and Training Decision Support -- Status Review

Approved abstract not available at printing

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Manpower and Personnel Estimation for Automated Information Systems

Approved abstract not available at printing

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Military Force Structure and Realignment "Sharpening the Edge through Dynamic Simulation "

This paper presents a unique approach to analyzing the force structure of the armed forces of the United States. The proposed method is to use a developed symbolic network representative language which combines the continuous variable features of system dynamics and the discrete event features of conventional simulation techniques. The result is a method to allow the strategic analyst to develop the influence diagram to analyze force structures within the combat logistics domain. Such analysis provides critical information regarding proposed future structures of the armed forces. This language structure is built to integrate with the network SLAMSYSTEM environment.

Wednesday, 1330 - 1500

COMPOSITE GROUP VI SESSION Michelson 117

Thursday, 0830 - 1000

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Using Air Force Total Officer Personnel Projection System (AFTOPS) for Joint Specialty Officer Studies

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Insights from Single Source, Steady-State Personnel Inventory Profiles

Approved abstract not available at printing

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A Model to Analyze the Effects of a Changing Billet Structure on Army Personnel Policies

Approved abstract not available at printing

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Officer Career Field Analysis, Issues and Approaches

Approved abstract not available at printing

Thursday, 1030 - 1200

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Enlisted Attrition, Assumptions & Military Draw-down

Approved abstract not available at printing

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The Effect of SRB on Army Re-enlistment Rates

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The Relationship of Manpower and Personnel in the Military Services

Approved abstract not available at printing

Thursday, 1530 - 1700

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Equitableness of Treatment in Army Judicial Proceedings

Approved abstract not available at printing

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Marine Corps Officer Performance & Promotions

Approved abstract not available at printing

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Champions of Total Quality: Their Competencies, Styles, and Organizational Climate

Approved abstract not available at printing

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The Relationship of Manpower Requirements and Allocations

Approved abstract not available at printing

WG 28 — RESOURCE ANALYSIS AND FORECASTING - ABSTRACTS

Chair: **Maj. Mark A. Gallagher, OSD PA&E**
Cochairs: **LTC Andrew G. Loerch, CAA**
CDR Barbara Marsh-Jones, NCA
Advisor: **Mr. Daniel P. Barker, OSD PA&E**
Room: **Michelson Hall - Room 116**

Tuesday, 1030-1200 ***Software Costs***

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An Empirical Evaluation of Software Cost Models

Cost and schedule estimates for Department of Defense (DoD) future software development projects are usually derived using analytical models developed by contractors for these purposes. These models typically take the form of a set of base equations that allow the estimation of effort and time. The effort and time estimations are modified by a number of additional parameters that reflect conditions specific to the project and organization of interest (for examples, complexity of software, capability of personnel, and use of tools). Some models are based on empirically derived regression equations; others are approximations based on observed manloading over time. Nevertheless, the DoD software acquisition process continues to be plagued by large cost overruns and schedule delays in many programs. These events give rise to questions regarding the accuracy of current models.

The objective of this work was to assess empirically the predictive accuracy of such models. Data were collected on 66 completed software development projects. The data from the completed projects were used to generate estimates of effort and time from two of the most widely used software cost-estimating models. The model-generated estimates were compared to the actual effort and time outcomes.

The results show that the models' predictive performance varied widely over various applications (for example, embedded projects versus Management Information Systems projects). The effort estimates were biased and both the effort and time estimates were sensitive to non-size inputs. These results suggest the predicative accuracy of the two models studied is poor; however, some evidence suggests that calibration improves the predictive accuracy of both models.

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Integrated Commercial-Off-The-Shelf Software Implementation

The MITRE Washington Economic Analysis Center supported a reengineering project by estimating costs for implementing an integrated suite of commercial-off-the-shelf (COTS) business application software. Users often benefit from investing in integrated software because they do not have to expend additional engineering effort to incorporate each application into their system. In the integrated COTS case, tailoring the software to user requirements in still necessary and depending upon the organizational requirements may entail a large effort. To understand the costs and schedule for this type of implementation, the Economic Analysis Center developed a methodology for costing the implementation of integrated COTS software. This case study provided a general framework for understanding the COTS software implementation process. It also estimated costs specific to a proprietary suite of software and determined an approach to obtain supporting data.

Tuesday 1330-1500 ***Budget Optimizations***

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Application of Mixed-Integer Linear Programming to BRAC 95

The OSD joint cross-service analyses and the DoN base closure processes both made use of mixed-integer linear programs as tools to identify potential closure and realignment actions. This talk will present some of the formulations that were used. Descriptions of the formulations will include a discussion of the data that were collected and how the data constrained the analyses. The strengths and weaknesses of the employment of a standard operations research/management science tool to a contentious set of issues will also be discussed. Some of the issues that arose included: interpretation of model output by decision makers, accuracy of computations performed by Intel Pentium processors, and poorly scaled data. A method for obtaining the best, second-best, and third-best solutions will be presented.

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Resource Allocation Issues Based on Complex Joint Analysis

This paper examines some challenging, emerging issues in the joint Anti-Armor Mission Area Analysis, currently in Phase I - Initial Prototype. This exemplary mission area analysis:

-- builds upon Defense Program Guidance Illustrative Planning Scenarios,

-- expands them to joint campaign plans,

-- amalgamates separate simulation results executed by two services,

-- incorporates costs from all four services, and

-- combines the data in an OSD PA&E Resource Allocation Master Model.

Many of the issues identified in this ground-breaking analysis are pertinent to other efforts attempting rational cross-service resource allocation.

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Value Added Analysis DSS Development -- An Update

This paper describes the Value Added Analysis methodology, which is used as part of the US Army's Planning, Programming, Budgeting, and Execution System; it assists the Army leadership in evaluating and prioritizing competing weapon system alternatives across mission areas during the process of building the Army budget. The Value Added Analysis concept uses a family of models to measure an alternative system's contribution to the program using a hierarchical assessment framework. A mathematical optimization model is then used to determine simultaneously an alternative's cost-benefit and to identify an optimal mix of weapon systems for inclusion in the Army budget. The methodology has undergone continuous revision and improvement since its inception in 1990. This paper will focus on these methodological improvements.

Wednesday, 0815-0830 ***Working Group Business***

Nomination of Chair and Cochairs

1996 session topics and presenter suggestions

Wednesday, 0830-1000 ***Peacekeeping Operations Costs***

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Peacekeeping Cost Analysis (PECAN)

The purpose of looking at peacekeeping cost analysis was to provide a general framework for responsively projecting the incremental costs of Army peacekeeping operations. The increased participation of U.S. Army forces in peacekeeping operations makes it necessary to improve the capability of assessing and forecasting the cost burden of these operations. Prior cost analysis efforts and experiences have focused on traditional missions and conventional military issues with little historical data to draw on to assess deployment and operating costs for Army peacekeeping engagements. The objective of PECAN was to develop a basic methodology for projecting the incremental cost of varying peacekeeping scenarios; the objective was improving cost estimating capabilities as new data becomes available and additional cost elements are identified.

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Deployment Cost Model

Unlike the private sector where the performance ratings of cost accounting departments rest on the accuracy of forecasts of product line costs, the financial management community of the Federal Government generally pays little attention to this important measurement tool. The segment explores ways forecasting can be used in organizations responsible for estimating costs for unit cost resourcing, new programs or ventures, training exercises, and troop deployments. Featured is a review of the new automated DoD Deployment Cost Model.

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Resource Implications of Joint Force Packages

Various force packages can be formed from the force structure determined during the Bottom-Up Review. These force packages consist of Joint Reconnaissance Strike Complexes (JRUKs) that are designed for major and smaller regional contingencies.

We estimate the capital and O&S costs for these JRUKs. Particular attention is paid to several cost-estimation methodological issues. One major issue, of particular importance during downsizing, is the determination of what cost components of each specified JRUK are fixed versus variable; a second issue concerns the allocation of capital costs over the service life of assets.

We discuss our method of estimating the variable O&S costs and determining the fixed component of the command and control structure. With respect to capital costs, we address the allocation procedures needed to compare capital and O&S costs. Traditional recapitalization measures are compared with alternative approaches that incorporate the social discount and technological obsolescence in the computations.

Wednesday 1030-1200 ***Activity Based Costing and Acquisition Reform***

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Activity Based Costing (ABC) for DoD Infrastructure

The Department of the Army has tested Activity Based Costing (ABC) at nine installations to determine total cost and unit costs of facilities' maintenance services. The Army is now considering expansion of its ABC efforts to all base operations functions. An automated tool to facilitate storage of information, calculation of costs and report generation has been successfully tested and offered to the DoD community.

ABC is a managerial cost accounting technique that over the past ten years has become widely accepted in the private sector. It is most applicable where an organization produces several products or provides multiple services to customers. Its principal feature is allocation of overhead costs in line with actual support to a specific product or service rather than conventional allocation based on manpower or other gross characteristics of the supported cost center.

As Defense entities are consolidated or go to a charge-back environment, managers have increased interest in knowing their actual resource expenditures for services provided. The Army test of ABC strongly indicates that current rates used for reimbursement of services do not recover all applicable costs and that rates for similar services vary considerably from installation to installation due to unique circumstances.

This presentation will describe ABC model concepts, characteristics, and operation. The model uses a relational database installed on a personal computer. The presentation will emphasis model output and the potential to serve installation managers.

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Business Practices and Business Base and Weapon System Costs

The Affordable Aircraft Acquisition Study conducted by the office of the Secretary of Defense (OSD) and the Advanced Research Projects Agency (ARPA) in 1993 explored ways to reduce aircraft program acquisition costs by 50 percent. The study suggested technologies, processes, and products to reduce costs and identified potential host programs to demonstrate the effectiveness of these efforts. One of the suggested processes was Activity Based Costing (ABC). ABC is a cost estimating and management process designed to identify the costs and determine the cost drivers of business activities; it gives management a tool to improve the design and affordability of the activities and the product. The ASTOVL/CTOL program managed by ARPA and the Joint Advanced Strike Technology Program (JASTP) office is using ABC as an affordability initiative. The ASTOVL/CTOL program manager has asked the contractors to develop ABC estimating models and to use ABC to identify activities and processes that can be done more efficiently. Furthermore, the government will use ABC in its estimate of the program's cost. The paper explains how ABC has been used in the ASTOVL/CTOL program and shows its potential applicability to other defense acquisition programs as a tool to estimate and help control costs.

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The Impact of Acquisition Reform on Resource Analysis

Although acquisition reform is being pushed by Congress, the administration, industry groups, and acquisition professionals as a way to reduce the cost of defense goods and services, the real impact on cost remains unknown. In addition, analyzing resources and estimating costs in a largely new environment, and in one in which little historical cost data exist, takes on a new dimension of complexity.

Current cost estimating models and methodologies are no longer sufficient to estimate the procurement and operational costs of future defense systems. For example, with greater reliance on systems assembled from commercial products, historical data (based on complicated development programs) may not be adequate to predict future costs. Similarly, systems that rely on commercial logistics structures will not cost the same to maintain as did systems for which the Services established organic support structures. New models will be required as will new methodologies. Changes in legal requirements regarding contractor accounting systems and the mandate to use commercial standards in lieu of military standards will have similar far reaching effects--which will have their own impacts on resource analysis.

This paper will first outline the acquisition reform changes that are likely to have a direct impact on the cost of defense goods and services. The paper also examines resource analysis as a discipline, the basis of various cost models currently being used, and research leading to new cost models and estimating methodologies. It will also discuss emerging models and the issues associated with their development and use.

Wednesday, 1330-1500

COMPOSITE GROUP VI SESSION Michelson 117

Wednesday, 1530-1700 ***Health, Environment, and Energy Costs***

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Military Health Care Costs

This paper contains estimates of cost functions for CONUS military hospitals. Cost data maintained at the individual hospitals do not reflect the full cost of medical care, because they omit overhead costs incurred at the Service headquarters and OSD levels. The omitted costs were estimated, and applied to the locally-reported costs via a set of adjustment factors. Then regression models were developed to express adjusted cost as a function of the inpatient and outpatient workloads, the hospital capacity (i.e., the number of fully-staffed beds), and the volume of graduate medical education (if any). Although separate inpatient and outpatient models were estimated, the data on community hospitals and regional medical centers were pooled after making an adjustment for heterogeneous variance. Finally, the cost functions were used, in conjunction with the results of other studies, to assess the cost-effectiveness of transferring into military hospitals a portion of the workload currently serviced in the civilian sector under CHAMPUS.

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Planning Environmental Resource Strategy Evolution and Utilization Study

The Assistant Chief of Staff for Installation Management (ACSIM) directed the US Army Concepts Analysis Agency to use the Pollution Abatement and Prevention Analysis (PAPA) multiobjective mathematical programming methodology to formulate and analyze investment strategies that support Army environmental policy and program requirements in response to Executive Order 12856 and related DoD guidance. The investment strategies identify the acquisition of specific pollution prevention opportunities (PPOs) and energy conservation opportunities (ECOs) by type, number, and installation location, for each fiscal year in the acquisition period. These strategies are the values of the decision variables that optimize the objective function. ACSIM identifies the objective functions of interest, which may call for benefits in the form of optimizing pollution reduction, cost savings and life cycle costs. Extensive "what if" exercises are possible to examine the sensitivity of the strategies to budget levels, technology and cost estimating parameters. A significant part of the effort is the development of a data base containing PPO cost and benefit data. An ECO data base with such data is available from earlier work. In addition, the study addresses the use of the pollution reduction results associated with the investment strategies as measures of installation readiness, reflecting the installation contribution towards achieving environmental goals.

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Synthesizing Energy Worth (SEW)

The Assistant Chief of Staff for Installation Management (ACSIM) directed the US Army Concepts Analysis Agency to develop further the Renewables and Energy Efficiency Planning (REEP) methodology and apply it in support of Army energy policy and program requirements. The Synthesizing Energy Worth (SEW) study assists the Army in evaluating investment strategies that make use energy conservation technologies, renewable energy sources, and available financial sources. The strategies involve investment decisions at 110 Army installations in the Continental United States for 78 energy conservation opportunities over an 11 year time frame (1195-2005). Technical aspects of the REEP methodology will be addressed including the multi-spreadsheet linear programming model. In 1992 after 3 years experience with spreadsheet optimization models, CAA looked into the task of writing an application that would generate an optimization matrix from spreadsheets consisting of one master spreadsheet with links to any number of independent (link free) spreadsheets. This turned out to be less difficult than anticipated because of the powerful software tools available today (Excel, C on the Macintosh, C on the RISC work station, IBM Optimization Subroutine Library (OSL)). To construct an initial production level version required about 5 professional staff months. The SEW model to be discussed now resides on 79 spreadsheets.

Thursday, 0830-1000 ***Learning Curves***

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The Learning Rate's Overpowering Impact on Cost Estimates and How to Diminish It

Standard cost-estimating practice involves application of a cost-improvement factor, or "learning" rate, to account for management, engineering, and production improvements that save money as successive units are produced. Lack of credible historical data that are analogous or applicable, however, makes it difficult or even impossible to determine exactly what the "correct" learning rate will be in any particular estimating context. Nevertheless, the estimator's choice of learning rate exerts a major, perhaps dominant, impact on the estimate of the total spending profile of a large-quantity production program to the extent that small variations in the learning rate substantially outweigh all other contributions to the total program estimate.

Effects of learning-rate uncertainty on program cost estimates can, however, be mitigated by eschewing cost models that provide estimates of "theoretical first unit" (T1) costs in favor of models that estimate average unit cost of a realistic number of units (e.g., 10 satellites, 25 launch vehicles, 100 aircraft). The latter kind of model circumvents the controlling effect of the steep portion of the learning curve (involving the first few production units), thereby reducing the detrimental impact of learning-rate guesswork on the parts of both model developers (who need to assume a learning rate in order to normalize historical data) and model users (who need to assume a learning rate in order to estimate total production costs).

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Estimating Learning Curve Parameters

Learning curves are frequently used to project the procurement costs of future defense systems. Alternative methods for estimating learning curve parameters are well established, but the properties of these methods are not well understood by many cost analysts. In fact, the properties of methods that use lot midpoint estimates have not been established and cost analysts consequently may be using incorrect estimates for the standard errors of the learning curve parameters.

Because learning curves are such an important tool in cost analysis, it is important for the cost analysts to be informed about how to obtain correctly standard errors, tests, and confidence intervals when certain methods are employed. In the case where nonlinear methods are used, the small-sample properties of the parameters estimates also need to be examined.

This study will determine the properties (unbiasedness, consistency, efficiency, etc.) of two alternative methods for estimating learning curves with lot midpoint data. The first method cycles back and forth between estimates of the midpoints and linear estimates of the parameters. The second method uses nonlinear optimization to estimate the parameters in one step. In the case of the first method, the standard errors, tests, and confidence intervals obtained from the final iteration are incorrect and an alternative calculation must be made. The appropriate calculations will be determined and a comparison will be made between the two methods to determine which has more desirable properties.

Thursday, 1030-1200 ***Business Base Analyses***

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Contractor Indirect Costs

IDA has been collecting overhead and business data on 12 defense contractors since the early 1980s. Among those contractors are 7 aircraft companies, 2 engine companies, an electronics company, a missile company, and a manufacturer of tracked vehicles. The database contains annual data generally from 1969 through 1987. We expect to complete updating the data through 1993 for 5 of those companies (4 aircraft and 1 engine) during the early part of 1995.

This paper contains two major sections. The first part will describe how we structured the databases to reflect company business practices and to facilitate analysis. In the second section, we will describe and provide examples as to how the data were used to: 1) develop statistical models to forecast future overhead costs and to decompose overhead into its fixed and variable components, 2) identify historical trends in the behavior of direct and indirect costs for four aircraft contractors, and 3) study contractor investment decisions and employment practices.

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System Design, Development and Production Process Modeling

Three system acquisition studies have been completed on major combat support vehicle programs for the U.S. Army Program Executive Officer, Tactical Wheeled Vehicles (PEO-TWV) to facilitate critical system acquisition resource decisions. The three programs were:

- the Family of Medium Tactical Vehicles (FMTV) 5-ton and 2.5-ton truck production program at Stewart & Stevenson Services, Inc. in Sealy, Texas,

- the Palletized Loading System (PLS) production program at the Oshkosh Truck Corporation in Oshkosh, Wisconsin, and

- the High Mobility Multipurpose Wheeled Vehicle (HMMWV) production program at the AM General Corporation in South Bend, Indiana.

Each contractor's production scenario was analyzed and modeled to quantify accurately the relationship between production rates and unit costs. Specific objectives included identifying (1) Minimum Sustaining Rates (MSRs) to support current and future budget and resource programming for potential follow-on procurements, (2) production rate thresholds that significantly affect unit costs, and (3) critical production program factors and their impacts and sensitivities to production rate.

The approach focused on a detailed modeling of each contractor's production processes, flows, and operations. A standard architecture of multiple linked functional modules, tailored to specific contractor operations, was used for each process module. Each model contains detailed information on personnel, burden rates, material, material price/quantity relationships, capital, manufacturing support, program management, and all related direct and indirect production costs. A clear distinction is made between variable versus fixed costs. Financial data is portrayed principally from an Activity Based Costing (ABC) perspective.

The process modeling technique resulted in a powerful and versatile acquisition management decision support tool which (1) identifies and characterizes the interrelationships of all manufacturing operations and manufacturing related functions, (2) facilitates the conduct of production program planning excursions, (3) displaying the results quickly and in meaningful ways to address critical resource decisions; and (4) supports the conduct of sensitivity analyses on critical production program variables, portraying their resultant impacts to MSRs and production rates versus unit cost relationships.

Usage of the models to support a broad range of other government program management requirements and contractor internal operations became readily apparent. Examples of government program management office uses include should-cost studies, proposal/contract modification negotiations, ECP/VECP evaluations, waivers and deviations analyses, cost impacts of schedule adjustments, budget justifications, quantification of impacts of system changes, use on concurrent engineering, introduction of integrated process and product development, insertion of new technology, and initiation of design-to-costs goals. Examples of contractor management include facility utilization analyses, capitalization requirements, proposal preparations and contract negotiations, return on investment decisions, resource (materials, labor, labor mix, and tooling) planning, make-versus-buy decisions, impacts of design and manufacturing experimentation (robotics, automated inspection, agile manufacturing, lean production, and improved information systems (electronic data interchange with supplier and paperless shop floor).

Thursday, 1330-1500 ***Budgeting for Forces***

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Thinking about FYDP Reform

Since the early 1960s, the Planning, Programming, and Budgeting System (PPBS) has been the most important management process for resource allocation within DoD; and the 3-dimensional structure of the Future Years Defense Plan (FYDP), combining information in eleven Major Force Programs (MFPs) and five basic appropriation categories across DoD components, provides the central framework for data management in PPBS. Over the past thirty years, there have been numerous adjustments in defense organization, improvements in analytical capabilities across DoD, and a dramatic increase and diffusion of computing power. Parallel and competing data systems have been developed. Multiple data structures produce complex data relationships, increase workload, and cause confusion. Poorly defined and/or competing terms of reference contribute significantly to a lack of connectivity between the planning, programming, and budgeting phases of PPBS. This undermines DoD's ability to relate strategy to resources. There is thus a growing consensus that current PPBS procedure and the existing FYDP structure are not meeting sufficiently the information requirements of key officials. A new look at DoD mission in the post Cold War environment and Joint Staff efforts to improve assessments of joint warfighting capabilities continues to highlight shortfalls of the existing FYDP structure; and are adding new urgency to the search for an integrated framework to support Defense-wide decision making for resource allocation. The briefing will review the strengths and weaknesses of the exiting FYDP structure along with related systems, discuss the status of on-going efforts for improvement, and consider alternative approaches.

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Defense Program Projection

DoD needs a long-range planning tool to help lay out projected budgetary needs. Since 1990, the Department has been using the Defense Program Projection (DDP) as this tool. The DPP is a computer database that shows selected programs in detail and the rest of the Department's budget by mission area, component, and appropriation to the year 2013. This database also allows the Undersecretary of Defense for Acquisition and Technology (USD(A&T)) to identify possible problems in acquisition programs beyond the current program years and assists in the proposal of current solutions.

The development of the DPP followed from the Force Acquisition Cost System (FACS) developed at the Institute for Defense Analyses (IDA) in the mid-80's. Many of the methodologies from the FACS were incorporated into the computer programs that adjust the DPP database for changing detail information about major forces, procurement programs, or RDT&E programs. The briefing includes the genesis of the DPP, the algorithms used in forecasting the DoD budget, and the uses for the DPP output.

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Advance Force Costing Methods

Advances in information technology have, for the first time, made possible the creation of sophisticated analytical models for estimating the cost of force units. Developing cost estimates for DoD force units has always been a data-intensive effort involving the laborious assembling of source data on force composition, equipment consumption rates, personnel costs and other costs associated with force units. The data requirement involved in developing force unit cost estimates are further complicated by the fact that a cost estimate may be needed for any phase of a force unit's "life cycle," to include activation, annual operations, inactivation, or movement.

In the past the need for cost estimates based on force units generated two approaches; for specific estimates of specific pieces of the life cycle, spreadsheets have been developed. For more comprehensive costing requirements, mainframe processing was required to handle the mass of data.

In recent years, however, the microcomputer environment has evolved to the point that large processing requirements can be handled on standalone PCs. The Army has taken advantage of this occurrence by creating a PC-based analytical tool that is capable of producing cost estimate for all phases of the life cycles of a force unit. The Army FORCES model contains composition data on all Army combat units (over 1000 unit types). It is a menu-driven model written in FOXPRO and designed to provide major improvement

over spreadsheets in ease of use and speed. The FORCES model will be briefed and demonstrated.

Thursday, 1530-1700 ***Program Risk Analysis***

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Cost Risk Assessment and Analysis for Weapon and Information Systems

All cost estimates for major defense acquisition must now be accompanied by a formal risk analysis. A decision maker who must decide the official cost position should make that decision in the context of the point estimate with respect to all other outcomes. Usually, the cost estimate is in the form of a point estimate that is the result of an aggregation of separate estimates of cost elements. Unless each component of the estimate is known with certainty, a point estimate represents only one of several possible outcomes. Recognizing the fact that there is more than one outcome raises two interesting questions: (1) what causes the potential for multiple outcomes, and (2) given the uncertainty of more than one outcome, what is the confidence on the particular point estimate that is chosen as the most likely cost outcome? The trust of cost risk analysis for major acquisition systems is to quantify the possible cost outcomes and their likelihood so that an informed budgetary decision can be made. It also helps a program manager to understand the potential risk associated with their program for consideration of risk mitigation options.

Cost risk analysis covers a dynamic open system domain, with many global and local parameters effecting acquisition cost at different times. This paper defines the causes of cost uncertainty in four categories of estimating, technical, schedule, and configuration. It also identifies the indicators for each of the four cost uncertainty categories. Having the risk causes and their indicators for the cost estimate, the estimator can analytically identify mean, variance, and shape of the total-cost probability density function that are essential for development of cost range estimate.

We define cost growth as a delta between could cost and the actual cost (type one error). There is also another delta between could cost and the estimate (type two error). Cost risk analysis is to assist acquisition management in planning, programming, budgeting, and execution, to optimize both error types, and to improve cost estimating skill.

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The Development of a Metamodel for a Major Weapon System Cost Model

Cost estimation is an integral part of the procurement process of major weapon systems. Despite this essential role, the cost estimation process is only able to provide the decision makers and analysts with limited insight. This is due to the complex nature of the cost models which typically contain 20-30 cost estimating relationships (CERs) and 50-100 variables.

In an effort to provide additional insight to the cost estimate, this research demonstrates a methodology that will 1) identify the cost drivers of the cost model, 2) estimate the effects of these cost drivers, and 3) approximate the variance of the cost model to support confidence interval estimation.

Using a cost model for the Navy's Tomahawk Baseline Improvement Program, a series of designed experiments in conjunction with regression analysis was employed to develop a model of the cost drivers--a metamodel. This metamodel captures the essence of the original cost model, but is in a more comprehensive form. The estimation of the variance contained in the original cost model allowed the construction of confidence intervals using the metamodel. A comparison of the intervals constructed using the metamodel with those generated by the original model verified the metamodel can be used as an approximation of the original model to facilitate "what-if" analysis.

WG 29 — READINESS - ABSTRACTS

Chair: **Mary T. Bonnet, AFSAA/SASM**
Cochair: **John Tillson, IDA**
John D. Walsh, OSD, Readiness
Advisor: **Michael A. Parmentier, OSD**
Room: **Michelson Hall - Room 120**

Tuesday, 1030 - 1200

Readiness Overview

Michael Parmentier, OSD, Director of Readiness and Training

Approved abstract not available at printing.

Assessing the Adequacy of Defense Readiness Funding

Jim Wilson, IDA

Approved abstract not available at printing.

Tuesday, 1330 - 1500

A Framework for Resource Analysis

Linda Cavalluzzo and Stan Horowitz, CNA

Approved abstract not available at printing.

Joint Tasks, Conditions & Standards: A Foundation for Assessing Joint Readiness

Dr. Michael Wagner, Dynamics Research Corp., LTC Chris Anzalone, Joint Staff/J-7 and Dr. David M. Promisel, USARL

Approved abstract not available at printing.

Wednesday, 0830 - 1000

Building a Joint Training Readiness Management and Reporting System

John Tillson, IDA

Approved abstract not available at printing.

Concepts for Measuring Joint Readiness

William Buchanan, IDA

Approved abstract not available at printing.

Wednesday, 1030 - 1200

Army War Reserve - Decision Support Systems

Robert K. Abercrombie and Richard E. Bell, Martin Marietta Energy Systems

Approved abstract not available at printing.

Wednesday, 1030 - 1200

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Analysis of America's Readiness-Based Sparing Aviation Consolidated Allowance List

This memorandum documents research we did for the Navy and Marine Corps that helps them develop new ways of reducing the cost of aviation supply support without incurring a loss in readiness. This work is particularly relevant in today's fiscally constrained environment, because the services are continually being asked to perform at the same standards with fewer dollars to buy resources.

In previous research, we showed the Navy how to cut the cost of carrier aviation inventories (AVCALs) by as much as 26 percent without cutting readiness by implementing a sparing method called readiness-based sparing (RBS). The RBS method of selecting inventory allowances is different from the traditional demand-based sparing method in that it links supply resources to aircraft readiness at least cost. This work prompted the Navy to conduct an at-sea test of an RBS inventory on USS America in 1993-94. The Navy tasked us to perform the analysis and report the test results.

In this memorandum, we analyze how well America's new RBS AVCAL supported the airwing during its recent deployment. We will show that America's aviation inventory cost $33 million less than the traditional inventory would have cost, and supported America's airwing as it was designed to do with no loss in aircraft readiness. Therefore, this analysis demonstrates how the Navy can continue to support deployed aircraft at the current readiness levels, but at a significantly lower cost.

Thursday, 0830 - 1000

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A Framework for Assessing Readiness and Relevancy

Approved abstract not available at printing.

Jim Jondrow , Laura Junor, Jessica Oi, Matt Robinson, Ted Cavin and LCDR Millie Simons, USN
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Avoiding a Hollow Navy

Downsizing brings pressure on all parts of the budget including those related to readiness. This paper examines strategies for avoiding a hollow force in a downsizing environment. The topics include:

- *Defining hollowness and readiness*

  "Readiness" has received considerable attention in the last few years. But its meaning is often clouded in generalities. Many associate it with hollowness—which can include concerns broader than readiness. This paper examines the fundamental distinctions between hollowness and readiness. Topics include public statements involving hollowness and readiness; various ways hollowness has been defined in the past; a historical perspective on hollow forces; funding and hollowness and a conceptual framework linking readiness and hollowness.
- *Identifying and summarizing detailed indicators of readiness*

  Studies of hollowness and readiness tend toward generalities, anecdotes and long lists of detailed indicators. But there is no consensus about how to combine the indicators into a limited number of coherent measures—which precludes hope of prediction.

  We propose Principal Component Analysis as a means of extracting the unified information conveyed by the many detailed indicators. This tool provides a means of summarizing the statistical commonality

among the indicators without assumptions about causal structures. The technique can be interpreted as discovering the hidden or unobservable indicators of hollowness that are responsible for generating the dependence or variation in the indicators.

- *Identifying determinants of readiness and comparing alternative predictors*
- *Developing measures of balance between support and forces*
- *Fashioning overall strategies for preventing a hollow force*
- *Sealift Readiness*

This research is part of a study on *Avoiding a Hollow Force*, underway at the Center for Naval Analyses. The main goals are to (1) define readiness and hollowness as they pertain to Sealift, (2) identify readiness indicators particular to sealift, and (3) analyze the relations of these indicators to capability.

Defining readiness and hollowness for sealift involves reviewing the sealift mission and the differences between sealift ships and combatants (CASREPs, contracting, civilian and military manning, flagging, etc.).

Background will include sealift use during wartime (WWII, Korea, Vietnam, Desert Shield/Storm), jointness issues (TRANSCOM), ship types and missions (pro and cons), and a comparison of afloat prepositioning vs. Land prepositioning. There will be a review of the literature on sealift issues.

The substantive findings will include a data book on sealift indicators. The analysis of these indicators will include constructing summary indicators and examining the relationship between the indicators and capabilities (e.g., measurement tons on station by C+X).

Thursday, 1030 - 1200

Readiness Baseline Analysis - Hollow Forces

Colin Halvorson, LMI

Approved abstract not available at printing.

Equipment/Personnel Readiness Measurements

Colin Halvorson, LMI

Approved abstract not available at printing.

WG 30 — DECISION ANALYSIS - ABSTRACTS

Chair: **Matt Vance, McDonnell Douglas Aerospace**

CoChairs: **Landon Elswick, NSWC/Carderock Division**
LCDR Matt Boensel, Office of the CNO, N814E
Dr. Dick Pariseau, Kapos Assoc, Inc.
COL Greg Parnell, AFIT/ENS, Dept. of Operational Sciences

Advisor: **COL Bruce Smith, AF Geophysics Lab**

Room: **Michelson Hall - Room 118**

Tuesday, 1030-1200

Dr. Ron Nickel
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Application of Mixed-Integer Linear Programming to the Base Realignment and Closure (BRAC) '95 Process

The OSD joint cross-service analyses and the DoN base closure processes both made use of mixed-integer linear programs as tools to identify potential closure and realignment actions. This talk will present some of the formulations that were used. Descriptions of the formulations will include a discussion of the data that were collected and the data constrained the analyses. The strengths and weaknesses of the employment of a standard operations research/management science tool to a contentious set of issues will also be discussed. Some of the issues that arose included: interpretation of model output by decision makers, accuracy of computations performed by Intel Pertium processors, and poorly scaled data. A method for obtaining the best, second-best, and third-best solutions will be presented.

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Army War Reserve-Decision Support System (AWRDSS)

Approved abstract not avaliable at printing

Tuesday, 1330-1500

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Counterproliferation Decision Support Methodology

Approved abstract not avaliable at printing

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Nonnuclear Consumables Annual Analysis (NCAA) Target Values / Priorities

Approved abstract not avaliable at printing

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An Approach to Joint Test of Advanced Weapon Systems

This paper describes an approach to advanced weapon system performance testing. The essence of this approach is an iterative application of an end to end synthetic scene generation process that incorporates experimental design and random sampling procedures, comprehensive data collection methods (including quality control, calibration, in the field local area network, and database management), physics formulations as energy balance models, and a statistical inference validation procedure. This process produces synthetic scenes for a broad range of background and target conditions. The goal is to use this process, in an iterative fashion, to generate a broad range of surrogate battlefield scenes to evaluate, interpolate, and extrapolate weapon system performance. The product provides a basis to enhance smart and brilliant (autonomous) weapon system performance. These procedures and products are relevant to design,development, and developmental and operational test and evaluation of many Department of Defense (DoD) advanced weapon systems. The SWOE JT&E approach has been successfully implemented to produce and validate a broad range of synthetic surrogate battlefield scenes for temperate latitude and desert conditions.

Approximately 22 individual numerical models were assembled and run, as a scene generation modeling package, to produce synthetic infrared (3-5 & 8-12) surrogate battlefield scenes. Thermal, radiance, and rendering models were merged to provide a comprehensive scene simulation capability. A stratified, temporal and spatial, random sampling scheme was used, in the field, to obtain infrared images to quantify the magnitude and range of scene variability and for comparison to the generated synthetic scenes. Three field activities were conducted to obtain a comprehensive database for validation and to provide the DoD with a high fidelity database for evaluation of weapon system performance. Statistical inference techniques and target recognition techniques were used to compare and validate the generated synthetic scenes.

Accomplishments of SWOE JT&E are: an approach to and procedure for validation of a surrogate battlefield scene generation capability, a methodology for obtaining unbiased samples of surrogate battlefield environments and targets, a comprehensive package of energy balance models, a database (>1.4 terrabytes) of temperate latitude and desert measurements, and a capability to simulate multi-sensor weapon systems.

Wednesday, 0830-1000

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The Development and Application of the United States Air Force Environmental Technology Priority System (ETPS)

This paper details the highly successful development and application of a decision support system for prioritizing environment, safety and occupational health technology needs and research programs. Key to the process was the development of decision frameworks that brought a diverse set of stakeholders and decision makers to consensus on resource allocation for a complex problem. A total of 379 technology needs and 235 R&D programs were evaluated and prioritized. The Analytic Hierarchy Process was employed in conjunction with state-of-the-art group decision techniques to gain input from over 350 participants. Prior to this effort, decision makers typically used persuasive methods to convince or argue over preconceived agendas. The new model is based on the interactive method, which facilitates collaborative problem solving. The method creates an environment for dialogue on the process, problem and solutions. The process is a success. Decision makers have a process and audit trail to defined their financial decisions. They know they will have a framework for future years investment strategy. Customers know they are being heard by the research and development community and that there is a rational basis for funding decisions. Decision makers were so impressed by the good planning and valid funding requirements for high priority technology, they gave the method credit for increased Environmental R&D funding by $70 million in FY95.

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Use of Design of Experiments Methodology in the Search for a Halon Replacement Chemical

Recent scientific discoveries have determined that chlorinated and brominated compounds, such as halons, contribute to the depletion of the earthÕs ozone layer. Halons are important because they are used as the primary fire extinguishing chemical in all Department of Defense (DoD) and commercial aircraft. In compliance with national and international legislation, industry producers have ceased halon production as of 1 January 1994.

Wright Laboratory is the lead laboratory in a joint DoD/FAA three-phase program to identify, test, and select a halon replacement chemical for use in aviation applications. The objective of Phase I was to determine which parameters most influence the amount of agent needed to extinguish that fire. The objective of Phase II was the selection of the most promising halon replacement chemical for further Phase III testing. Phases I and II are completed.

The entire program has been heavily dependent on full-scale testing conducted at Wright Laboratory. Two applications were investigated: dry bay and engine nacelle fires. Fifteen parameters were considered significant in the dry bay application; 16 in the engine nacelle. Given this large number of parameters, traditional testing methodologies were not feasible from a time and budgetary standpoint. The Design of Experiments (DOX) methodology allows the test matrix designer to systematically select parameter settings and combinations that will allow for the optimization of the quality and quantity of information received from the total test program. This program would not have been able to meet its schedule milestones without the use of this experimental methodology.

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C-17 Paratroop Jump Separation Analysis

Approved abstract not avaliable at printing

Wednesday, 1030-1200

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A Methodology for Evaluating Joint Task Group Performance

Approved abstract not avaliable at printing

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Educating for Joint Decision Making

Approved abstract not avaliable at printing

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The Use of Decision Analysis in Evaluating Special Operations Forces in Joint Operations

Approved abstract not avaliable at printing

Wednesday, 1330-1500

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Integrating Electronic Meeting Support Groupware and Decision Analysis

Approved abstract not avaliable at printing

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Decision Analysis with Elicited Audience Participation

Approved abstract not avaliable at printing

Thursday, 0830-1000

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Evaluating Future Military Space Technologies

Approved abstract not avaliable at printingvvv

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Using Decision Analysis to Support Selection of Science & Technology Initiatives

The changed operating environment and the reduction of the Department of Defense budget have caused the role the U.S. Navy to change. Now, the smaller U.S. Navy must put greater emphasis on operating jointly with the other services. Consequently, the Navy must take a fresh look at its strategy, tactics and force structure requirements. In response to these changing requirements, the U.S. Navy laboratories must restructure their Science and Technology investment profiles. Also, with reduced laboratory budgets, the investment risk is spread over fewer R&D projects and consequently fewer mistakes can be tolerated.

This paper presents techniques to help laboratory managers make the aforementioned Science and Technology investment decisions. The techniques consider joint warfighting requirements, the capabilities extant in a given laboratory and the risks associated with various investment alternatives. The application of these techniques to the selection of Science and Technology initiatives at the Carderock Division of the Naval Surface Warfare Center will be repesented. Since this paper represents work-in-progress, successes and/or lessons learned will be reported.

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Optimizing Investment in Science & Technology

Approved abstract not avaliable at printing

Thursday, 1030-1200

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When the Analyst Speaks, Who Listens? What Do They Hear? And What Do They Do With The Results?

Approved abstract not avaliable at printing

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Responsive Surface Methodology as a Decision Analysis Sensitivity Tool

Approved abstract not avaliable at printing

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Rank Disagreement: A Comparison of Multi-Criteria Methodologies

A number of multi-criteria decision support techniques have emerged in recent years that use varying computational approaches to arrive at the most desirable solution, and thereby ÒrecommendÓ a course of action. Decision-makers who use the results of this analytic work should be assured that the computational schemes used by their supporting analysts or decision support software produce the appropriate solutions. We conducted a series of simulation experiments that compared the top ranked options resulting from the computational algorithms that support Multi-Attribute Value Theory (MAVT) and three methods that are reported in the literature that allow rank reversals, the change in rank order of two options when an unrelated option is added or deleted from the analysis: the Analytical Hierarchy Process (AHP), Percentaging, and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). We also included a Fuzzy algorithm proposed by Yager to gauge its consistency with the other algorithms, even though it is not subject to rank reversals. These experiments demonstrated that the MAVT and AHP techniques, when provided with the same decision outcome data, very often identify the same alternative as best. The other techniques are noticeably less consistent with MAVT; the Fuzzy algorithm being the least consistent. The situations under which the most frequent and significant differences occurred were dependent upon the method.

The results of our experiments indicate that other issues (e.g., the processes used for problem structuring and the elicitation of value weights) are likely to be of greater significance to problem outcome (based on our experience) than the choice between the computational algorithms of MAVT and AHP. The results cause us to be concerned about the use of other methods.

Thursday, 1530-1700

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A Methodology for Comparing the Value of Competing AFMC Manpower Allocation Strategies

Approved abstract not avaliable at printing

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Modeling Corps Artillery in a Theater Level Combat Model

Approved abstract not available at printing.

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Interactive Selection of Best Working Group Presentation

Approved abstract not available at printing.

WG 31 — COMPUTING ADVANCES IN MILITARY OPERATIONS RESEARCH - ABSTRACTS

Chair: **MAJ Charles Pate, TRADOC Analysis Center**
Cochair: **CPT David Briggs, University of Florida**
Advisor: **MAJ George Stone, University of Florida**
Room: **Rickover Hall - Room 110**

Tuesday, 1030 - 1200

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JLINK - A Distributed Interactive Janus

The Janus(A) simulation model is currently fielded throughout the Army and is being used for both training and analysis. Recent interest and development in Distributed Interactive Simulations (DIS) has encouraged research to make Janus compliant to DIS standards. This consists of making Janus capable of communicating with other dissimilar models using DIS protocols. With this capability, Janus provides on portion of the future DIS concept combining constructive, virtual and live simulations in real-time scenarios.

TRAC-Monterey is currently working on two projects that will support this compatibility, Janus/BDS-D and Janus Fast Movers. The Janus/BDS-D connection was designed to support the Anti-Armor Advanced Technology Demonstration; while Janus Fast Movers is a joint project between TRAC and the Air Force to seamlessly connect Janus to an F-16 simulator located at Armstrong Labs. The system that was designed to interact with the DIS environment is a combination of two software packages and referred to as JLINK. The first JLINK piece is Janus 4.X a modified Janus model which incorporates software enhancements and calls additional code that interfaces between the Janus model and the second piece a computer interface unit or translator referred to as the World Modeler. The World Modeler receives and transmits DIS compliant PDU's between Janus and DIS simulators as well as performing other functions such as network management, dead reckoning, entity/terrain reconciliation and engagement arbitration. This new capability permits Janus to act as a semi automated force for virtual simulations as well as provide interactive play with other DIS compatible simulators such as ModSAF.

This briefing describes the JLINK connection and the two projects with which it is associated. It discusses the basic function of the World Modeler and the changes made to Janus 4.0 to make it DIS compatible. Keywords: Distributed Interactive Simulation (DIS), Janus, Battlefield Distributed Simulation-Developmental (BDS-D)

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Theater Level Operations Other Than War Modeling: Applications of Decision Making Theory

An automated model for generating courses of action in support of an Operations Other Than War (OOTW) simulation is developed to evaluate the utility of using decision theory construct in an OOTW simulation. The model simulates the decision making of a theater level staff in the OOTW humanitarian assistance mission

environment. The model uses probabilistic forecasting models and Bayesian techniques to predict what the state a region in the theater will be in some time in the future. Decision tree structures and the forecasting module are used to solve the decision making problem using maximum expected utility. The model uses pairwise comparisons of utility attributes to obtain a decision maker's preference structure. This structure is applied over a multi-attribute utility function and the decision tree, to find the optimal course of action for some region of the theater at a specific time. Some variations on Lanchester's attrition equations are used to model attrition, the effect of civilians in a combat zone, and the effect of rules of engagement. The model was tested using data representative of Somalia in late 1992. The results indicated the best approach in this instance is to initially provide a high level of aid to reduce the civilian starvation rates then transition to a more aggressive posture with a strong force in readiness to retaliate for attacks by opposing forces.

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High Resolution Terrain Representations: An Application in Parallel Processing

Approved abstract not available at printing.

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High Fidelity Terrain Visualization: Applications to Janus Modeling, and Opportunities for Parallelism

In the past few years, successful attempts have been made to replicate actual terrain at the high resolution of data for every square meter on the ground. Previously reported work has described the mechanism for generating the database for such terrain, and for visualizing it from an operator controlled viewpoint. Early implementations of this approach use a special purpose transputer based computer to achieve frame rates in the region of 5-15 frames per second.

The presentation will describe an attempt to produce the same kind of visualizations using a single processor based workstation, and its potential application to battlefield simulation. This will include how such a capability may be integrated with Janus, as a visualization tool to assist players in making tactical decisions, and how the currently used target acquisition models used in Janus (and other combat models) may be enhanced with data obtained from generated scenes.

In order to obtain realistic frame rates, rendering needs to be improved by an order of magnitude over those described above. Some potentially cost effective methods for achieving this will be outlined. Keywords: Terrain databases, Janus ray tracing, real time simulation, virtual reality

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ATPS: An Expert Systems Based Automated Test Planning System

The Automated Test Planning System (ATPS) is a rule based expert system designed to aid OSD and Service staff in the testing mission. ATPS provides the DTSE&E with an intelligent system for assessing program risk, harmonizing key acquisition documents, and building and reviewing Test and Evaluation Master Plans (TEMPs). The four primary components of the ATPS framework are TEMP Build, T&E Program Risk Assessment (TEPRAM), TEMP Review and T&E Program Design. This "system of systems" is being built sequentially and incrementally. Phase I was a feasibility study to determine the scope of ATPS and gather the information to be contained in the first module, TEMP Review. Phase II built this module, which was successfully fielded in 1993. Phase III saw the development of the TEPRAM, which was fielded in 1994. Phase IV, currently underway, consists of the development of the TEMP Build Module, which is due to be released on March 1, 1995. The final module, T&E Program Design, will be a management tool designed to provide oversight of the entire program, to provide summary information regarding the program's progress, and to provide management and other component staff with the utmost flexibility in using and managing each ATPS module.

The ATPS TEMP Build Module contains Service-specific information, hints, tips, and guidance and presents this information to the user through the use of expert-system generated checklists. An integrated editor allows the user to enter in responses to the checklist questions. These Its intent is to provide a consistent method to help the user build draft TEMPs, which ATPS can output in the format specified by the DoD5000.2M. The T&E Program Risk Assessment Module harmonizes key acquisition documents and is intended to provide

more consistency in how these documents are used, developed or reviewed, and to aid the user in assessing program risks from a Test and Evaluation perspective. The TEMP Review Module improves and streamlines the review process by providing the "final exam" to sites that prepare or review TEMPS. ATPS also demonstrates the ability to accept TEMP comments and generate these comments to an ASCII file. It is anticipated that the TEMP Review Module may ultimately provide for an eventual "paperless" review process.

ATPS was not designed to replace technical thought, rather it provides a standard baseline for TEMP development and evaluation within a rich, easy-to-use, interactive environment. The body of knowledge gained from DoD testing organization, extant paper checklist and the DoD 5000 series instructions. The ATPS common framework also contains a comprehensive Hypertext HELP facility which makes sections of the DoD 5000.2-M available throughout TEMP Review and TEMP Build sessions by cross-referencing each checklist questions to its applicable DoD 5000.2-M paragraph.

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Joint Munitions Effectiveness Manual (Air-to Surface) CD-ROM

Approved abstract not available at printing.

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Exploratory Analysis of Combat Using Neural Network and Traditional Statistical Approaches

Statistics and neural networks are methods used to learn about observed experience. The statistician and neural network researcher interprets patterns from these experience data sets, creates relevant conclusions, and determines the accuracy of the data and the conclusions. A challenge, is noisy data that confounds the inferencing tractability of any conclusions. Together, traditional statistical and exploratory neural network models provide different, but similar, strategies for developing inferences within noisy data.

To examine the verticality of both traditional statistical and exploratory neural network models of a real system provides an assessment of the process strategy of both types of models. One such real system is the complex, nonlinear data from military combat.

Neural network methodologies are described as showing promise in finding a relationship between battle winners and input variables as well as casualties. The interface of statistics and neural networks is discussed.

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Re-engineering the Target Acquisition Model, Development of the Enhanced Target Acquisition Model (ETAM)

Approved abstract not available at printing.

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Model Abstraction Techniques for Models with Multiple Levels of Fidelity

A simulation model is a representation of a more complex real-world situation. A technical issue frequently faced by simulation model developers is determining which real-world factors must be represented in the model, i.e. identifying the right level of model fidelity to meet analysis requirements. Ignoring factors leads to model results which do not accurately represent the real-world situation, and therefore leads to incorrect predictions by the model. On the other hand,

incorporating "too many" factors leads to excessive computational and human resource utilization.

Over the years model developers have used a number of techniques to abstract factors out of a simulation model to reduce computational complexity while maintaining the validity of the results. More formal research has also been conducted by simulation researchers to build a theoretical foundation for certain model manipulation. More recently, researchers in the artificial intelligence (AI) subfield of qualitative simulation have also been investigating techniques for simplifying models, determining whether models results are valid, and developing tools for automatic model selection and manipulation.

The focus of our research, and the topic of this presentation, is to compile and organize these various model abstraction techniques, and draw some conclusions about the applicability of various abstraction techniques in various problem domains. Our presentation includes a taxonomy of model abstraction approaches, drawn from both traditional simulation and the qualitative simulation field of AI. We also illustrate how these techniques can be applied to an actual radar warning receiver model, and draw some conclusion about the applicability of the techniques.

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Re-engineering Legacy Computer Wargames

Approved abstract not available at printing.

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Military Force Structure and Realignment "Sharpening the Edge" Through Dynamic Simulation

This paper presents a unique approach to analyzing the force structure of the armed forces of the United States. The purposed method is to use a developed symbolic network representative language which combines the continuous variable features of system dynamics and the discrete event features of conventional simulation techniques. The result is a method to allow the strategic analyst to develop the influence diagram to analyze force structures within the combat logistics domain. Such analysis provides critical information regarding proposed future structures of the forces. The language structure is built to integrate with the network SLAMSYSTEM environment.

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Use of JMEM Data and Programs to Support Service Mission Planning Programs

Approved abstract not available at printing.

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J-MASS: A Maturing Technology for Modeling and Simulation

J-MASS (Joint Modeling and Simulation System) provides operations analysts with a single simulation environment for building, executing and post processing models and simulations on a UNIX workstation. Models and simulations built in J-MASS can be either real time or event based, can include both hardware in the loop and operator in the loop, and operate in a distributed processing mode over a heterogeneous set of computers. this paper provides an introduction to J-MASS using models and simulations currently under development by J-MASS users around the country as examples. These examples include aircraft, missiles, radar, global positioning satellites, and infrared systems. Some of the models are being built in Ada and some in C++; models built in either language can be used in the same simulation. In addition, there will be a live demonstration of features and capabilities using models built by J-MASS customers.

Thursday, 0830 - 1000

COMPOSITE GROUP VI SESSION Michelson 117

WG 32 — ADVANCED ANALYSIS, TECHNOLOGIES AND APPLICATIONS - ABSTRACTS

Chair: **Mark Axtell, Veda Incorporated**
Cochair: **Molly McKenna, Veda Incorporated**
Advisor: **Lt. Col Roy Riesz**
Room: **Michelson Hall - Room 121**

Tuesday, 1030-1200 - (NN I)

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Creation of TTD-like Vector Files from ADRG Using Neural Networks

Support for IPB requires the population of a geographically indexed database of terrain information. The Defense Mapping Agency provides digital products for this purpose, but worldwide coverage for most of these data types is limited; the most extensive coverage is found in raster-format digitally scanned paper maps, stored on ADRG CD-ROM. Systems are now becoming available that permit some automated vectorizing of digital map data, but they still require a large amount of human interaction to extract the features of interest. It would be simpler to vectorize the original color plates used in creating the paper map, but often the source data is no longer available. This paper describes ASAS/Techbase funded work investigating the potential of using artificial neural networks, combined with conventional image processing techniques to extract color feature separates from a large raster map database, and apply subsequent raster-to-vector conversion programs to the resulting feature separates for extracting TTD-like vector datasets from the ADRG data.

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A Force Disengagement Model Using Neural Nets And Fuzzy Logic

Approved abstract not available at printing.

Tuesday, 1330-1500 - (Scheduling Algorithms)

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An Improved Heuristic For Intercontinental Ballistic Missile Crew Scheduling

Creating monthly schedules for missile crews is a complex and time consuming problem. Thousands of events must be scheduled for a few hundred missile officers. The rules and regulations governing the problem are numerous, and there are currently no established quality measures for missile crew schedules. The software currently available to schedulers only schedules a fraction of the required events. The objectives of this research were to create a rule-based heuristic which can quickly produce feasible or near-feasible schedules to make the scheduling process paperless, and to develop possible measures of effectiveness for missile crew schedules. The research was successful in each of these areas. Schedules which comply with all the rules and regulations were generated by the heuristic. From 95% to 100% of the required events were scheduled. The time required to run the heuristic was from 5 to 40 seconds on hardware available at a missile wing. Spreadsheets were used to preprocess the data before it was input to the heuristic. This made the process paperless. Eight potential objectives which were previously not used as quality measures for missile crew schedules were obtained. These objectives along with those contained in the regulations are supported by the rule-based heuristic.

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Solving The Traveling Salesman With The Time Windows Problem Using Tabu Search

This paper presents a robust tabu search approach to the traveling salesman problem with time windows. The approach uses a two-level tour hashing scheme within a reactive tabu search procedure to detect repeated solutions and to promote a more diverse search. Strong feasibility conditions restrict the neighborhood of candidate solutions. The search returns optimal or near optimal solutions within a fraction of the time required by optimal methods. The algorithm's search neighborhood is not restricted to feasible solutions, and superior marginally infeasible solutions are reported to enhance the decision making process. This paper presents computational results for 145 problems from the literature.

The traveling salesman problem with time windows is a special case of the vehicle routing problem with time windows. Military applications may include deployment, planning and scheduling, tactical and strategic logistic resupply operations, redeployment planning, and depot level supply distribution planning and scheduling.

Wednesday 830-1000 - (NN II)

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Bio-Analytics Applied To Statistical Mission Analysis

Approved abstract not available at printing.

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Operations Research Techniques for Neural Networks Training Data Considerations

The Operational Sciences Department of the Air Force Institute of Technology has focused research efforts on multilayer perceptron classifiers and specifically, on how training data is obtained for these nonlinear models. Multilayer perceptron training data can be viewed as an n x m matrix where n is the number of exemplars and m is the number of features. The goal is to select "high information" features and exemplars. To choose important features given a candidate set, a statistical screening procedure identifies irrelevant features. This procedure is folded into a feature selection algorithm using the likelihood ratio test statistic within a backwards sequential procedure. To optimally select exemplars from the feature space, a criterion is developed based on minimizing the volume of the confidence ellipsoid for the weights in the multilayer perceptron. Powell's algorithm is employed when all points in the feature space are candidate exemplars and a discrete exchange algorithm is used when points are chosen from some feasible set. These statistically-driven methods allow a user to obtain, over time, an efficient-simple yet accurate-multilayer perceptron.

Wednesday 1030-1200 - (Analytical Models)

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Near-Term Battlefield Combat Identification System (NTBCIS) Survivability

Approved abstract not available at printing.

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Early Entry Force Analysis (EEFA)

The Early Entry Force Analysis (EEFA) study was conducted by the Study Directorate of the Training and Doctrine Command's (TRADOC) Analysis Center (TRAC) in support of the Early Entry Lethality and Survivability (EELS) Battle Lab. EEFA examined the Louisiana Maneuvers (LAM) 94 issues of determining how to make light forces more lethal, survivable, tactically mobile, and sustainable and determining the potential contribution to the battlefield by middleweight units; light enough for rapid force projection, yet tactically mobile and lethal. A new methodology using expert system (Force Package Planner (FORP)) and spreadsheet (Sufficiency Criteria for Realignment Adjustment Processor (SCRAP)) to help determine force package was developed. AN objective lightweight and objective middleweight force package consisting of Army, Marine, Air Force and Navy components using this methodology was developed for the European Command (EUCOM) 11 scenario. The Early Entry Force Tailoring Tool (EFFORT), a goal program using the General Algebraic Modeling System (GAMS), was developed to design and tailor force packages rapidly, based on the threat/environment/scenario and commander's intent. The Force Tailoring Tools (FORTT) of EFFORT, FORP and SCRAP offer a new methodology for designing force packages to satisfy any contingency. The analytical insights and conclusions show the improvements which can be made to early entry forces.

Wednesday 1330-1500 - (Data Reduction and Analysis)

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A State Of The Art Ground Vehicle Signature Characterization Capability At Eglin AFB FL

EGLIN AFB has developed a state-of-the-art capability for the characterization of ground mobile vehicles in the Radar and Infrared (IR) spectra. The

facility includes a tower,/turntable configuration, instrumentation, data reduction, calibration and analysis capabilities which are unparalleled within DOD facilities. The Joint Munitions Test and Evaluation Program Office, commonly referred to as CHICKEN LITTLE, has supported the improvements and optimization of this facility since 1985. This presentation will include an overview of the facility and capabilities available to DOD and industry. Examples of military and commercial customers' data collection activities over the past two years will be highlighted. Specific attributes of the facility such as high quality instrumentation, calibration techniques, site characterization, (including very low radar cross section background) and rapid response data reduction and analysis will be highlighted. Also, a historical series of metrics will be presented highlighting the data quality, data turn-around time and data collection improvements which have been accomplished over the past three years resulting in reduced costs for testing and reduced turn-around time for data collection and final data products. Some of the applications for use of the facility to support modeling and simulation activities, including Hardware-In-The-Loop will be provided as part of the presentation.

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Automated RWR Data Reduction

Approved abstract not available at printing.

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Maintenance Modernization System

The Maintenance Modernization System (MMS) was developed for the US Army 37th Transportation Command (37th TRANSCOM) by Data Systems Research and Development (DSRD) Program, managed and operated by Martin Marietta Energy Systems, Inc. for the Department of Energy, Oak Ridge Operations (DOE-ORO). MMS is an information management system that collects and uses information generated and maintained in multiple Unit Level Logistics Systems (ULLS). MMS consolidates supply and maintenance information and accumulates historical data to provide higher headquarters with timely access to subordinate unit ULLS information in a variety of report formats and management applications. MMS allows higher headquarters to consolidate data from subordinate units, view record data files on repair part stockage, monitor maintenance and supply activities and generate historical data for trend analysis and problem solving. MMS includes the communications interface capability to link multiple stand alone ULLS machines with higher headquarters. Data periodically received from ULLS updates previously recorded MMS information. MMS consists of a site module installed on the unit ULLS machine and a headquarters modules that provides access to all collected ULLS data. A distribution module is incorporated into both the site and headquarters modules for use with both local area networks (LANs) and wide area networks (WANs). From the unit perspective, there are no new procedures or changes to existing ULLS operations other than the activation of the MMS data transmission function. Data transmission is via asynchronous modem connections supporting both LAN and WAN environments, and back-up capability via floppy diskette transfer.

Thursday 0830-1000

COMPOSITE GROUP VII ..... Michelson 117

Thursday 1030-1200 - (Simulation)

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Military Force Structure and Realignment "Sharpening the Edge"

This paper presents a unique approach to analyzing the force structure of the armed forces of the United States. The proposed method is to use a developed symbolic network representative language which combines the continuous variable features of system dynamics and the discrete event features of conventional simulation techniques. The result is a method to allow the strategic analyst to develop the influence diagram to analyze force structures within the combat logistics domain. Such analysis provides critical information regarding proposed future structures of the armed forces. This language structure is built to integrate with the network SLAMSYSTEM environment.

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Modeling Control in Computer Simulations

This study outlines the design of the General Control Model as applied to a perception based computer simulation for the control of Joint and Allied Forces for al operational sides. The study develops the notion of battlefield control and describes the characteristics necessary to represent this notion of control in computer simulation where each unit has the potential to possess unique perceptions of the battlefield.

A complete description of the model is complemented by an explanation of the implementation of the General Control Model in a computer simulation. The Future Theater Level Model (FTLM) is used as the computer simulation vehicle. Recommendations for future developments and improvements to the General Control Model, including the use of an information queuing model associated with each processing headquarters to represent the spectrum of information to burdensome quantities, are outlined.

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The Effects of Decision Making Quality and Timeliness on the Response Surface of a Simple Combat Simulation

Past experiments with a three-sector Lanchester Square Law simulation with simple C2 have shown nonmonotonicity of a chaotic nature in response to small variations in initial conditions. Small changes in initial force dispositions can cause very large differences in battle outcomes. This nonmonotonic behavior is caused by the nonlinear impact of decision making, and the nature of the response varies dramatically with the modeled attributes of C2 processes.

Preliminary results show that if decision making is just based on current rather than projected battlefield conditions in the various sectors, improving information timeliness can actually have a negative effect, as forces may spend more time reacting than fighting. The work underway is intended to demonstrate whether this is true of the fidelity of the decisions made is improved.

Thursday 1530-1700 - (Analytical Support Tools)

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Computer-Based Instruction

Approved abstract not available at printing.

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Smart Weapons Operability Enhancement

Approved abstract not available at printing.

WG 33 — MODELING, SIMULATION AND WARGAMING - ABSTRACTS

Chair: **Major Jude C. Fernan, USA, TRAC-Monterey**
Cochairs: **CDR Jeffrey Kline, USN, OSD-PA&E**
Michael Garrambone, VEDA, Inc
Steve Packard, Martin Marietta Energy Systems
John Winkelman, Martin Marietta Government Electronic Systems
Advisor: **Dr. Sam Parry, NPS**
Room: **Michelson Hall - Room 119**

Tuesday, 1030-1200

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Navy Theater Level Model

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A Case Study for the Use of Models, Simulations, and Wargames in Support of Joint Training and Joint Training Analysis

Approved abstract not available at printing

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Joint Campaign Analysis Using Expert in the Loop Modeling Operations

Approved abstract not available at printing

Tuesday, 1330-1500

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VULCAN's FORGE: How to use a technology game to develop revolutionary solutions to counter-proliferation problems

Approved abstract not available at printing

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The Use of Modeling and Simulation in Educational Wargaming

Approved abstract not available at printing

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Use of Modeling and Simulation in Joint Analysis of Joint Operations

Approved abstract not available at printing

Wednesday, 0830-1000

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Developing the Data Inputs Required for Modeling and Simulation

Approved abstract not available at printing

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Building the Synthetic Environment

Approved abstract not available at printing

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VIVA LA VV&A! or Verification, Validation, and Accreditation (VV&A) Efforts and Objectives under the DoD Modeling and Simulation Master Plan

The draft DoD Modeling and Simulation (M&S) Master Plan has as one of its sub-objectives the development of methodologies, standards and procedures for the Verification, Validation and Accreditation (VV&A) of models and simulations, and the Verification, Validation and Certification (VV&C) of data. The Defense Modeling and Simulation Office serves as a full-time focal point for information concerning DoD M&S activities and has undertaken a number of initiatives in support of the VV&A objective. These efforts include the development of standards and guides, sponsorship of prototype applications, and planning for accreditation support services. The VV&A Execution Plan places a primary focus on programs which address joint requirements, including DIS applications, as well as both training and test and evaluation community interests. This paper discusses the variety of work which is ongoing for Fiscal Year 95 and looks at future needs in meeting the requirements of the M&S Master Plan. Attention is given to the policy guidance which is being developed to address the needs of the Services and a positive interchange of ideas is actively sought.

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Janus Analysis of Added Value of Unmanned Vehicles

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Determining the Implications of Unexploded Ordnance (UXO) on the Battlefield Using a Minefield Effectiveness Model

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Parametric Study of Warhead Pk verses CEP for Surface-to-Air Missile (SAM) Targets

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J-MASS: A Maturing Technology for Modeling and Simulation

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A State-of-the-Art Ground Vehicle Signature Characterization Capability at Eglin AFB, FL

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COMPOSITE GROUP SESSION VII Michelson 117

Thursday, 1030-1200

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Modeling Psycho-Social Attributes in Conflict

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Credible Uses of DIS for Analysis

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The Effects of Decisionmaking Quality and Timeliness on the Response Surface of a Simple Combat Simulation

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Pleiades: A Hybrid Simulation Architecture for Mission Effectiveness Analysis

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Parlier, LTC Greg H, US Army
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Patenaude, MAJ Anne M, ODUSA
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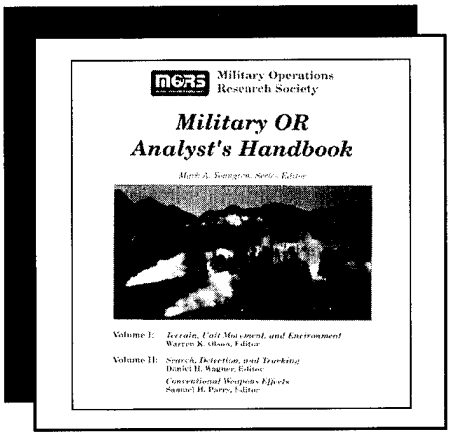

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Alphabetical Index of 63rd MORSS Presenters

Schedule for the 63rd MORSS

Tuesday, 6 June 1995		
0700	0830	Registration
0715	0815	Working Group Chairs/CoChairs Warm-Up
0830	1000	**Plenary Session**
1030	1200	1st WG Session
1200	1330	Tutorials
1330	1500	2nd WG Session/**CG I & II Sessions Meet**
1530	1700	**Special Session I**
1715	1900	Mixer
Wednesday, 7 June 1995		
0700	0800	Town Hall Meeting (WG & CG Chairs)
0830	1000	3rd WG Session
1030	1200	4th WG Session/**CG III & IV Sessions Meet**
1200	1330	Tutorials
1330	1500	5th WG Session/**CG V & VI Sessions Meet**
1530	1700	**Special Session II**
1730	2030	Banquet with Speaker ($21.00)
Thursday, 8 June 1995		
0830	1000	6th WG Session/**CG VII Session Meet**
1030	1200	7th WG Session
1200	1330	Lunch with Speaker ($15.00)
1330	1500	**Special Session III**
1500	1530	Working Group Chairs/CoChairs Wrap-Up
1530	1700	8th WG Session -- MORS office closes