



**V M A S C**  
*Virginia Modeling, Analysis & Simulation Center*



# 2002

# Annual Report

# MESSAGE FROM THE DIRECTOR

I am pleased to present the Virginia Modeling, Analysis and Simulation Center (VMASC) Annual Report for calendar year (CY) 2002. This report highlights our many accomplishments during the past year and fulfills the terms of the Cooperative Research and Development Agreement between Old Dominion University and the United States Joint Forces Command.

CY2002 again saw VMASC surpass its previous year's results in terms of revenue, project activity, and progress toward our vision of becoming a "...global leader in Modeling and Simulation (M&S) research and development and an integrator of M&S with visualization technologies." Through CY2002, VMASC-generated project revenue increased by 63% from \$3.5M to more than \$5.5M. For the third year in a row VMASC remained the largest research producer within Old Dominion University.



In 2002, we made significant progress towards the development of the first ever Battle Laboratory within academia. In building this laboratory we purchased over \$500,000 in hardware and software. This equipment was used effectively during the Joint Battlespace Environment demonstration and Marine Corps Special Event at the 2002 Interservice/Industry Training, Simulation and Education Conference. Our plan for the first half of CY2003 is to complete development of the Battle Laboratory and to initiate government and commercial decision support projects in collaboration with our industry, government and academic partners, beginning with the late summer and fall 2003. The Battle Laboratory and Enterprise Decision Support Center is our featured research activity highlighted in the center section of this report.

Our modeling and simulation graduate programs continued to grow impressively in 2002. Fifty-one students are currently enrolled in the Masters degree program with 12 having graduated from the program. Nineteen students are currently enrolled in the PhD program, with the first student still on track to receive his degree in May 2003. The rapid growth of these programs has resulted in challenges for the students and our faculty/staff in terms of finding space, identifying relevant research and internship opportunities, and attracting qualified faculty, in sufficient numbers, to teach the required and elective M&S courses.

In October, Old Dominion University, through the Old Dominion University Research Foundation, was re-awarded the Student and Faculty Research Services Contract with the United States Joint Forces Command. VMASC prepared the proposal for this 5-year, \$30M ceiling contract, and will manage contract execution under the terms of the University's Cooperative Research and Development Agreement with the Joint Forces Command. Throughout 2003 we will work closely with USJFCOM to bring student and faculty research expertise to bear on current and future joint operational challenges.

In addition to the foregoing accomplishments, VMASC initiated a partnership with the Eastern Virginia Medical School to create a National Center for Collaboration in Medical Modeling and Simulation. In late fall, we were notified that this project would receive \$2.25M in Congressional funding in 2003. We are excited about the possibilities this initiative will provide to our faculty, staff and students and expect this project to be another major focus for VMASC in 2003.

These accomplishments are among the most significant of the many achieved by the VMASC team. Individual faculty accomplishments of note are highlighted on the 2002 Accomplishments page, and the 2002 Publications and Presentations page lists major scholarly documents created by our exemplary researchers, dedicated university faculty, and committed students.

The VMASC team is continuing to extend the frontiers of modeling, simulation and visualization science and engineering through research and by educating tomorrow's civilian and military workforce in what we believe will be one of the dominant enterprises of the twenty-first century.

The VMASC story continues to remain exciting and compelling—exciting in terms of the new challenges being created by our Battle Laboratory and Enterprise Decision Support Center and our bold expansion into the field of medical modeling and simulation; compelling in our significant growth and the continuing opportunity that our research and education offers to our sponsors, our partner members, and our region. We at VMASC promise that we will continue to shape and transform the future by pushing the boundaries of modeling, simulation and visualization and invite you to join us in this exciting endeavor.

Sincerely,

R. Bowen Loftin  
Executive Director

# ORGANIZATION SYNOPSIS

The Virginia Modeling, Analysis and Simulation Center is a not-for-profit collaborative enterprise center of Old Dominion University's College of Engineering and Technology. We are partnered with academia, industry and government. Our foci are:

- Modeling, simulation and visualization research, development and education.
- Leveraging, promoting and cultivating simulation technology expertise through industry, government, and academia.

## Vision

VMASC will be a global leader in modeling and simulation (M&S) research and development and an integrator of M&S with visualization technologies. VMASC will be a portal for the nation's premier M&S educational program.

## Mission

**Engage** in collaborative research and development in modeling, simulation, and visualization (MS&V).  
**Provide** government, industry and academia with MS&V scientific/engineering applications, development and technical services.  
**Promote** education in MS&V through graduate degree programs, short courses, and certificate programs.  
**Stimulate** economic development through increased industry and government use of MS&V.

## Facility

**Location:** 7000 College Drive, Suffolk, Virginia

### Seven Development Laboratories

- Operations Research & Analysis
- Human Factors Engineering
- GIS/Database
- CAVE Facility (Norfolk campus)
- Constructive Modeling
- Virtual Simulation
- Virtual Environments (Norfolk campus)

**Simulation hardware, software and tools valued at over \$4 million**

# MODELING AND SIMULATION GRADUATE PROGRAMS

## 2002 Statistics

- First Modeling & Simulation Dissertation Proposal Defended
- 51 students enrolled in the M&S Master's Program with 12 graduates since program start
- 3 Masters of Engineering in Modeling and Simulation program graduates in 2002
  - Todd K. Chamberlain
  - Jennifer E. Mills
  - Edward Shepherd
- 19 students enrolled in the M&S Ph.D. Program
  - 1 Army War College Fellow
    - LTC George Reynolds
  - 1 Fullbright Scholar
    - Hungria Berbesi



College of Engineering and Technology student John Sokolowski successfully defended the first Modeling and Simulation Ph.D. dissertation proposal on March 7. Mr. Sokolowski presented his proposed research for modeling the human decision process performed by senior military commanders, which will incorporate the military decision-making doctrine that exists

today with recent research on how expert humans make decisions in complex situations.

# PROJECT ACTIVITIES

## ENGINEERING

### Intelligent Synthesis Environment

**Project Leads:** *Dr. R. Bowen Loftin, Director,  
VMASC and ODU Modeling and Simulation Programs  
Dr. David Dryer, Assistant Professor,  
Department of Engineering Management and  
Systems Engineering  
Dr. Debra Major, Associate Professor,  
Department of Psychology*

**Sponsor:** *NASA, Langley Research Center*

**Description:** This project focused on extracting the key tasks from, and the interaction within, an engineering team that is developing the next generation vehicles at NASA. Current research is targeted at identifying technologies that enhance team collaboration.



### DEVELOPMENT AND VALIDATION OF A SELECTION SYSTEM FOR WELDERS

**Project Lead:** *Dr. James Bliss, Associate Professor,  
Department of Psychology*

**Sponsor:** *Northrop Grumman Newport News  
Welding School*

**Description:** The goal of this research was to define methods for optimizing the welder trainee selection system used at Northrop Grumman Newport News (NGNN). The research team, in collaboration with members of the Training Modernization Group (TMG) and representatives of NGNN management, gathered comprehensive information about welding. Following interviews with current and former NGNN welding students, welding instructors, representatives of NGNN's human resources department, and members of NGNN management, the research team completed a comprehensive analysis of the welding tasks taught at NGNN. Following that analysis, the researchers assembled a list of possible interventions that offered promise for refining the welder selection process at NGNN.

## INFORMATION SYSTEMS TECHNOLOGY

### INFORMATION SYSTEMS AND DIGITAL LIBRARY DEVELOPMENT SUPPORT

**Project Leads:** *Dr. Steven Zahorian, Chair,  
Department of Electrical and Computer Engineering  
Mr. Kevin McCleskey, Director,  
Student & Faculty Services*

**Sponsor:** *U.S. Joint Forces Command,  
Joint Warfighting Center*

**Description:** Continue ongoing effort to provide a wide range of support to the JW900 Department at JWFC. Specific projects include; Assist with the installation, configuration and troubleshooting of various computers and systems within the JWFC computer network. Assist in the manufacture and installation of fiber optic connectors and multi mode ST fiber connectors and

testing using the Seicor testing unit; provide technical and engineering support in the area of distance learning technologies and initiatives. Provide guidance on cutting-edge technologies, Provide support in the area of graphics and visualization; support the continued development and implementation of XML-based indexing architecture for the Joint Digital Library and the development of a speech to text translation capability for the Joint Digital Library.

### INFORMATION SYSTEMS TECHNOLOGY SUPPORT

**Project Lead:** *Dr. Mohammad Zubair, Associate Professor,  
Department of Computer Science  
Mr. Ajay Gupta, Director of Computer Resources  
Department of Computer Science*

**Sponsor:** *U.S. Joint Forces Command, Joint C4ISR Battle Center*

**Description:** Continue ongoing effort to provide technical support for the development of an improved and enhanced management information system. Focus of the project was database administration and development, conducting research, and providing support for the development of web-based management applications.

### MANAGEMENT INFORMATION SYSTEM DEVELOPMENT

**Project Leads:** *Dr. Kurt Maly, Chair,  
Department of Computer Science  
Dr. Mohammed Zubair, Associate Professor,  
Department of Computer Science  
Mr. Ajay Gupta, Director of Computer Resources,  
Department of Computer Science*

**Sponsor:** *U.S. Navy, Commander, Operational Test  
and Evaluation Froce*

**Description:** Continue ongoing effort to provide technical and analytical support to develop and implement the Force Management Information System (MIS) using web-based technology and commercial software. The resultant MIS, when fully fielded, will include all the elements of test management oversight, finance and manning modules, and other administrative support modules to facilitate accurate information and report generation.

### KNOWLEDGE MANAGEMENT SYSTEM REQUIREMENT DEFINITION STUDY

**Project Lead:** *Mr. C.C. Hill, Project Engineer,  
Engineering and Technical Services*

**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting  
Experimentation Battle Laboratory*

**Description:** Assist the Joint Experimentation Directorate with an integrated program of knowledge management research and evaluation experimentation support that assesses concept based hypothesis for near, mid and far term concepts, reviews technology capabilities, identifies the latest and best knowledge management practices, and assesses commercial and industry advanced knowledge management programs, to identify and recommend the best-value solutions supporting changes to doctrine, organizations, training, material and leadership to achieve significant advances in joint operational capabilities.

### INFORMATION DISSEMINATION MANAGEMENT SUPPORT

**Project Lead:** *Mr. Tom Lang, Director,  
Engineering and Technical Services*

**Sponsor:** *U.S. Joint Forces Command, Command,  
Control and Communications Directorate*

**Description:** Provide continuing research and technical support to examine interoperability issues affecting the Combatant Commanders-in-Chief. Support is focused on interoperability problems encountered by United States based forces deploying overseas. Identified issues and problems are set in perspective relative

to their overall impact on joint forces operations by relating the deficiencies to their appropriate operational requirement, assessing their impact on the conduct of joint forces operations; then prioritizing them with cost estimates and recommendations for resolution within ongoing or new C4 programs or technology development initiatives.

## M&S TECHNOLOGY

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### MODELING AND SIMULATION ENGINEERING AND TECHNICAL SUPPORT

**Project Lead:** *Mr. Robert Kean, Senior Engineer Advisor, Engineering and Technical Services*

**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting Center*

**Description:** Continue ongoing effort to provide modeling and simulation technical and engineering support including researching various legacy training models and simulations and their interactions, using tools associated with the Joint Training Confederate (JTC), and providing recommendations for acquisition of modeling and simulation tools to be used by the JTC to meet exercise unique training objectives. In addition, provide subject matter information support concerning potential future training and analytical simulation systems and other emerging technologies.

### CARGO LOGISTICS MODELING AND SIMULATION

**Project Lead:** *Dr. Jim Leathrum, Associate Professor, Department of Electrical and Computer Engineering*

**Sponsor:** *Military Traffic Management Command Transportation Engineering Agency*

**Description:** Enhance Army logistics simulation capabilities involving Joint Logistics Over the Shore operations, seaports, nodal networks and intra-theater infrastructure. Specific tasks include: development of an initial Joint Logistics Over the Shore capability; investigate the use of the transit architecture developed in the Port Simulation model to support the networking of multiple terminals; assist in the development of a port or embarkation process; and assist in the development and execution of a test plan and performance analysis for the Enhanced Logistics Intra-theater Support Tool.

### JOINT SIMULATION SYSTEM OPERATIONAL TESTING SUPPORT

**Project Lead:** *Mr. John Sokolowski, Project Scientist, VMASC*

**Sponsor:** *U.S. Navy, Commander, Operational Test and Evaluation Force*

**Description:** Provide technical support for the Joint Simulation System (JSIMS) operational test and evaluation process. Assist in developing the test methodology and applying it to test events. Develop test procedures, criteria, and metrics that are relevant to JSIMS operational requirements. Because JSIMS is the first large-scale computer simulation to undergo the formal operational test and evaluation process, the test methodology developed may become the standard for future operational testing of simulations.

### MODELING THE DECISION MAKING OF THE JOINT TASK FORCE COMMANDER

**Project Lead:** *Mr. John Sokolowski, Project Scientist, VMASC*

**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting Center, and the Defense Modeling and Simulation Office*

**Description:** The focus of this project is the development of a computational model of the cognitive decision process used by senior military commanders at the operational level of warfare to correct existing shortcomings. The research will investigate the utility and accuracy of psychologically based decision modeling methods when implemented as executable software. The implemented model may

provide the basis for a software component that could substitute for high-level human commanders in simulation scenarios that call for command decision-making when human commanders are not available.

### COMPOSABLE, RE-CONFIGURABLE ENVIRONMENT FOR ACQUISITION, TRAINING AND EXPERIMENTATION

**Project Leads:** *Dr. Mikel D. Petty, Chief Scientist, VMASC  
Dr. Frederic McKenzie, Assistant Professor,  
Department of Electrical and Computer Engineering*

**Sponsor:** *Defense Modeling and Simulation Office*

**Description:** Determine and document current operational requirements for simulating the behavior of non-combatant crowds in military simulations. Experimentally establish and validate a requirements definition process. Review the current state of psychological models of crowd behavior. Develop a detailed design of a prototype implementation of a crowd simulation.

### A THEORY OF COMPOSABILITY

**Project Leads:** *Dr. Mikel D. Petty, Chief Scientist, VMASC  
Mr. Eric Weisel, Project Scientist, VMASC*

**Sponsor:** *Defense Modeling and Simulation Office*

**Description:** Develop a formal theory for semantic composability, drawing upon existing theories, including mathematical logic and computability theory. Produce formal definitions of composability and associated concepts, a set of theorems and proofs addressing crucial aspects of semantic composability, such as the validity of compositions, and an analysis of what the theoretical results imply for practical composability engineering.

### SOFTWARE ARCHITECTURE DESCRIPTION LANGUAGES

**Project Leads:** *Dr. Mikel D. Petty, Chief Scientist, VMASC  
Dr. Frederic McKenzie, Assistant Professor,  
Department of Electrical and Computer Engineering*

**Sponsor:** *U.S. Army Program Executive Office, Simulation, Training, and Instrumentation*

**Description:** Software architecture is high-level software design, dealing with the component-level structure and organization of large software systems. Architecture description languages (ADLs) represent general software designs at the architecture level. Experimental applications of two ADLs (Rapide and Acme) to existing simulations showed that ADLs could be used to discover important features of simulation system architectures.

## TRAINING & EDUCATION

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### NAVY FLEET TRAINING CENTER CRYOGENICS TRAINING SIMULATION

**Project Lead:** *Dr. Roland Mielke, Technical Director, VMASC*

**Sponsor:** *U.S. Navy, Commander, Naval Education and Training*

**Description:** Develop a low-pressure producer system simulation consisting of a detailed, physics-based computer simulation of the Cosmodyne GB-2 Low-Pressure Liquid Oxygen/Nitrogen Producer System. The developed simulation model accurately simulates the start-up, steady state, and shutdown operations of the cryogenics system, as well as the transitions between these operating states. Additionally, the simulation model captures and simulates abnormal conditions that could be encountered in the actual system. Additionally, six hours of cryogenic-specific safety instruction were converted to approximately one and one-half

## JOINT RANGE AND ADVANCED DISTRIBUTED LEARNING INTEGRATION

**Project Lead:** *Mr. Tom Lang, Director,  
Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command,  
Joint Warfighting Center*

**Description:** Identify Joint Range integration and interoperability shortfalls. Target opportunities for integrated training, experimentation and technology insertion. Focus on near and far term Joint Range integration to facilitate the integration of Joint and Service testing, training and experimentation at RDT&E and training ranges and facilities. Emphasis is on Navy and Marine Components and the Gulf Coast. Explore linkages with Distributed Training Environments that include network services providing for rapid, "just in time" training and rehearsal.

## NATO CONFERENCE SUPPORT

**Project Lead:** *Dr. Andreas Tolk, Senior Research Scientist, VMASC*  
**Sponsor:** *U.S. Navy, Commander Operational Test and  
Evaluation Force (COMOPTEVFOR)*

**Description:** Participate in the IABG NATO Symposium as presenter, technical advisor, and session chair as well as to prepare inputs for the IABG report on this symposium.

## VIRTUAL AND AUGMENTED REALITY FOR TRAINING

**Project Lead:** *Dr. R. Bowen Loftin, Director,  
VMASC and ODU Modeling and Simulation Programs*  
**Sponsor:** *NASA, Johnson Space Center*

**Description:** Research and examine the extent to which "immersion" in VR systems produces motion sickness and disrupts perceptual and sensorimotor functions that may ultimately result in negative impacts on performance of operational activities. The study is evaluating and comparing responses to two types of VR delivery systems (head-mounted display [HMD] and a dome projection system), during three duration periods and repeated exposures.



## DEVELOPING VIRTUAL ENVIRONMENTS FOR TRAINING

**Project Leads:** *Dr. R. Bowen Loftin, Director,  
VMASC and ODU Modeling and Simulation Programs*  
*Dr. Frederic McKenzie, Assistant Professor,  
Department of Electrical and Computer Engineering*  
*Dr. Mark Scerbo, Associate Professor,  
Department of Psychology*  
**Sponsor:** *U.S. Navy, Office of Naval Research*  
**Partners:** *University of Pennsylvania, LinCom Corporation,  
and University of Houston*

**Description:** Perform research to assist in understanding the additional constraints encountered due to emotional responses in judgment-based military scenarios. Specifically, the goal of this project was to address both culturally independent and dependent cues of nonverbal communication and recreate them in training scenarios. Focus was on cues that are precursors to aggression and/or hostile activities such as those cues that suggest deception. A digital terrain database of the Quantico MOUT side called Combat Town was used for the training environment.

The basic training objective was to monitor all ingress into the fictional town. The participant's role was to act in the role of a guard and stop each vehicle as it approached the checkpoint, check and verify the identities of all persons seeking access to the town, and clear and/or deny access to all vehicles that appear suspicious.

## ADVANCED DISTANCE LEARNING (ADL) OPERATIONAL REQUIREMENT DEVELOPMENT

**Project Lead:** *Mr. Tom Lang, Director,  
Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting Center*

**Description:** Continue the ongoing effort to support the development of an ADL Network and its resultant curriculum content. Support the submission of two advanced concept technology demonstration proposals to the Office of the Secretary of Defense for the development of both an ADL Network and ADL content development for shareable courseware. Support the development of a Joint Warfighting Center ADL Campaign Plan and ensure it is aligned, for the long-term, with Joint Experimentation and Mission Rehearsal. Support the requirement for leveraging the Joint Digital Library, Joint Simulation System, Joint Distributed Learning System, interagency and coalition training programs and other new technologies. Investigate leveraging the Partnership For Peace five-year strategic plan, the Swedish Memorandum of Understanding, the Memorandum of Understanding between U.S. Department of Defense and the Swiss Federal Department of Defense, Civil Protection, and Sports with the development of the ADL Campaign Plan.

## ARMY TRAINING SUPPORT SYSTEM (TSS) REQUIREMENTS DEVELOPMENT

**Project Lead:** *Dr. R. Bowen Loftin, Director,  
VMASC and ODU Modeling and Simulation Programs*  
**Sponsor:** *U.S. Army, Army Training Support Center*

**Description:** Provide support in three distinct areas critical to the future viability and success of the Army Training Support Center in meeting its mission objectives. The three focus areas are: develop a long-term (10-year) M&S integration concept to improve command business practices & products related to the Army Training Support System (TSS); analyze Army needs and provide requirement recommendations for building and equipping a visualization and wargaming facility; and produce a concept demonstration of a M&S application tool that highlights the value of using such a tool to capture, at the macro-level, the salient features of the planning process for a complex military training exercise.

## WARGAMING & MILITARY TECHNOLOGY

### VIRTUAL CAMPAIGN MANAGEMENT SYSTEM

**Project Leads:** *Dr. R. Bowen Loftin, Director,  
VMASC and ODU Modeling and Simulation Programs,  
Mr. Joe Grosel, Program Manager,  
Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting  
Experimentation Battle Laboratory*

**Description:** This project is focused on the development of a Virtual Campaign Management Information System (VCMS) that will enable the Joint Experimentation Directorate to locate needed information and simultaneously make this information available to the larger Joint experimentation community including, the Combatant Commands, Service Agencies, Joint Staff and the Office of the Secretary of Defense. The goal is to move the VCMS from the theoretical to a system design suitable for implementation.

## MILLENNIUM CHALLENGE 2002 RANGE INTEGRATION SUPPORT

**Project Lead:** *Mr. Mark Phillips, Senior Research Scientist, VMASC*  
**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting Center*

**Description:** Integrate live-test ranges on the US west coast into exercise Millennium Challenge 2002. Focus on expanding the on-going research and promote a Joint Battlespace Environment vision as it applies to joint training. Leverage existing Service and Joint programs by adding other live, virtual and constructive applications.



## ENGINEERING AND TECHNICAL SUPPORT RELATED TO C4ISR AND THEATER AIR MISSILE DEFENSE

**Project Lead:** *Mr. David O'Neill, Senior Engineer Advisor, Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Command, Control and Communications Directorate*

**Description:** Continue the ongoing effort to support CINC coordination duties for the Joint Theater Missile Defense Office. Evaluate the contributions of new C4ISR technology to approved Warfighting requirements. Ensure new C4ISR processes are interoperable and conform to joint standards. Support interoperability identification and resolution development. Perform tactical C4 reviews, studies and assessments. Review and assess Operational Requirements Documents and Mission Needs Statements.

## ADVANCED CONCEPT TEST DEMONSTRATIONS (ACTD) ENGINEERING AND TECHNICAL SUPPORT

**Project Lead:** *Mr. Al Wunsch, Senior Engineer Advisor, Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting Experimentation Battle Laboratory*

**Description:** Continue ongoing effort to review and make recommendations on issues associated with on-going Advanced Concept Test Demonstrations. Develop test and evaluation criteria for Joint exercises and tests. Review and comment on all ACAT I/IA and Joint Requirements Oversight Council special interest documents that have been validated and approved. Develop and staff technical white papers, Mission Need Statements, Capstone Requirements documents and Operational Requirements Documents. Conduct performance analysis and assessment of special projects to support requirements development.

## C4ISR ENGINEERING AND TECHNICAL SUPPORT

**Project Lead:** *Mr. Tom Lang, Director, Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Command, Control and Communications Directorate*

**Description:** Provide major exercise (Millennium Challenge) support and follow-on experiment engineering analysis and evaluation in support. Develop joint requirements, C4I networks, assumptions, principles and division of labor across service and agency boundaries.

## C4ISR PROGRAM MANAGEMENT SUPPORT

**Project Lead:** *Mr. Michael Rendon, Senior Engineer Advisor, Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Joint C4ISR Battle Center*

**Description:** Continue the ongoing effort to provide the Combatant Commands, at the Joint Task Force level, with a joint assessment and experimental capability that has strong connectivity to programmatic implementations through the Joint Chiefs-of-Staff, and which provides a forcing function for joint capability and interoperability.

## JOINT BATTLESPACE ENVIRONMENT DEMONSTRATION SUPPORT

**Project Lead:** *Mr. Mark Phillips, Senior Research Scientist, VMASC*  
**Sponsor:** *U.S. Joint Forces Command, Joint Warfighting Center*

**Description:** Provide a faculty and student research team to coordinate and integrate a range of simulation systems (constructive, virtual - including man-in-the-loop, with real time C4ISR Systems (GCCS-M & C2PC) to build a prototype of the Joint Battlespace Environment for demonstration at the various service models from Airforce, Navy and Marine Corps into a Common Operational Picture for demonstration during the I/ITSEC 2002 Conference.

## BATTLE LABORATORY/DECISION SUPPORT CENTER

**Project Lead:** *Dr. Roland Mielke, Technical Director, VMASC*  
*Mr. Mark Phillips, Battle Lab Director, VMASC*  
**Sponsor:** *Commonwealth of Virginia and ODU*

**Description:** Develop a Battle Laboratory/Decision Support Center within the VMASC facility to enhance the conduct of modeling and simulation research of direct importance to the military; improve our ability to support our industrial members by involving them in projects and research that expand their modeling, simulation and visualization horizon; serve as a demonstration of how modeling and simulation technology can be used to assist with business enterprise decision-making; and provide a state-of-the-art classroom in which to educate the modeling and simulation experts of the future.



## COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE (C4ISR) ENGINEERING AND TECHNICAL SUPPORT

**Project Lead:** *Mr. John Dorris, Senior Engineer Advisor, Engineering and Technical Services*  
**Sponsor:** *U.S. Joint Forces Command, Command, Control and Communications Directorate*

**Description:** Continue the ongoing effort to evaluate the contributions of new C4ISR technologies to various Warfighting processes. Facilitate process improvements by accelerating the implementation of selected C4ISR technologies. Ensure new C4ISR processes are interoperable and conform to joint standards and provide warfighter feedback early in the process. Compare alternative C4ISR processes, identify shortfalls in the current process and make technical recommendations to correct the shortfalls.

# BATTLE LAB



From the Battle Lab Director:

The VMASC Battle Lab and Enterprise Decision Support Center is a reality! On behalf of Dr. R. Bowen Loftin, Dr. Roland Mielke and all the VMASC staff, I would like to welcome you to the next phase of the VMASC evolution. The Battle Lab is an infrastructure carefully tailored to support the operations of VMASC, its customers and member partners. At its heart is the

intellectual capital of some very bright graduate students and M&S professors, supported by capable and flexible technology. On this page are conceptual views of three laboratories now in development. The Battle Lab also includes a GIS research lab, a collaborative decision support system, and a further extension of the VMASC visualization facility located on the Norfolk campus.

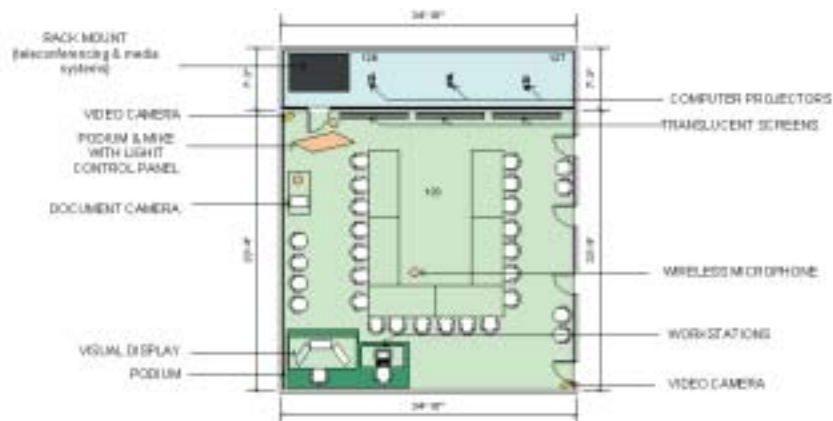
The VMASC Battle Lab will evolve as research and business needs evolve and our government, academia, and industry partners, present and future, become engaged with the Battle Lab, and actively work to strengthen the fastest growing M&S graduate program and MS&V center of excellence in the nation.

As the first Battle Lab Director, I am at your service. We intend to testbed exciting new concepts, reduce risk and cost, and improve creativity within your organizations. I encourage you to examine the VMASC track record for 2002 and then consider what the VMASC Battle Lab can do for you.

Mark Phillips  
Senior Research Scientist  
Battle Lab Director



## OPERATIONS RESEARCH AND ANALYSIS LAB



Additional Equipment (not shown):  
- Surround Sound System  
- KVM Switch

## HUMAN FACTORS ENGINEERING LAB



## CONSTRUCTIVE MODELING LAB



# VMASC Welcomes...

## Dr. Andreas Tolk



Andreas Tolk joined VMASC in April 2002 as a Senior Research Scientist. He has over 10 years of experience in the domain of simulation applications in the military environment. He received his Ph.D. at the end of his military career (German Armed Forces, Army Air Defense Artillery) from the Institute of Applied Systems Science and Operations Research of the University of the Federal Armed Forces in Munich, Germany, for his work on Integration of Means of Artificial Intelligence into Closed Combat Simulation Systems. He also holds a German Diploma (M.S.) in Computer Science. After leaving the German Armed Forces, Dr. Tolk joined ESG, one of the main German contractors for Command and Control Systems, where he worked as a program manager for Decision Support Tools, and afterwards went to IABG, the main supporter of the German DoD concerning military Operations Research, where he worked as Head of Department for Tactical Systems, Technical Advisor for R&D in C4ISR and finally as Vice President for Land Weapon System.

Dr. Tolk was one of the German industrial experts helping to write the NATO Modeling and Simulation Master Plan and has participated in several NATO Studies, Analysis and Simulation (SAS) Activities. He is a member of the Simulation Interoperability Standards Organization (SISO) and chairs the C4I forum of the Simulation Interoperability Workshops (SIW). He received several awards for his work on interoperability issues, especially integration issues of C4I systems and simulation systems for decision support, training in computer assisted exercises, as well as procurement and acquisition. Dr. Tolk has published over 30 articles and papers, several of them on the Recommended Reading List of SISO.

## Nannette Bongiovi, CPP



Nannette Bongiovi joined VMASC as the Operations Specialist. Her position is responsible for the Center's fiscal management, production of printed marketing materials, logistical coordination of short courses, and the development and maintenance of the VMASC website. She supervises the accounting support staff and the graphic design team; assists with pre-award proposal development, manages membership support, plans for and participates in various events such as trade-shows and conventions; and assists the General Manager with the

development and implementation of effective business processes and practices within the Center.

Ms. Bongiovi's employment with Old Dominion University began 1989 in the Office of Finance. She then transitioned to the Housing department and most recently served as the Assistant Director of the Center for Continuing Engineering Education. She received her BS degree in Business Administration from Old Dominion University in 1987 and her Certified Program Planner designation from the Learning Resources Network in Manhattan, Kansas in 1996.

## Tia Green



Tia Green joined VMASC on May 25, 2002 as the Center's Administrative and Office Specialist. Ms. Green performs the Center's receptionist duties, manages the conference room calendar, and coordinates all travel arrangements for the VMASC Director. She also provides support to the Office Manager/Coordinator of M&S Graduate Programs.

Ms. Green began her employment with Old Dominion University in August 2000 as an Office Specialist for the University's department of Student Health Services. In addition to being employed by the university, Ms. Green is an undergraduate student majoring in Finance and minoring in Accounting.

## Sheila Flanagan



Sheila Flanagan is the Program Specialist for the ETS/SFS Group of Old Dominion University Research Foundation. In October 2002, she assumed program support responsibility for all VMASC projects. In this position, she develops and implements administrative policies and procedures, supervises administrative staff, assists with pre-award proposals and post-award contract management,

maintains local personnel files and records, directs and coordinates travel arrangements, prepares and tracks financial spreadsheets, prepares monthly program reports, briefings/presentations and assists in the recruiting of student interns and faculty to support customer funded requirements from within ODU and other Virginia Universities.

Mrs. Flanagan received her BS degree in Organizational Management and Human Resource Development from Bluefield College in 2000.

## Lesley Buchanan



**Lesley Buchanan is the Program Specialist for the ETS/SFS Group of Old Dominion University Research Foundation. In her position with VMASC, she assists the Program Specialist in supporting the ETS/SFS Group in developing and implementing administrative policies and procedures, assisting with pre-award and post-award**

**proposals preparation, assisting in the maintenance of local personnel files and records, and coordinating travel arrangements.**

**Mrs. Buchanan began her employment with Old Dominion University on April 10, 2000 at the Virginia Beach Higher Education Center and then transferred to the Filipino American Student Cultural Center prior to coming to VMASC.**

# ACCOMPLISHMENTS FOR 2002

- VMASC will manage the Norfolk-based United States Joint Forces Command (USJFCOM) contract awarded to Old Dominion University to provide student and faculty research services in direct support of the USJFCOM mission areas of joint training, logistics, integration, experimentation, and transformation. The ceiling of the base period of the contract is valued at up to \$5.8 million, and the ceiling of the total value of the contract, if all options are exercised, is over \$30.8 million. If fully funded over the five-year period, the award will be the largest research contract in Old Dominion University's history.
  - Development began on the VMASC Battle Lab, the world's first university-run battle lab that can simulate chains of complex situations for businesses and military agencies. The Battle Lab was funded by a \$904,000 Old Dominion University and Commonwealth Research Technology Fund grant.
  - VMASC launched a new e-commerce web site at [www.vmasc.odu.edu](http://www.vmasc.odu.edu)
  - VMASC member support grew to 146 members during 2002 with the addition of ten new members. VMASC membership support was comprised of 98 Industry members (68%), 24 government members (16%), 15 affiliate members (10%) and 9 academic members (6%).
  - Old Dominion University and Eastern Virginia Medical School launched a joint program, christened the National Center for Collaboration in Medical Modeling and Simulation, to advance the use of M&S in medicine. Initial operations will be funded by a \$2.25 million congressional appropriation in 2003.
  - VMASC was profiled in the July 2002 issue of Military Training Technology Magazine
  - VMASC joined the circle of the Extensible M&S Framework (XMSF) core architects in late 2002. VMASC's role will be to tighten the relations between the M&S and the C4I community using similar technical solutions for establishing their future system architecture frameworks. Dr. Andreas Tolk will serve as a liaison to the SISO C4I community as well as to the C4I Domain Task Group of the Object Management Group (OMG).
  - John Sokolowski successfully defended Old Dominion University's first Modeling and Simulation Ph.D. dissertation proposal on March 7, 2002. Mr. Sokolowski presented his proposed research for modeling the human decision process performed by senior military commanders, which incorporates the decision-making doctrine that exists in the military today with recent research on how humans make decisions in complex situations.
  - Dr. Roland Mielke and Dr. Mikel Petty of VMASC presented an 18 hour short course in Modeling and Simulation to Booz Allen Hamilton, Inc.
  - VMASC contributed 110 gift wrapped toys and two bicycles to the W.A.L.K.I.N. Christmas Party, held on Saturday, December 14, for the less fortunate children of Hampton Roads.
  - Dr. Bowen Loftin:
    - was elected to serve on the Executive Committee of the National Training Systems Association.
    - was quoted in the Jan. 29 Daily Press and Virginian Pilot stories about the National Center for Collaboration in Medical Modeling and Simulation. He was also quoted in a Jan. 29 Virginian Pilot story about VMASC'S plans to build the Battle Lab.
  - was elected to a two-year term as Chair of the IEEE Computer Society's Technical Committee on Visualization and Graphics.
  - was elected to serve on the Technical Advisory Board for the Fraunhofer Center for Research in Computer Graphics, Inc.
  - was elected to serve on the Board of Directors of the National Center for Simulation.
- Dr. Roland Mielke:
- was named University Professor by President Roseann Runte. The designation, created in 1998 as a way to reward superior teachers, is for four years and includes an annual stipend to support teaching and professional development.
  - was quoted in a Feb. 20 Daily Press story about the VMASC Battle Lab, a proposed center of high-tech research in computer technology for both military in industry use.
- Dr. Mikel Petty:
- co-authored a National Research Council report on Modeling & Simulation for Defense Acquisition.
  - served as Associate Editor of journal SIMULATION, Transactions of the Society for Modeling and Simulation International.
- Dr. Andreas Tolk:
- participated in and co-chaired the NATO Studies, Analysis and Simulation (SAS) Panel Symposium on Analysis of Military Effectiveness of Future Command and Control Concepts and Systems, held at the NATO C3 Agency, The Hague, The Netherlands, April 23-25, 2002.
  - was re-elected as Chair of the Command, Control, Communications, Computers, and Intelligence (C4I) Planning and Review Panel (PRP) for the Simulation Interoperability Workshop Committee of the Simulation Interoperability Standards Organization (SISO). He was also elected to be Vice-Chair of the Information Operations and Intelligence, Surveillance, and Reconnaissance (IO/ISR) PRP.
  - received the Best Paper Award at the Simulation Interoperability Workshop Fall 2002 for his paper "Avoiding Another Green Elephant - A Proposal for the Next Generation HLA based on the Model Driven Architecture". This is the 8th consecutive award he has received from the Simulation Interoperability Standards Organization (SISO).
  - chaired the track on Verification and Validation for Multi-Resolution Modeling, during the Foundations 2002 Conferences for Validation, Verification, and Accreditation (VV&A), held at the John Hopkins University, Laurel, MD, October 22-24, 2002.
  - was invited to participate as a Subject Matter Expert in the NATO SAS Lecture Series on "Modeling of and for Military Decision Making", held at the NATO C3 Agency, The Hague, The Netherlands, December 10-11, 2002.

# 2002 PUBLICATIONS AND PRESENTATIONS

- L. A. Belfore, II, "An Architecture Supporting Live Updates and Dynamic Content in VRML Based Virtual Worlds," Symposium on Military, Government and Aerospace Simulation 2002 (MGA 2002), San Diego, California, April 2002, 138-143.
- L. A. Belfore II and S. Battula, "VRML Clients Linked through Concurrent Chat," Proceedings of the 2002 Winter Simulation Conference, San Diego California, December 2002, pp. 518-524.
- A. Griffin, J. Lacetera, A. Tolk (Eds.): "C4ISR/Simulation Technical Reference Model Study Group Final Report", Fall Simulation Interoperability Workshop 2002, Paper 02F-SIW-022, Orlando, Florida, September 2002.
- M. E. Klausmeier, L. A. Belfore, II, L. M. Deschaine, "An Open Source Approach to Environmental Data Management, Analysis and Visualization," Business and Industry Symposium 2002 (BIS 2002), San Diego, California, April 2002.
- R. B. Loftin, "Med School 1.0: Can Computer Simulation Aid Physician Training?," Old Dominion University's Quest, Vol. 5, Iss. 2, June 2002, pp. 16-19.
- F. D. McKenzie, M. D. Petty, and Q. Xu, "Using Rapide to Simulate a Federation Architecture", Proceedings of the Fall 2002 Simulation Interoperability Workshop, Orlando FL, September 8-13 2002, pp. 203-212.
- M. D. Petty, "Comparing High Level Architecture Data Distribution Management Specifications 1.3 and 1516", Simulation Practice and Theory, Vol. 9, Iss. 3-5, May 2002, pp. 95-119.
- M. D. Petty, et al, "Conclusions and Recommendations", in P. E. Castro, et al, Modeling and Simulation in Manufacturing and Defense Acquisition: Pathways to Success, National Research Council, National Academy Press, Washington DC, 2002, pp. 103-126.
- M. D. Petty, et al, "Modeling and Simulation Research and Development Topics", in P. E. Castro, et al, Modeling and Simulation in Manufacturing and Defense Acquisition: Pathways to Success, National Research Council, National Academy Press, Washington DC, 2002, pp. 77-102.
- M. D. Petty, F. D. McKenzie, and Q. Xu, "Using a Software Architecture Description Language to Model the Architecture and Run-Time Performance of a Federate", Proceedings of the Sixth IEEE International Workshop on Distributed Simulation and Real-Time Applications, Ft. Worth TX, October 11-13 2002, pp. 85-92.
- M. D. Petty, A. Tolk, and J. A. Sokolowski, "Introduction to DoD/Military Simulations," Tutorial presented at the 2002 Interservice/Industry Training, Simulation and Education Conference, Orlando FL., December 2-5, 2002.
- M. Phillips, "10 Things You Just Can't Blaim the RTI for...", DMSO News, Vol. 7, No. 1, Spring 2002.
- M. Phillips, and F. D. McKenzie. "Rapid Integration of Large Scale Distributed Synthetic Environments." Interservice/Industry Training, Simulation and Education Conference (IITSEC) 2002. Orlando, Florida. December 2-5, 2002.
- M. R. Sinclair, A. Tolk, "Building up a Common Data Infrastructure", NATO Studies, Analysis and Simulation (SAS) Symposium on "Analyses of the Military Effectiveness of Future C2 Concepts and Systems", AC/323(SAS-039)TP/32, The Hague, April 2002.
- J. A. Sokolowski, "Can a Composite Agent be Used to Implement a Recognition-Primed Decision Model?," Proceedings of the Eleventh Conference on Computer Generated Forces and Behavioral Representation, Orlando, FL., May 7-9 2002, pp. 473-478.
- A. Tolk, "Avoiding Another Green Elephant - A Proposal for the Next Generation HLA based on the Model Driven Architecture", Fall Simulation Interoperability Workshop 2002, Paper 02F-SIW-004, Orlando, Florida, September 2002; also published as a discussion paper on the OMG website <http://www.omg.org/mda/presentations.htm>.
- A. Tolk, "Common Data Administration, Data Management, and Data Alignment Systems as a Necessary Requirement for Coupling C4ISR Systems and M&S", Information and Security, Volume 12.
- A. Tolk, "Decision Support Systems in the Military Environment", Chapter 7 in "Innovations in Decision Support Systems", Tonfoni G. and Jain L. (Eds.), Studies in Fuzziness and Soft Computing, Physica Verlag, Germany, 2002.
- A. Tolk, "New Overarching Approaches to improve IT/C4ISR Systems by Integrating M&S Components", White Paper AT -082902-C4ISR, Summary published on 23rd Army Science Conference, Orlando, Florida, December 2002.
- A. Tolk, M. R. Hieb, "Building and Integrating M&S Components into C4ISR Systems for Supporting Future Military Operations", Position Paper for the 2003 International Conference on Grand Challenges for Modeling and Simulation (ICGCMs'03), Orlando, Florida, January 2003.

# 2002 ADVISORY BOARD

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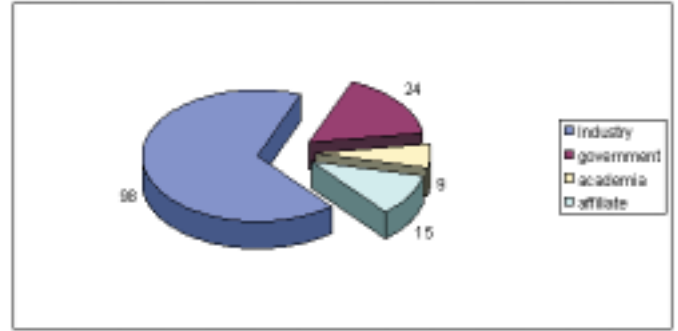
Army Research Institute  
NDIA/NTSA

Dr. Stephen Goldberg  
Mr. Fred Lewis

# MARKETING AND MEMBERSHIP FOR 2002

## VMASC MEMBER SUPPORT REACHES

146 Since formation, VMASC member support grew to 146 members during 2002 with 10 new members representing some of the largest defense contractors including General Dynamics Information Technologies and AT&T Government Solutions. In addition, significant software and hardware development companies joined including Agent Oriented Software, BioGraphic Technologies, Groupter Solutions, Mechdyne Corporation, Terrain Experts and VRCO. Membership was comprised of 98 industry members (68%), 24 government members (16%), 15 affiliate members (10%) and 9 academic members (6%).

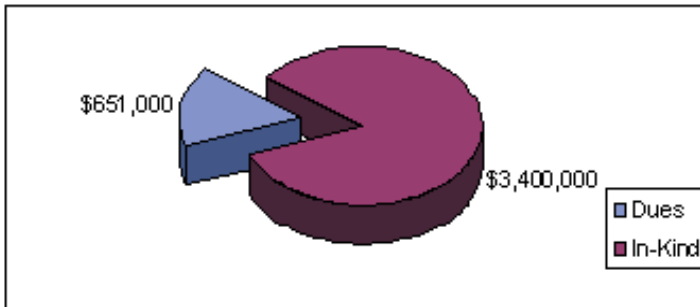


## NEW MEMBERS IN 2002

Agent Oriented Software, Inc.  
Angle Technology  
AT&T Government Solutions  
BGT BioGraphic Technologies, Inc.  
Calytrix Technologies  
General Dynamics Information Technologies  
Groupter Solutions  
Mechdyne Corporation  
Terrain Experts, Inc. (Terrex)  
VRCO, Inc.  
WernerAnderson, Inc.

## MEMBERSHIP VALUE SINCE 1997

The overall cumulative value of membership grew to over \$4 million with fee-paying members value at over \$651K and in-kind members at over \$3.4 million. Membership growth continues to accelerate among DoD focused engineering service providers and M&S software development companies.



## MARKETING STRATEGY

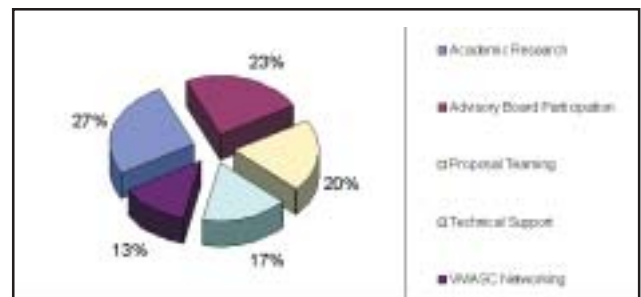
- Major emphasis on research and collaboration
- Use of the Battle Lab/Commercial Decision Support Center to rekindle membership & partnering research
- M&S graduate program expands collaborative resources and opportunities
- MVP/Membership Application now the standard for partnering with VMASC.

## MARKETING ACTIVITIES

Trade Show Exhibits at the Following Events:

- 2002 Summer Computer Simulation Conference, San Diego, CA
- Human Factors and Ergonomics Society, Baltimore, MD
- 11th Annual TASC/ODU/TGIC Government Contracting Symposium, Portsmouth, VA
- I/ITSEC 2002, Orlando, FL
- 2002 Winter Simulation Conference, San Diego, CA

## MOST IMPORTANT MEMBER BENEFITS



# 2002 ACTIVE MEMBERSHIP

## ACTIVE MEMBERS FOR 2002

Active membership encompasses all 2002 dues paying members, those members who renewed their in-kind membership, and members who partnered with VMASC on proposals or sponsored grants or projects.

Academic Members	9
Affiliate Members	8
Government Members	11
Industry Members	<u>45</u>
Total Active Members	73

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Christopher Newport University  
College of William and Mary  
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James Madison University  
Norfolk State University  
Old Dominion University  
University of Virginia  
Virginia Commonwealth University  
Virginia Polytechnic Institute

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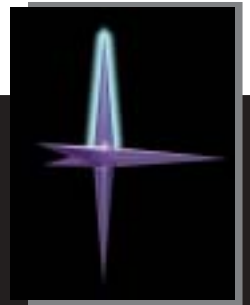
Eastern Virginia Medical School  
Hampton Roads Economic Development Alliance  
Hampton Roads Partnership  
Hampton Roads Technology Council  
National Center for Simulation  
National Training Systems Association (NDIA)  
Naval Post Graduate School  
Society for Computer Simulation (SCS)

## GOVERNMENT MEMBERS

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National Aeronautical Space Administration  
Technological Applications Group  
NAVSEA Dam Neck Combat Direction Systems Station  
TRADOC-US Army  
US Joint Forces Command/Joint Warfighting Center  
US Air Force Agency for M&S  
City of Suffolk  
Hampton Roads Planning District Commission  
Virginia's Center for Innovative Technology

## INDUSTRY MEMBERS

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Angle Technology, LLC  
AT&T Government Solutions  
Autodesk  
Bihrlle Applied Research  
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Booz Allen Hamilton, Inc.  
Brooks Automation  
CAE  
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Northrop Grumman (TRW)  
Oracle  
Powersim Corporation  
Promodel Corporation  
Rockwell Software, Inc.  
Scientific Research Corporation  
Silicon Graphics, Inc.  
Sun Microsystems Computer Corporation  
Terrain Experts, Inc. (TERREX)  
VRCO  
Veridian  
Virtual Prototypes, Inc.  
WernerAnderson, Inc.



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