FROM CONCEPT TO LEADER

THE VIRGINIA MODELING, ANALYSIS, AND SIMULATION CENTER

A TEN YEAR NARRATIVE
Congratulations to ODU and the Virginia Modeling, Analysis, and Simulation Center on your 10th anniversary. Through your work and leadership, the Hampton Roads area has become one of the nation’s leaders in this burgeoning field. As the modeling and simulation industry continues to grow its applications in the military, health care, transportation and other economic sectors, the Commonwealth will continue its strong support for your efforts.

Tim Kaine, July 2007
One decade of vision, dedication, creative thinking and strategic partnerships constitutes the foundation of excellence on which VMASC has been built.

At the forefront of interdisciplinary research, VMASC brings together the expertise of faculty members, researchers, graduate students and postdoctoral candidates in fields ranging from computing science to geography, mechanical engineering to communications, logistics to environmental and health sciences, economics to psychology. They all share the discipline of analytical thought, the need for high-speed computing to model problems and simulate solutions.

More than any other university, Old Dominion University has supported the creation of inter-disciplinary teams, promoting an agile and skilled group of researchers ready to work collaboratively.

At the cutting edge of technology, VMASC employs high speed computing and the latest in visualization technologies to effect brilliant solutions to the complex problems we face in the world today.

Like the foot of the compass, VMASC brings together all levels of education from secondary schools to community colleges to the universities not only in Virginia, but across the globe. VMASC also provides a focal point for the 130 companies working in this field in the region. VMASC is a proud partner of the military and its location next to JFCOM is deliberate and facilitates interaction.

Ten years of leadership and hard work have provided Virginia a wonderful resource which will continue to foster economic development, employment, diversification in the local economy, and first-rate research. It is time to celebrate the accomplishments of the leadership, faculty, staff and students involved in VMASC. It is also time for Virginia to recognize VMASC as a wise and sound investment for the future. Let us build on this solid foundation!

Roseann Runte
President
Old Dominion University
July 2007

Dear Reader:

The summer of 2007 marks the ten year anniversary of the Virginia Modeling, Analysis, and Simulation Center (VMASC). The Center officially opened on 11 July 1997 as a consortium of academia, industry, and government with the goal of applying and advancing simulation technology to benefit its members. VMASC has held true to that objective. Evidence of this can be found in the history of the Center from its modest origins as a venue for short-course, formal training of members of the Joint Training, Analysis, and Simulation Center (JTASC) to its expanding application foci, which is leading the way in modeling and simulation education and research. The following is a brief history, a reflection, on the concept, vision, people, programs, projects, challenges, and accomplishments that have shaped the Center over the last decade. VMASC has successfully reached its first milestone and it is now focused on developing a very progressive pathway into the future of modeling and simulation.

This narrative was derived from annual reports, official documents, correspondences, newspaper clippings, and interviews with individuals who were integral to the development of the Center. It follows a simple chronological order and is in no way an exhaustive study. Listed below are the individuals whose input helped craft the story of VMASC.

F. Richard Whalen  Kevin McCleskey
Eugene Newman  R. Bowen Loftin
Roland R. Mielke  Michael McGinnis
Thomas Mastaglio  John A. Sokolowski

Catherine M. Banks
VMASC
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When the Virginia Modeling, Analysis, and Simulation Center (VMASC) opened back in 1997, Virginians had high hopes for the project. We wanted VMASC to lead the way in the burgeoning modeling and simulation industry—to establish the Commonwealth as a national leader in the field, and in the process to bring new jobs to the Hampton Roads region. From the beginning, the potential of the VMASC concept was clear.

Modeling and simulation has come a long way in recent years. In a post-9/11, post-Katrina world, this technology provides the practical training that allows us to test different scenarios and to prepare us for the problems we face everyday. From homeland security and emergency preparedness, to transportation planning and medical training, research of the type being done at VMASC is helping us tackle some of the most pressing issues facing our country.

That’s why in 2005, Tim Kaine and I proposed the Virginia Modeling and Simulation Initiative, an aggressive plan to promote Virginia’s high-tech modeling and simulation industry by boosting research, encouraging development, and improving information technology infrastructure. And what an impact it’s made.

Just two years after the proposal, Virginians are beginning to see a return on their investment. The Center has been particularly successful in field defense research and development, partnering with the Joint Forces Command and NASA to do important work that will help us keep our country safe.

But the applications of the new technology go beyond military simulation into fields ranging from homeland security to medical modeling to energy. On a recent tour of VMASC’s brand new facilities in Hampton Roads, I witnessed the state-of-the-art technology that is being used to simulate disaster and relief responses, and I saw the virtual operating rooms where students replicate the real life procedures of surgery. The Center has even begun to look into green technology, experimenting with ways to transform algae into fuel.

I’m also happy to report that the Center has proven a great boon to the economy of Virginia. The Hampton Roads Planning District Commission found in 2004 that VMASC contributes more that $400 million to the local economy, with the potential to reach $1 billion by 2009. The Center brought thousands of high-paying, high-tech jobs to the region--exactly the type of jobs Virginia needs to remain competitive in a global economy.

Over the past decade, the men and women at Old Dominion University and VMASC have done a tremendous job advancing the technological bona fides of the Commonwealth and contributing to the public welfare. It is my sincere hope that VMASC continues to be a leader in modeling and simulation in the decades to come, both increasing the prosperity and prestige of the Commonwealth and preparing our future generations for whatever may come their way.

Mark R. Warner
September 2007
From Concept To Leader: The Virginia Modeling, Analysis, and Simulation Center

A Ten Year Narrative
During the late 1980s significant cuts in the Department of Defense budgets required the U.S. Atlantic Command to review alternative ways to conduct large-scale training exercises that had included 20,000 plus participants. Command Post Exercises (CPX) developed out of this need.

By 1990 the Naval Undersea Warfare Center, which was to occupy a building in Suffolk’s Lakeview Industrial Park, was relocated under Base Realignment and Closure (BRAC) leaving the building vacant. In response to the military’s increased use and need for modeling and simulation, General John Sheehan, Commander-in-Chief, U.S. Atlantic Command, stood up a war-gaming enterprise center that was staffed with 100 military and government contractors to support the new alternative in the mid 1990s. The group was situated in the building now occupied by the Joint Training, Analysis, and Simulation Center (JTASC) in Suffolk, Virginia. At this time there was little, if any, military modeling and simulation being done in the Hampton Roads region.

Meanwhile, at Old Dominion University (ODU) the Director of Military Activities, Richard Whalen, and President James Koch were actively seeking opportunities for military partnering. Whalen arranged for the ODU leadership to be briefed by Eugene Newman, a Senior Civilian Servant from the Suffolk facility, regarding the special training requirement that was needed there—a requirement the University could address. All involved recognized this moment as an opportunity for a mutually beneficial relationship that could provide professional training for the military while opening the door to modeling and simulation research and development.

By 1994 a concept driven by need brought the military and academic community together in a collaborative relationship that has since experienced much success.
The Virginia Modeling, Analysis, and Simulation Center (VMASC) began as an idea, a concept driven by need: the JTASC required short-courses and formal training of its staff and ODU determined it would take on that task. The concept became a plan, the plan became a Center; and all of this transpired over a three-year period from fall of 1994 to the summer of 1997.

Things were set in motion in October 1994 with the establishment of the Joint Training, Analysis and Simulation Center as a part of the United States Atlantic Command (USACOM), now the US Joint Forces Command (USJFCOM) in Suffolk, Virginia. One of its core requirements was to establish a facility with the infrastructure and workforce necessary to conduct simulation-based joint training that was not dependent on large-scale and expensive field training exercises. To meet that requirement the JTASC was charged with developing the processes and procedures, designing the facility, developing the workforce, and conducting joint exercises necessary to prepare Joint Task Force (JTF) Commanders to conduct operations as a Joint Force vice the individual service approach. It was apparent that the workforce of the future was not available in the Hampton Roads area; JTASC would have to develop this workforce in order to be successful in its assigned role.

To compound the problem, no institution of higher learning in Hampton Roads or the country was equipped to satisfy the academic needs of the JTASC. The emphasis on M&S as a training tool for leaders in a Joint Operation was new requiring expertise that did not exist; it had to be developed in an academic environment. Leaders at JTASC had looked to human resources and expertise outside of the region by turning to contractors in Orlando, Florida, and various defense contractors (M&S professionals with previous military experience) in Washington, DC as an interim measure. It was apparent that this dilemma had to be addressed and the logical institution to address the need was ODU.

The need for local expertise incited a handful of interested individuals at ODU. The Virginia Modeling, Analysis, and Simulation Center (VMASC) began as an idea, a concept driven by need: the JTASC required short-courses and formal training of its staff and ODU determined it would take on that task. The concept became a plan, the plan became a Center; and all of this transpired over a three-year period from fall of 1994 to the summer of 1997.

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of knowledgeable, intuitive, and earnest individuals to develop an academic-based venue to train members of the JTASC and members of the contract team right here in the region. That fall semester (1994) Eugene Newman, coordinator of Technical/Business Development for JTASC, and Roland Mielke, ODU professor of Electrical and Computer Engineering, worked on a proposal inviting the University to take the lead in providing this academic training. Meetings were held with the University President and Provost (Drs. James Koch and JoAnn Gora) and academic deans (Drs. James Cross and William Swart) to make them aware of the immediate need at the JTASC and to stress the fact that this would fill an education void in the region while fostering a professional relationship with the USJFCOM. Dr. Mielke proferred the introduction of short courses to begin formal academic training at the JTASC. ODU agreed to review the matter; by spring 1995, Dr. Mielke taught the very first short course and within months Jack Stoughton, ODU professor of Electrical and Computing Engineering, was assigned an office at USJFCOM to better accomplish his task of determining the validity of the requirement to prepare trainers for joint training.

In April 1995 Newman, Mielke, and Captain John Sherlock of the JTASC hosted a follow-up meeting of a delegation of Virginia political leaders and ODU administrators to explain the mission and the requirements of the JTASC. This meeting focused on the lack of formal training confounding JTASC members, and it addressed the fact that the JTASC had been looking outside the region for this training. The discussion also broached the subject of future trends for modeling and simulation and the regional economic effect that could result from a working relationship among the University, the USJFCOM, and the city of Suffolk. Congressman Norman Sisisky, Mayor of Suffolk Chris Jones, and other local government officials were interested in learning about the future of technical knowledge transfer from the government to the public sector.

In October, organizers of the future center put together a status report that described an effort to develop a computer simulation demonstration project that could be used to illustrate the sophistication and significance of next generation computer modeling and simulation technologies. The project was to address a research area rich enough to include modeling both physical and economic processes with several separate, but interrelated entities. The problem ideally suited for this demonstration was the investigation of ways to enhance the control and management of the flow of commercial goods through the Port of Hampton Roads. With this demonstration project, the organizers were expanding the depth of research opportunities for the Center while making the Center a valuable resource for solving problems affecting the economy in the region. It was obvious the Commonwealth needed to get involved. It was equally apparent ODU needed to begin thinking beyond the short courses to approach the state with any budgetary requests in support of this new endeavor.
Things moved quickly after the October status report and discussions regarding the economic affect a modeling and simulation center might have in the region. In January the Hampton Roads Planning District Commission sent a letter to Governor George F. Allen endorsing ODU’s effort to establish the Virginia Modeling and Simulation Center (VMASC). The Commission stated the Center would serve as a catalyst for technology transfer from the JTASC to the private sector. The letter made clear that the Center provided a “tremendous opportunity for the Hampton Roads Region and the Commonwealth of Virginia to share in the development of an industry that has unlimited economic potential.”

Concurrent with that letter was ODU President James Koch’s scheduling of an informational briefing with General John Sheehan (USACOM) to further the consortium. Sheehan’s positive response set the tone for a mutually beneficial and amicable relationship. Within months ODU was drafting a Cooperative Research and Development Agreement (CRADA) with the US Atlantic Command. Newman, Mielke, and Navy Captain James Sherlock collaborated on developing the first CRADA. President Koch reviewed the draft document and committed $250,000 of internal funds as a start-up to begin the search for a Director of the Center. An evolving business plan and a proposal of operations was being developed and it would fall to the Director to manage the new center for modeling and simulation, oversee the requirements of the CRADA, and serve as host for the new M&S academic program. Booz-Allen & Hamilton, Inc., formulated the proposal, a Business Plan for the Development of the Virginia Modeling and Simulation Center for Old Dominion, addressing start-up costs for the state and local units of government.

The Business Plan outlined the vision and mission, the capital requirements, the management team, the business strategy, marketing, and the financial strategy. It proffered the first year capital outlay to begin at $1,799,000 with additional investments of $2.3 for year two; $1.6 for year three; $1.6 for year four; and $1.6 million for year five. This funding would allow for the eventual self-sustainment of the Center. It was clear VMASC’s viability hinged upon long term funding commitments from the Commonwealth. This in turn would attract matching funding from educational and industry partners.

The Business Plan recommended the management team consist of an Executive Director and subordinate Technical and Administrative Directors to oversee the Center’s operations and research. The Plan proposed a business development strategy implemented in three phases:

- **Phase 1** Formation of the Consortium
- **Phase 2** Growing the Commercial Sector Partnership

Greetings General [Sheehan]: I am certain you are aware that exploratory steps have been taken . . . to establish a public-private consortium, tentatively known as the Virginia Modeling and Simulation Center. As designed, this innovative concept would create a major state-assisted facility to serve as the transfer agent for DoD developed modeling and simulation technology through a partnership of academia, government and industry . . . the economic consequences of such a center to the Hampton Roads region are enormous, and benefits to the Department of Defense substantial.

Dr. James V. Koch, President ODU
After a substantial market analysis was conducted marketing strategy was developed. It was readily discernible that market potential existed for a simulation technology center in Virginia. The Plan defined the scope of the growing market, assessed motivations of consortium members, and listed competition for VMASC, of which there was no regional competition. The marketing plan exploited the fact that the Center is co-located with a huge Department of Defense infrastructure that aggressively uses modeling and simulation. The plan put into effect a sales strategy that insisted on treating modeling and simulation as a long-term product that would be paying for itself in five to seven years. The target market: state and federal agencies that would come to view VMASC at the leading edge in providing modeling and simulation products.

In June a status report was released linking the major military operational headquarters and their four doctrine commands with Hampton Roads in an effort to call attention to the opportunities this relationship could bring to the Commonwealth. First, tying the JTASC to Virginia’s universities would open the door for international recognition as a hub for modeling and simulation. Second, Virginia’s universities could become the technology transfer agents for modeling and simulation technology. The status report listed the current and ongoing activities in preparation for the initiation of VMASC:

- a Memorandum of Understanding between the JTASC and ODU was being crafted in the form of a cooperative research and development agreement or a CRADA
- the VMASC facility was being leased
- the Executive Director search was underway
- marketing surveys were being conducted
- industry partners were being solicited

The report set the goals and objectives of the Center for the first year followed by three year intervals. The path ahead was clearly defined.

In the fall the CRADA went into effect as authorized by ODU President James Koch and Vice Admiral William J. Fallon, Deputy Commander of USACOM. The CRADA detailed the scope and responsibilities of the government, University, and VMASC personnel. Funding, Reporting and Publications, and Intellectual Property all had to be explicitly outlined. It was agreed that both entities would report the progress of work being done under the agreement annually.

The 1996 CRADA worked well and it remained in effect for five years with a capacity for renewal. (It has since been renewed once in 2001. At present, a new CRADA has been agreed

Admiral Fallon served as Assistant Chief of Staff for Plans and Policy of the USACOM from September 1993 through June 1995.
In November, Dr. Thomas Mastaglio was named Executive Director of the new Center. Dr. Mastaglio retired in 1991 after twenty-two years in the Army and established a consulting and scientific analysis company. He had worked for IBM, Loral Federal Systems, and Lockheed Martin. His experience included industry research and proposal development and training effectiveness/ usability engineering. His research interests included application of artificial intelligence to improve human-computer interaction and learning, usability engineering, cognitive modeling, and the development of large scale enterprise models and simulations. Mastaglio brought to VMASC a wealth of experience that blended military service, defense business, and scientific expertise.

Dr. Mastaglio decided to take the position because it afforded him an opportunity to expand on much of the work the Department of Defense had been doing by applying it to other things. He had been asking himself, “Is there a business opportunity coupled with technology already in place?” The answer was, “No.” Mastaglio realized, however, that VMASC would provide that opportunity; and, it was exactly what he wanted to do providing the University would invest in the development of the Center. The opportunity was exciting and a draw for him. He felt ODU was well-positioned as the academic institution at the heart of the M&S corridor in Suffolk. VMASC would be at the forefront in a community of users versus builders of M&S. Significant at this time was Dr. Mastaglio’s suggested change in the name of the Center. He recognized that analysis and assessment were integral to “users” of M&S, and so he proposed that the “A” in VMASC no longer stand for “and”, but rather “Analysis.” Analysis was integral to the work at the Center and the name should reflect that. VMASC was now the Virginia Modeling, Analysis, and Simulation Center.

From the teaching and research perspective, it was decided that VMASC faculty would be immersed in basic and applied research; they were to be scholar-teachers creating new knowledge and new applications of modeling and simulation technology in a broad range of academic and professional domains. The University also moved forward with a fully-fledged academic program. The College of Engineering and Technology developed a masters program in Modeling and Simulation (M&S). Professor Jack Stoughton is credited with balancing the needs of the JTASC and the University’s requirements for the academic program. This effort took two years to reach fruition.
Two major challenges have become apparent during this first year. The first is getting a commitment from industry to support and participate in a demonstration project. The other challenge has been locating appropriate faculty expertise to support project concept and proposal development. VMASC today is still evolving and is far from being fully defined or mature as an organization. As we progress, lessons are being learned.

Dr. Tom Mastaglio, Executive Director

From January through May of 1997 Dr. Mastaglio met with ODU administrators to establish strategic goals for the Center addressing the near-term, mid-term, and long term objectives. These goals were to transition into a strategic plan that would be set into motion by the new Executive Director.

For the near-term, Year 1 July 1997–June 1998, it was expected that VMASC would be a fully equipped, operational facility. At least six demonstration projects would be developed. The M&S short courses would continue to be offered along with the development of an M&S education program. With the recruitment of at least twelve charter members and twenty corporate members, an advisory board would be assembled and integrated into the mid- and long-term goals.

Mid-term goals would incorporate the next three years, 1997-1998, Year 1, 1998-1999 Year 2, 1999-2000 Year 3. Included in the mid-term objectives was securing a major federal agency to fund research so that the Center would become self-supporting. It was expected with the ongoing research and the outreach efforts of the VMASC personnel that a demonstrated positive impact on the economic development of the region would be observed and experienced. By the close of the mid-term the graduate program would be well underway.

The long-term goals would reach into the first five years of the Center to include 2000-2001 Year 4 and 2001-2002 Year 5. By the close of the fifth year national recognition of VMASC as an M&S center of excellence would be established as well as the production of identifiable marketable products that were the result of VMASC projects. VMASC would now be the preeminent source of expertise as a software repository. Consulting would be a mainstay of the Center as well as the sponsoring of workshops and conferences.

Within a few months of Dr. Mastaglio’s appointment the Center executed that strategic plan. It included initiatives to leverage local expertise, to stimulate M&S as an essential tool for competitive businesses, and to work with the Commonwealth to make Virginia an international center for the development of commercial simulation. Dr. Mastaglio publicized the organization of the Center. The strategic plan was met with approval bringing with it a contract award of $12 million by the USACOM to facilitate student and faculty funding. This funding transitioned the Center from concept to fully operational. The organization was now firmly rooted.
By mid-June Dr. Mastaglio provided a briefing to General John Sheelan that spoke to a more structured, focused effort at VMASC. His briefing discussed leveraging military M&S expertise, Department of Defense developments, and trends in the computer industry. He made the case for Hampton Roads as the leader in modeling and simulation technology based on the following:

1) the presence of military M&S users to include three major training and education centers and doctrine and operational commands

2) the regional need for high tech economic development now recognized by the Commonwealth

3) the presence of electronics and information systems companies

4) the management and personnel resources available among the military retirees in the area

5) the I-664 corridor

6) the technology applications emphasized by ODU

The Center officially opened on July 11 with a ribbon-cutting ceremony taking place. The announcement read as follows:

VMASC Open House set for July 11

Old Dominion University’s Modeling, Analysis, and Simulation Center will officially open its doors, Friday, July 11 with an open house from 1-5pm. The Center is located on the Portsmouth campus of Tidewater Community College.

President James V. Koch will officially dedicate the facility at 3 p.m. Also expected to speak are Vice Adm. William J. Fallon, U.S. Navy, and state Sen. J. Richard Holland. Demonstrations of high-tech computer simulations as well as tours of the 6,500 square-foot facility will be conducted by students, faculty and staff of VMASC.

Established in 1996, VMASC adapts Department of Defense military modeling and simulation technology – military “war games” – to create computer simulation technology for the commercial sector.

The University’s vision for the Center was now clearly articulated: VMASC would take the lead in developing modeling and simulation through a consortium of academia, government, and industry. The mission was to promote economic development, support research, advance education, and provide technical expertise. The Director’s goals for year one included identifying expertise, developing local faculty experts, and getting the word out about the new modeling and simulation research center.
By the fall semester (1998) the academic program was underway with nine students admitted into a newly instituted masters program in modeling and simulation. The curriculum was interdisciplinary including courses from Electrical and Computer Engineering, Engineering Management, Psychology, and M&S courses developed by the VMASC faculty researchers.

By all measures the close of VMASC’s first full year of operation was a success. The goals set by the University to raise regional awareness of the role of simulation as a tool to be used in industry and the military, champion opportunities for economic development, promote collaborative efforts in Hampton Roads, and make headway in legislative initiatives were clearly obtained. And, the University established a world class graduate program in Modeling and Simulation. Operational funding for the Center, of which VMASC was now one of eight Enterprise Centers of the University, would be provided by ODU through a General Assembly base funding initiative that began in 1997-1998 budget year. The Center was called to match those funds with contributions from its consortium members.

At the heart of the technical effort was VMASC’s capability to construct simulations that addressed real world problems such as transportation networks, intermodal traffic flow at a port, and the operation of a port. These research domains were certainly real world problems for Hampton Roads—and the successful modeling and proffering of solutions would seem to make soliciting matching funds less arduous. However, as Dr. Mastaglio quickly learned getting companies and public agencies to commit funding for their portion of the projects was difficult. Challenges in obtaining commitments from industry to support projects and in recruiting appropriate faculty expertise compelled Mastaglio to reconsider ways to support the USACOM. He recognized that the exchange of knowledge would not be easy—expertise was available but it needed to be fully integrated at the USACOM and within the community. The confluence of a fully developed academic program that provided a high-level of workforce training for military M&S users and a program to work directly with the military in support of research would help the Director meet the challenge. A plan to integrate ODU students and faculty into the USACOM while taking an active role in the research agenda was introduced the following year.
In 1999, VMASC experienced the growth of its professional staff. Professor Roland Mielke was brought on as the Technical Director. Dr. Mielke assisted the research agenda by identifying domains where enterprise simulation (see quote) could be of benefit. As Technical Director, Dr. Mielke also recognized a wide swath of other M&S applications to include urban operations, disaster preparedness, manufacturing, supply chain management, entertainment, and training. With his direction VMASC recruited willing industrial partners to develop enterprise simulation demonstrations that encouraged other partners and businesses to embrace simulation technology as a management tool. Mielke remained the Technical Director of VMASC until he transitioned to the Graduate Program Director of the M&S Graduate Program in August 2006. He also served as Acting Executive Director May 2005 through May 2006.

To oversee the research at VMASC, Executive Director Mastaglio hired Dr. Mikel Petty as Chief Scientist. Dr. Petty came to VMASC from the Institute for Simulation and Training at the University of Central Florida. He brought with him expertise in engineering management and computer science, meriting an appointment in both ODU academic departments. Dr. Petty set the tone for the VMASC research agenda. He recognized the combination of VMASC M&S faculty and the faculty throughout the various departments as a collegial teamwork that was deep in talent and broad in coverage.

Dr. Fredric “Rick” McKenzie was hired at ODU in the Electrical and Computer Engineering (ECE) Department. McKenzie was hired by the ECE Department as someone who could support M&S research. Integral to the interdisciplinary nature of the masters program were the ECE courses taught by Dr. McKenzie, two of which are still required courses for the masters program. McKenzie has supported the research effort at VMASC on a variety of projects to include crowd modeling and medical imaging.

This same year a number of other positions were filled: Bill Younger oversaw the marketing effort, Bill Miller was hired as the General Manager, and Ralph Rogers was appointed the Graduate Program Director for the M&S Program. The close of the second year of operation brought with it the approval to expand the Graduate Program in Modeling and Simulation to include a Ph.D. program; by fall 2000 students were being accepted into the Ph.D. program. 1999 also saw VMASC’s Engineering Technical Services (ETS) put into operation serving the USACOM, now designated USJFCOM, in the capacity of an honest-broker that is mutually beneficial to both the USJFCOM and the University.

With VMASC oversight ETS provides a pool of technical talent that remains embedded in the USJFCOM. It also allows the University to gain knowledge and experience on how the military works so that the M&S curriculum can reflect an intellectual exchange that nurtures and develops a mature product acceptable to the academicians and useful to the military. The emphasis for ETS is on analysis.

An enterprise simulation is a dynamic model or simulation which is constructed with a top-down perspective and is intended to provide an overall conceptual view of the enterprise. Enterprise simulation allows decision-makers to ask ‘what if’ questions . . . . It is our vision at VMASC that in the near future enterprise simulation will be the standard management tool and will be found on the desktop of all corporate decision-makers.

Dr. Roland R. Mielke, Technical Director
The ETS and Student and Faculty Services (SFS) group was established to manage two five-year, cost reimbursable Government Services contracts awarded to VMASC through the ODU Research Foundation. These two contracts were awarded to provide research and development, engineering, analysis, and technical services support and they were the direct outgrowth of the CRADA signed between ODU and the USJFCOM to be executed at VMASC. The contract objectives were to:

- provide “reach-back” to the University and to its national and international academic network for those technical capabilities not readily available within industry at-large
- provide “honest-broker” services not burdened by profit or other organizational goals
- provide “leading-edge” technology capability analysis to enhance USJFCOM’s ability to fulfill its mission objectives
- provide “intellectual capital” with a talent base rich in experience and expertise to maximize a University - Department of Defense partnership
- support “recruitment and retention” of a high quality professional staff enhancing capabilities for Department of Defense customers

As with all new contractual agreements there were a few challenges that needed to be addressed to ensure a mutually beneficial relationship existed between VMASC and the USJFCOM. In 1998 Kevin McCleskey was hired to oversee the ETS and SFS contracts on a full time basis. McCleskey shared that oversight with retired Navy Captain Tom Lang. Lang had recently retired from the Joint Battle Center. He had a good grasp of how the ETS should operate. He was hired on to assist Kevin and the two of them advanced both components. By summer 1999, ETS and SFS were comfortably producing exponential growth moving from three to twelve delivery orders. (The ETS and SFS eventually became independent of each other yet remain linked because ETS allows for hiring of faculty as a labor category).

ETS lends itself to longer term efforts, usually annual efforts while SFS can be thought of as “spring work,” whereby faculty and students work together for a semester or two often focusing on a discreet problem that requires faculty expertise. ETS, on the other hand, is populated with skilled workers who can sustain, grow, and oversee an expanded program. Both ETS and SFS work is dispersed throughout the USJFCOM in various departments such as the:

- **J2** Intelligence
- **J6** C4 Systems (Computers, Communication, Command, and Control)
- **J7** Joint National Training Center
- **J8** Joint Integration and Interoperability
- **J9** Integrated Program Knowledge Management Research and Evaluation/Experimentation
  - **Joint Systems Integration Command (JSIC)** Technical Analysis (replacing the Joint Battle Center)

The introduction of ETS has been significant to the success of VMASC. Since its inception, the ETS and the SFS group has provided exceptional, cost effective technical support to a variety of Department of Defense customers. The SFS served to complement the ETS effort by developing, implementing, and managing government contracts that provide the Uni-
versity a unique opportunity to directly support the defense industry through the integration of leading edge technologies. The customer base is centered on USJFCOM, the JWFC, and other local and non-local Army and Navy organizations that have written student and faculty tasks under the SFS contract. Within ODU, the ETS and SFS group has contracted for services of students and faculty members from VMASC, the Batten College of Engineering and Technology, the College of Sciences, the College of Business and Public Administration, and the Darden College of Education.

VMASC and the USJFCOM have subsequently renewed the original ETS contract awarded in fall 1997 with a 1998 start date. The ETS contract is a renewable five-year task order contract. Each year the contract is “opened” to get a base year government close-out and an annual restart. The funding for the support services has distinguished it as a credible research and support component of VMASC. Over $23 million dollars has been awarded research and technical services support to the USJFCOM and subordinate agencies. The current contract runs 2004-2009. On average, there are twenty eight full-time employees and fifteen full-time equivalent faculty and students supporting thirteen statements of work.
YEAR 3
2000

A NEW DIRECTOR AND A PH.D. IN ENGINEERING

In 2000 Dr. R. Bowen Loftin was hired on as the second Executive Director of VMASC. Loftin’s academic credentials and experience met the needs of the moment for VMASC. He served as Professor and Chair of the Department of Computer Science and the Director of the NASA Virtual Environments Research Institute at the University of Houston. His research explored visualization and modeling and simulation in a variety of domains and he served as a frequent consultant to both industry and government in the areas of modeling and simulation, advanced training technologies, and scientific/engineering data visualization. Dr. Loftin was familiar with VMASC and he was aware of the University’s progress with its graduate programs. Upon making the job offer to Dr. Loftin, Dean Swart had asked him if he would agree to wear two hats, one as Executive Director of VMASC and the other as Director of Simulation Programs. Loftin had the experience of running a center like VMASC, but he had not had the opportunity to shape an academic program such as ODU’s. This challenge was exciting to Dr. Loftin; he joined the ODU faculty in July that year.

It is worthy of note Dr. Loftin’s desire to participate in the shaping of a new field of study, a new discipline in modeling and simulation. He was well aware of the other programs and his counterparts in those programs. The Naval Postgraduate School had the first Ph.D. program, but it was exclusive to officers in the military. The University of Central Florida also had a program which at the time was narrowly focused and housed in the Industrial Engineering Department. As Director of Simulation Programs, Loftin would partner with Dr. Ralph Rogers, the M&S Graduate Program Director and Department Chair of Engineering Management, in all aspects of ODU’s program that now invited research at the doctoral level. Both men saw this as an opportunity to shape a discipline with relatively no counterpart. The Ph.D. program was introduced in the fall 2000 semester with the admission of two students to the nation’s first public university based Doctoral Degree Program in Modeling and Simulation. Dr. Loftin spent his first year organizing the Center to meet the needs of the research and academic programs. Loftin appreciated the challenge his predecessor faced in translating what the Department of Defense was doing with modeling and simulation into civilian applications. There had been no successful example of this and it was apparent that the degree of effort to take what the Department of Defense (DoD) does and twist it into industry was near impossible. Loftin would approach this transfer of technology and expertise via the academic program, which he saw as the significant factor that would make the Center outstanding. Within weeks of his arrival as Center Director, Loftin was fully immersed in the Ph.D. program teaching, mentoring, and assisting with the administration of the program.

Technical plans to support research were generously funded. Labs at both the Suffolk and Campus sites were to be created to support M&S project and research activities. VMASC West (Suffolk) would invest over $2.1 million in state-of-the-art simulation development tools. The facility was to contain over sixty computer workstations; the lab was configured to support M&S project and research activities. VMASC East (ODU Campus) was designed to conduct research and development in computer visualization and immersive environments.

Dr. Bowen Loftin, Executive Director
The labs were to be equipped with high performance graphics, hardware and software to create intelligent, virtual environments that are richly interactive. The labs would be capable of integration and synchronization of numerous visual, auditory, and haptic display devices. Systems were configured to facilitate integration of third-party software and a variety of data formats.

With this technological capability, VMASC was able to participate in the Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) which was a ground breaking experience—VMASC was the only exhibitor to demonstrate a functional CAVE (fully immersive environment).

The year 2000 also brought with it the formalization of a VMASC Board of Advisors to include a Chairman and Vice-Chairman to serve as official representatives of the Board of Advisors (see Appendix 2). The Board’s responsibilities, powers and duties, as outlined in Bylaws of the Virginia Modeling, Analysis, and Simulation Center Board of Advisors were as follows:

- The Board of Advisors shall serve as advisors to the VMASC Executive Director and shall perform such other duties under which VMASC is associated.
- The Board of Advisors shall attend the annual VMASC Board meeting and other meetings.
- The Board of Advisors shall also act as a Board of Advisors for purposes of conducting the business of VMASC, including the election of Officers as provided herein.

The summer brought with it an additional initiative from the Army War College. Each year the War College in Carlisle, Pennsylvania sponsors Senior Army Fellows at several universities including Harvard, Tufts, and Carnegie Mellon. This Fellowship represents the most senior and formal form of Army education. LTC Neil Johnson was invited to conduct research at VMASC as the first Army War College Fellow. LTC Johnson was a member of the National Guard and had worked for the National Guard Bureau. Fellows are required to hold a master’s degree and successfully proceed through a rigorous selection process. LTC Johnson was equipped to engage in the masters M&S courses and upon completion of his Fellowship was promoted to full Colonel with a post at the Pentagon. During that same time VMASC also hosted Australian Army Captain Karl Hamlyn. While at VMASC, Hamlyn concentrated solely on obtaining his degree in modeling and simulation. He spent a year completing the coursework and about six months completing his thesis. Hamlyn’s thesis, A Study of the After Action Review Process in Military Simulation Exercises, recognized the importance of technology base applications in military simulations as training tools, as well as the equally important capability of computer simulations to reduce the dependency of military exercises on human assessment. Hamlyn's thesis argued that the use of application tools, such as the statistically-based combat models aimed at improving realism, needed to be integrated into the training and analysis process.
VMASC’s international acclaim was well underway by 2001. The Center was recognized as an international leader with its commitment to the first M&S focused Battle Laboratory located at an academic institution. The VMASC BattleLab was to serve as a research infrastructure aimed at long-term research activities in support of Hampton Roads government, community, and military sectors. The Lab would be a commercial decision support center. Funding to develop a fully operational BattleLab was provided by the Commonwealth Technology and Research Fund and the University totaling $904,000. Much work lay ahead before the BattleLab would have its official opening in 2004.

The BattleLab was conceived as an innovative computer simulation laboratory designed to provide the advanced modeling and simulation infrastructure necessary to support VMASC’s core research areas. It is a place to use simulation to investigate new methods of war-fighting. In a military setting this is a direct application. In an academic, theoretical setting this allows students to investigate new areas of simulation. The BattleLab is also a Decisions Support Center providing enterprises with new methods of conducting and evaluating their business practices. This allows for advanced testing capabilities to explore “what if” scenarios. These applications allow for new experimental solutions and the ability to do so at a reduced cost. Simulations can take the place of manpower. The computers can run simulations at greater speeds than real-time allowing larger spaces of time to be generated and evaluated in a smaller real time. Hence, the BattleLab was designed to have access to over $3 million in simulation software and $1 million in computer simulation hardware.

Directing the new BattleLab was Mark Phillips. Dr. Loftin had met Phillips at a 1997 conference in Australia, where Loftin was invited as keynote speaker. Major Mark Phillips had been working with modeling and simulation as part of the expansive M&S program underway in Australia. Loftin recognized the strides the Australians had been making in the field and wanted to bring that expertise back to the Houston, where he was working at that time. On subsequent visits to Australia, Loftin maintained his relationship with Phillips and continued to consider ways to bring the Major to the U.S. In September
2000, Loftin was once again in Australia, but this time he was able to invite Phillips to join his new VMASC team. It was Phillips’ creativity and energy that Loftin admired. After Phillips arrival at VMASC the BattleLab concept took on a more meaningful form. With oversight from Technical Director Roland Mielke, Phillips developed a plan that included all aspects of executing a BattleLab: from design of the facility to technical capability to funding. Phillips’ determination was well rewarded as the concept was supported with the necessary funding to begin building a lab.

With all the outreach and expansion came the need for administrative assistance for the Director of VMASC. Dr. Loftin determined he needed someone to oversee the general management of VMASC and decided to promote Kevin McCleskey to that position. McCleskey was now tasked with the administrative operation of the Center which included a constant interface with VMASC customers—commands, companies, and individual clients. Sheila Flanagan was hired to assist McCleskey in the Programs Office. This office was and continues to be integral to the research effort at VMASC by providing contract administration, overseeing personnel management, and ensuring VMASC remains in compliance with ODU Research Foundation requirements.

Year two for the Army War College Fellowship introduced LTC George Smith to the VMASC team. LTC Smith had decided not to pursue the M&S masters degree; instead, he stayed close to his formal training. He spent much of his time following geo-political areas of interest and he was called to Washington on a number of occasions. LTC Smith completed his assignment for the Army War College with a project that focused in decision making and policy setting.
VMASC will manage the Norfolk-based USJFCOM contract awarded to ODU to provide student and faculty research services in direct support of the USJFCOM mission areas. The ceiling of the base period of the contract is valued up to $5.8 million, and the ceiling of the total value 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 ODU’s history.

Kevin McCleskey,
General Manager

VMASC’s fifth year increased project revenue by sixty-three percent and for the third consecutive year VMASC was the largest research producer in the University. The BattleLab played a key role in designating VMASC as a cutting-edge research center. VMASC’s BattleLab hosted a number of labs within:

- GIS Research lab
- Human-Factors Engineering lab
- Constructive Modeling lab
- Operations Research and Analysis lab

By 2002, the BattleLab was equipped with over $500,000 of software and hardware, all of which was used during the Joint Battlespace Environment demonstration and Marine Corps Special Event at the 2002 I/ITSEC. The Lab was to be the testbed for new concepts aimed at reducing risk and cost while improving the creativity of VMASC clients. Chief Scientist Petty wanted to bolster the internal research ability. He knew he could not rely solely on the ODU faculty given their responsibilities in their respective departments. A number of projects had been turned down because 1) the inability to commit researchers to the job and, 2) some of the projects required specialized skill sets. Dr. Petty needed to hire researchers who could meet the needs of the USJFCOM and be self-supporting rather quickly.

To spearhead this effort Dr. Petty hired Dr. Andreas Tolk as the military modeling expert. Dr. Petty had known Dr. Tolk for a number of years having met him at conferences and workshops. Dr. Tolk was considered VMASC’s first real research hire. He had over ten years of experience in the domain of simulation applications in the military environment. Dr. Tolk 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. He also was one of the German industrial experts who participated in drafting the NATO Modeling and Simulation Master Plan.

In 2002 VMASC initiated a partnership with the Eastern Virginia Medical School (EVMS) to create a National Center for Collaboration in Medical Modeling and Simulation. Medical modeling and simulation was not new to Dr. Loftin. His interest in this domain began while he was in Houston. It took him years to build that program and if he had any regrets about leaving University of Texas, it would be due to the time and energy he had invested in the medical M&S program. To continue his commitment to medical M&S, Loftin met with Dr. Donald Combs, EVMS Vice President for Planning and Program Development, in March 2000 about a partnership between EVMS and VMASC. Both men were in agreement on a partnership and the course of action needed to secure funding. By summer of 2001 funding was proposed with $225,000 for year one (2002) and $2 million in year two (2003). Both institutions were very pleased to receive this congressional funding.
That fall VMASC was profiled in the Military Training Technology Magazine in an article entitled, “A Return to its Roots.” The essay highlighted the leadership, the research, and the relationship between VMASC and the military.

The Center also hosted Major Karl Neal as the 2002 Army War College Fellow. Neal participated fully in the graduate program. He completed the program in 2005 earning his master of science with the completion of his thesis, *An Application and Evaluation of a Methodology for Testing Operational Level Training Simulations*. The research centered on an existing methodology developed by VMASC that focuses on the analysis of military tasks that require an operational simulation to train, such as training joint force command tasks and decision making at the operational level of combat. Neal tested the methodology by applying it to an existing operational level training simulation system during an actual training exercise and subsequently in a non-exercise controlled test environment.
A NEW NOTION: THE DISCIPLINE OF M&S

Year six was a big year for VMASC beginning with a greater appreciation for the Center’s functionality and contribution within the M&S community. The Center was now recognized nationally and internationally for its amalgamation of three roles: M&S research and development, the M&S academic program, and the M&S oriented organizations that constitute VMASC membership. The research and development conducted at VMASC was known for being firmly grounded in theoretical rigor, organized methodology, and effective practice. Dr. Petty could proudly boast that each project produced “useful results and intellectual advances.”

During this year, the notion of modeling and simulation as a discipline was becoming a reality. It was now apparent that the collection of techniques, results, and theories developed and applied across the mathematics, engineering, physics, and business disciplines were coalescing into a distinct discipline known as modeling and simulation. This new academic discipline had a core of fundamental ideas and an interconnected body of knowledge that would expand with every research effort. As Chief Scientist, Dr. Petty adhered to the discipline of M&S as the guiding principle of VMASC.

Petty also had the pleasure of directing the first Ph.D. awarded in the modeling and simulation graduate program. The dissertation topic focused on modeling the human decision process performed by senior military commanders incorporating the military decision making doctrine that exists today with research on how expert humans make decisions in complex situations. To assist with the ever-expanding research agenda, Dr. Dave Dryer and Dr. Ryland Gaskins were hired. Dr. Dryer’s research interests focused on modeling and simulation enterprise activities including dynamic systems modeling, simulation interoperability, and simulation assessment as well as human-computer interaction with enterprise systems. Dr. Gaskins’ research domains included modeling and simulation of crowd behaviors during military operations, evaluating battle simulators, cognitive psychology, human error probabilities, and taxonomies.

The Graduate Program accepted its first Fulbright Scholar, Hungria Berbesi. Miss Berbesi was admitted into the doctoral program as an international student from Venezuela. The Fulbright Program afforded Miss Berbesi the opportunity to further develop the research she began as a masters student in Venezuela in the area of socio-economic models that characterize the interconnectedness between economy and society. Her research at VMASC included complex systems theory, enterprise modeling, enterprise architecture development, and the methodology for creating the visualization tools for this complex organizational system.

VMASC East played a key role in a project focusing on military simulation. Dr. Rick McKenzie directed a Crowd Modeling project that simulated the events surrounding the downing of a Blackhawk helicopter in Mogadishu, Somalia in 1993. The research drew from a Mogadishu database and virtual characters. Real-time animation loops were developed for integration.
The 2003 I/ITSEC in Orlando, Florida afforded VMASC the opportunity to participate in a major exhibition partnering with the USJFCOM in support of the Joint National Training Capability (JNTC) Special Event. The event replicated the live, virtual, and constructive characteristics of joint training. VMASC also demonstrated its Crowd Modeling for Military Simulation project, the XMSF Battle Management Language (presented by Dr. Andreas Tolk), the NASA Wallops Island Rapid Response project (headed by Dr. David Dryer), and the Storage Machine in an Box-StorM (presented by Mark Phillips).

VMASC was no stranger to distinguished political guests in 2003. In April Senator John Warner visited the Center. The planned visit was to showcase VMASC before the Commonwealth’s Senior Senator. It was Senator Warner who had secured the congressional funding for the medical M&S collaboration between EVMS and VMASC. Senator Warner had also been ranking member of the Senate Armed Services Committee.

VMASC had also collaborated with General Dynamics in developing a Joint Transformation Data Support System – JTEDS. JTEDS was an effort led by Dr. Petty for the J9. Its success fostered a positive professional relationship among the institutions involved and yielded several M&S students. All of these efforts were made to encourage collaboration by bringing politicians, representatives from industry, the military personnel in the M&S community. This top-down business development approach brought with it publicity and potential relationships.

VMASC hosted LTC Sandi Dittig as the 2003 Army War College Fellow. LTC Dittig’s research interests focused on modeling and simulation methods that could be applied to issues of national defense, especially in the military training and personnel policy arenas.
For the first time since the Center’s formation, the Board took an active leadership role with the Regional Economic Impact and Cluster Analysis Study. A significant number of board members brought Industry sponsorship to the study and took a leading role in the process from definition of MS&V to providing key domain expertise and cluster mapping activities.

Robert R. Harper,
Chairman,
VMASC Advisory Board

Throughout year seven VMASC drew upon four pillars to define and support the discipline of modeling and simulation:

- **Resources** – the personnel and infrastructure that enable modeling, simulation, and visualization research and development to be conducted in a richly interactive environment. This is how, when, and where new ideas are formed and explored.
- **M&S Education** – the education program enables VMASC to broaden the modeling, simulation, and visualization body of knowledge while at the same time develop modeling and simulation professionals for the ever expanding workforce.
- **Research and Development** – broadens the theoretical and practical application of modeling, simulation, and visualization to solve real-time problems and issues. It is here that current technology is improved upon and new technologies are created. These advances in technology are integrated into customized solutions for VMASC clients.
- **Collaborative Partnering** – in pursuit of research and development initiatives as well as to solve decision-maker problems. Partnering allows for the exchange of new ideas extending and improving the understanding and potential for modeling and simulation applications.

To help develop collaborative partnering, an economic impact study of modeling, simulation, and visualization was conducted. This was an update of the original study done by Booz-Allen & Hamilton, Inc. in 1996, A Business Plan for the Development of the Virginia Modeling and Simulation Center for Old Dominion University. In March ODU and the Hampton Roads Planning District Commission sponsored the new study to determine the current economic impact of modeling and simulation in the region. The Economic Impact and Cluster Study for Hampton Roads Virginia concluded with some astonishing numbers. A key finding was the determination that modeling, simulation, and visualization activities contributed $413 million in total regional economic output and accounted for more than 4,000 regional jobs in 2004.

From the Loftin’s perspective, the Economic Study was the most important thing he accomplished as Director of the Center—the study made the state and Governor Mark Warner aware of the economic impact of M&S and this resulted in significant state funding. Unlike the first study, which argued for funding the Center based on the potential the Center would have, this study talked to industry as it focused on the economic impact M&S was currently having in the region. In a phone interview with Dr. Loftin in May 2007, he unequivocally stated that “if there is one single thing that changed ODU’s future, a single thing in terms of impact for the state, community, and ODU/VMASC it was this study.” Working on the study for over six months, Roland Mielke, Bob Harper, and Kevin McCleskey drafted a document...
that convinced the Commonwealth Secretary of Commerce and Trade of the impact M&S was having and would continue to foster in Hampton Roads. It also served as the lever for Governor Mark Warner in funding the future of modeling and simulation.

VMASC had a break through year in 2004. The expansion of research and development now included emerging areas of expertise such as:

- simulation integration, interoperability, and composability
- human behavior modeling, human factors, and human machine interface
- visualization and virtual environments
- medical modeling and simulation
- homeland security, homeland defense, and non-attrition modeling
- simulation testing

The research agenda called for assembling a team of faculty, students, and staff to accentuate the technical excellence and community prominence. Additional faculty were hired as senior researchers. Faculty from the Batten College of Engineering and Technology and the College of Science also contributed to the research effort. In 2004, Drs. Nathan Bailey, Lee Belfore, James Bliss, Dave Dryer, Ryan Gaskins, Rick McKenzie, Roland Mielke, Mark Scerbo, John Sokolowski, and Andreas Tolk were integral to the research conducted at VMASC. Joe Bricio, Hector Garcia, Mark Phillips, Will Richards, Mike Robinson, Jen Seevinck, and Charles Turnitsa supported the faculty as Project Scientists. Three new faculty researchers also came on board: Drs. Wes Colley, Jessica Crouch, and Yuzhong Shen.

The students were active in 2004. Eric Weisel became the second graduated M&S doctoral student. His dissertation was entitled, “Models, Composability, and Validity.” research developed a formal theory for semantic composability of simulation components drawing upon existing theories including mathematical logic and computability theory. Mimi Nguyen competed for and was awarded a $10,000 scholarship from I/ITSEC. The scholarship was offered to “stimulate student interest and university participation in preparing individuals for leadership in the Simulation, Training and Education community. Mimi and fellow Ph.D. student Rob King also worked at The Hague as initial participants in an exploratory student internship program between NATO C3 Agency and VMASC. This initiative was spearheaded by Dr. Andreas Tolk and Mr. Thomas Kreitmair of NC3A. The project objectives were to begin the process of establishing a successful collaborative working relationship between VMASC and NC3A and to provide ODU M&S students an opportunity to gain some valuable real-world experience in a challenging work environment. During their internship the students worked with Mr. Kreitmair to integrate the Joint Semi-Automated Forces (JSAF) simulation within one of the NC3A’s existing distributed simulation frameworks to support live NATO exercises.

The VMASC-NATO collaboration also included the NATO M&S Group meeting (NMSG-027), which was hosted by VMASC. The event was attended by eighteen M&S experts from Canada, Czech Republic, France, Germany, Spain, Sweden, and the US. The agenda for these representatives was to develop a NATO master plan to design an HLA Federation known as the NATO Pathfinder with models and tools from NATO and Partners for Peace nations.
VMASC had other successes that year. In the spring, Drs. Loftin and Sokolowski were instrumental in securing a $9.8 million dollar grant through Senator Warner’s office to support the development of modeling and simulation for homeland security. This effort leveraged the M&S technology developed by the military by adapting it for civil environment use. VMASC engaged eight industry partners and two other universities in the development of this capability. It was the catalyst for the creation of further M&S homeland security efforts in the Hampton Roads area such as the stand up of the Emergency Management Training, Analysis and Simulation Center (EMTASC). By October a two million dollar Emergency Response Grant for the Hampton Roads Planning District was awarded VMASC. The task at hand was to develop a simulation that realistically portrayed the effects of a regional casualty event. At the federal level, the Department of Homeland Security requested a Mass Casualty Model to support Metropolitan Management and Reporting System Training and Analysis Requirements. Lockheed Martin also contracted work from VMASC: the new Global Vision Integration Center awarded VMASC a contract to perform an independent assessment of their multi-resolution simulation system linking an aggregate-level simulation (JWARS) to an entity-level simulation (JSAF).

In 2004 ODU opened the Engineering and Computational Sciences Building (ECSB) on the Norfolk campus. VMASC was provided approximately 6,500 square feet of the building earmarked for laboratories, faculty and staff offices, and support facilities. Dubbed VMASC East, the centerpiece for the ESCB is the Immersive Virtual Environment Lab designed to create a multi-modal, interactive, computer-generated environment using several large-scale visual display systems augmented by spatial audio systems and tracking systems. This lab includes a four-walled CAVE facility, a four-meter projection dome with magnetic tracking, and a 20’x 9’ two channel projection wall with spatial audio system housed in a seventy-four seat tiered theatre environment.

VMASC at ECSB is also home to three distinct labs. The Visualization Development Lab supports development of real-time, interactive computer
graphics, data visualization, and prototype virtual environments. The Modeling and Simulation Lab is an extension of the Constructive Modeling Lab at VMASC-Suffolk. It provides a modeling and simulation development environment in support of computer visualization research. The Human Factors Lab is also an extension of the Human Factors Engineering Lab at VMASC-Suffolk. It is designed to conduct usability testing and cognitive task analysis.

Although the BattleLab was well under way, the official ribbon cutting took place in May with Governor Mark Warner as special guest. At the ceremony the Governor was joined by Suffolk Mayor Dana Dickens and Dr. Roseann Runte to officially open the facility. The BattleLab and Decision Support Center was made possible through funding by the Virginia's Commonwealth Technology Research Fund and ODU. What was unveiled was the state-of-the-art facility for modeling and simulation that would help solidify Virginia's international leadership in these areas. To showcase the Lab a highly visible technology demonstration was presented as the lead-in for Mr. Tom Brokaw's presentation at the Commonwealth of Virginia Information Technology Symposium. The demonstration included functioning as lead integrator for an ambitious demonstration that linked thirty five different Department of Defense simulations and systems in partnership with the new USJFCOM Joint Advanced Training Technology Laboratory. The BattleLab official opening was a signature event. It was a "coming out" party for VMASC maturation and it marked a significant stage in the development of the Center.

It also became clear that ODU would reinforce its leadership in graduate programming by creating an innovative laboratory for the masters and Ph.D. programs. In 2004 the BattleLab received a Defense University Research Infrastructure Program grant from the Office of Naval Research that enabled it to purchase a four meter and a three meter Vision Dome as well as a Vision Station. Data storage capability was enhanced by the addition of 12TB of hard drive capacity, data management software, and an optical based network infrastructure. The Human Factors Engineering Lab was reconfigured to support expanding research domains.

At this time the VMASC Advisory Board chairman was Mr. Robert Harper of Northrop Grumman. The Board commissioned the Regional Economic Impact and Cluster Analysis Study to assess the economic impact of modeling and simulation in Hampton Roads. From that study the VMASC Advisory Board constituted an Executive Committee to further evaluate the recommendations put forth by the study. Their aim was to find the best way to capitalize in the significant footprint of modeling and simulation within the Hampton Roads region. As Advisory Board Chairman, Mr. Harper summed up 2004 on a very positive note: "Continued industry, academic and local and state government support, coupled with innovation and experience, will result in collaborative benefits to all VMASC members. In my view, the potential for growth of the MS&V technology in Hampton Roads is enormous ...." The results of the study led to increased funding for VMASC and the creation of a very specialized center, EMTASC.

The 2004 Army War College Fellow was LTC Mike LoQuasto. His background in systems design and analysis and his experience as a simulations training officer lent themselves very well to his research at VMASC. LoQuasto investigated modeling and simulation methods combined with neuron-linguistic programming methods that can be applied to military institutional and collective training.
Hampton Roads already is home to an emerging and very promising modeling and simulation industry which uses cutting-edge technology to, for example, develop and test combat strategies for the military, provide “virtual” training for healthcare professionals, and assist public and private organizations with crisis planning and homeland security issues.

Governor Mark Warner, 11 April 2005

In February a newly formed Congressional Caucus on Modeling and Simulation held its inaugural meeting on Capitol Hill. The Caucus was headed by Virginia Representative Randy Forbes. The Caucus centered its discussion on emergency management and the role of modeling and simulation. Throughout the winter and spring more meetings were convened by political representatives from the federal, state, and local levels of government, members of the military, academe, and the modeling and simulation industry to further the dialogue on the role of modeling and simulation relative to homeland security.

As a corollary to those discussions the Virginia General Assembly (reconvened) session endorsed Governor Mark Warner’s proposed budget amendment authorizing $1.45 million as seed funding for expanding the Commonwealth’s modeling & simulation capability. Portions of this funding were earmarked for ODU and would serve to enhance VMASC with the addition of new faculty, new courses and curriculum, and more funding to promote research and development. The initiative also included establishing a national Institute for Homeland Security and Crisis Management in Suffolk. Governor Warner shared his vision: “With modeling and simulation soldiers can learn new skills to keep them safer, doctors can practice and advance new medical procedures without risking harm to a patient, and first responders can experience realism in preparing for extraordinary events like Anthrax attacks. Modeling and simulation can reduce risk while improving knowledge and saving lives, and we want the best and the brightest working on this technology.”

As Governor Warner announced his amendment to the budget, he specifically addressed the need to fund VMASC:

The use of mathematical modeling and computer simulation to explore complex problems, particularly in defense and homeland security, has grown enormously in recent years. States which are well positioned to take advantage of that growth benefit substantially. The economic contribution of this sector to Virginia for FY 2004 is estimated at $413 million. The Virginia Modeling, Analysis and Simulation Center at Old Dominion University is the focal point of Virginia’s activity. We recently became aware of an opportunity to make Virginia preeminent in this field and further enhance the economic benefits to the state. I am therefore recommending that we strengthen Virginia’s capacity in modeling and simulation by adding funding to support focused research efforts and collaborative projects with the US Joint Forces Command headquarter in Norfolk.

The Regional Economic Impact and Cluster Analysis Study cited the economic impact of modeling and simulation in Hampton Roads noting that over 4000 people were employed in
M&S related jobs and that the industry brought over $400M per year to the region. Predicting the current rate of growth could double by the end of the decade, the study proffered that this rate could accelerate even faster if the companies in the region would cooperate in developing a program of interest. In light of the strong defense oriented foundation of many of the companies and the concerns about terrorist attacks, the report proposed pursuing a program in homeland security. Members of VMASC and leaders from its industry membership began meeting to discuss how they could implement such a program. By May, the number of participants interested in developing a homeland security initiative grew to over twenty. Their collective work resulted in a new, specialized center called the Emergency Management Training, Analysis, and Simulation Center (EMTASC).

EMTASC is the first and only center to target command and management at the operational level. It is one of the first centers that provides realistic scenarios with homeland security issues. It is also the first step toward a center whose mission is to mitigate loss of life and property due to natural or man-made disaster. The Commonwealth pledged $1.45 million dollars to bolster modeling and simulation in Hampton Roads as well as establish EMTASC. The Center was officially recognized on August 31 in a ceremony held on VMASC’s front lawn. Governor Mark Warner, members of the Virginia General Assembly, and state and local officials attended the ceremony. Governor Warner emphasized the importance of EMTASC recalling the chaos that ensued during and after Hurricane Katrina—a clear cut case for advanced emergency response preparation. The Governor praised the forward thinking organizers of EMTASC. As keynote speaker at the ribbon-cutting ceremony, the Governor introduced the new center with the following:

This new facility will combine world-class expertise and state-of-the-art modeling and simulation for training, analysis, and operational support for disaster management and homeland security situations. As our prayers go out to the citizens of the Gulf region who have been devastated by Hurricane Katrina, that terrible storm reminds us again of the importance of this critical emergency management training and simulation.

At the ceremony the Center made known its vision and mission:

**EMTASC VISION**

The Emergency Management Training, Analysis, & Simulation Center (EMTASC) is the premier provider of operational training and support for homeland security Emergency Command and Management Agencies.

**EMTASC MISSION**

The Emergency Management Training, Analysis, & Simulation Center (EMTASC) serves to mitigate loss of life and property due to manmade and natural disasters by preparing emergency command and management personnel and organizations. The center employs world-class expertise and state of the art modeling and simulation tools to conduct training, exercises, analysis, and operational support for disaster management and homeland security situations.

Governor Warner has always been a strong supporter of cutting-edge technology. At the close of the ceremony he challenged VMASC and the regional leadership to double the growth of M&S and to broaden its uses to attract non-defense and gaming companies by recognizing the fact that the present M&S users community, industry, and military all place modeling and simulation as a major driver of the region’s economy: “Modeling and Simulation is the fastest growing area in technology and we’ve already put a stake in the ground.”
This year also experienced much internal transition as VMASC Executive Director Bowen Loftin accepted an appointment at his alma mater, Texas A&M University as Vice President and Chief Executive Officer of the Galveston campus. Dr. Roland Mielke served as the Acting Executive Director of the Center for the 2005-2006 academic year. Chief Scientist Mikel Petty accepted the position as Executive Director of the Center for Modeling, Simulation, and Analysis at the University of Alabama in Huntsville. VMASC began the national search for its new Executive Director in the summer and by November the search committee had selected VMASC’s third Executive Director Brigadier General Mike McGinnis. Dr. McGinnis would begin his new position in June 2006.

VMASC was pleased to serve as host to LTC Jerry Wood, the 2005 Army War College Fellow. LTC Wood investigated simulation used in leader training for Homeland Security scenarios that could be applied to Army National Guard Joint Force Headquarters.
EXPANDING THE RESEARCH FOCI

Dr. Michael McGinnis left the United States Military Academy in West Point, New York to join VMASC becoming the third Executive Director on 10 June 2006. Prior to assuming this position Brigadier General (Ret) McGinnis served for seven years as Professor and Department Head of the Systems Engineering Department at West Point. His previous Army modeling, simulation and analysis assignments include Director of the US Army Unit Manning Task Force, Director of the US Army TRADOC Analysis Center at the Naval Postgraduate School in Monterey, California, and Director of the US Military Academy Operations Research Center. Dr. McGinnis brought with him years of service on key government engineering, modeling, simulation and analysis committees. These committees work to bring about change at the Army and Department of Defense levels such as the National Academy of Sciences Committee on Defense Modeling, Simulation and Analysis, the Undersecretary of Defense for Acquisition, Logistics and Technology Systems Engineering Forum, the US Army OneSAR Architecture Working Group, Senior Reviewer for the Army Standards Nomination and Approval Process for Semi-Automated Forces, US Army Training and Doctrine Command (TRADOC) Modeling and Simulation Committee, and the Deputy Undersecretary of the Army for Operations Research and Systems Analysis (ORSA) Advisory Committee.

McGinnis decided to take the position of Executive Director because it represented a great opportunity, as he says, for his personal and professional growth: “On the professional side, I saw great challenges ahead of VMASC for growing M&S in new domains. I recognized that VMASC was ideally situated to working with industry, government and academia, as an honest broker, to move the art and science of modeling and simulation forward both as an academic discipline and as an industry. Personally, I appreciated and looked forward to working with President Roseann Runte, the faculty and students from Old Dominion University, and the talented and dedicated professional staff at VMASC. VMASC was a perfect fit for me.” With that perfect fit, McGinnis immediately set off to fostering relationships within ODU, with VMASC partners, and with industry leaders in the Hampton Roads community.

Expanding the application and cluster areas of VMASC research was high on the agenda in 2006 and it started with hiring Dr. John Sokolowski as the VMASC Director of Research. Dr. Sokolowski had served as a Senior Research Scientist since 2001; he replaced Mikel Petty as Acting Chief Scientist in May 2005 until taking the position as Director of Research. Dr. Sokolowski’s academic training includes computer science and engineering with a BS degree Computer Science, an MS in Engineering Management, and a Ph.D. in Engineering (with a Concentration in Modeling and Simulation). His research comprises human behavior modeling, decision system modeling, multi-

ODU has developed modeling and simulation in a multidisciplinary manner with M&S faculty spread across all six colleges and twelve different departments. That approach has allowed us to expand our M&S research beyond just the military. It now includes homeland security, transportation, medical, education, and enterprise support. We are bringing M&S capability to new frontiers to solve an ever expanding array of problems.

Dr. John Sokolowski, Director of Research
agent system simulation, and modeling and simulation for homeland security. His vision for research and development at VMASC is succinctly articulated:

Old Dominion University is the international research leader in modeling and simulation, visualization, and M&S-supported analysis.

The research foci include advancing both the pure and applied aspects of M&S research. VMASC is advancing the M&S body of knowledge by focusing its research in two pure areas, human behavior representation and M&S interoperability. These two areas have formidable research challenges to meet the demands of future simulation systems. VMASC is also advancing applied M&S research in the areas of military, homeland security, transportation, medical, serious gaming for education, and enterprise decision support. VMASC has formed research clusters around these areas to help bring M&S technology and solutions to areas not previously employing the technology to solve complex problems. These clusters will also help foster economic growth by providing a means to showcase new research products that companies may be able to transition into the market place.

One of Dr. Sokolowski’s goals is to attract young researchers with backgrounds in these pure and applied areas to help accelerate their growth. VMASC hired two new Research Scientists in 2006 to begin expanding the research foci, Dr. Stacie Ringleb and Dr. Alicia Sanchez. Dr. Ringleb received her Ph.D. in mechanical engineering from Drexel University. Her research at Drexel focused on the development of an image-based technique to assess ankle and subtalar joint knee kinematics. She followed that research with a post doctoral fellowship at the Orthopedic Biomechanics Laboratory at the Mayo Clinic. Dr. Ringleb’s VMASC research focus is medical modeling and simulation. She is developing and validating a patient-specific model of the ankle joint that will be used to optimize treatment and minimize the potential of ankle arthritis in patients who experience trauma or a degenerative joint disease. She is also investigating novel methods for rehabilitation and evaluation of stroke patients.

Dr. Alicia Sanchez comes from the University of Central Florida. Dr. Sanchez has worked as a Research Psychologist at NAVAIR Orlando and then joined the faculty of UCF as a research scientist for the Institute for Simulation and Training. She has also taught for the Digital Media Department. Dr. Sanchez’s dissertation involved the validation of a Synthetic Learning Environment (SLE) named the Virtual Field Trip that she built to facilitate vocabulary acquisition in second grade students. Using the Virtual Field Trip she was able to demonstrate an increase of up to three times the number of vocabulary words second grade students used in a writing sample when they used an experiential learning tool based on the educational theories of situated learning and anchored instruction with only a twenty minute exposure to the software. Her findings indicate that rich multi-media environments may not only increase depth of processing and enhance learning, but also supplant real world experiences without which students might not be able to interpret new information presented to them. Dr. Sanchez’s research interests also include games, other SLEs, and the utility of games for education and training. This body of research, called Serious Games, is an emerging field with implications for impacting all facets of military, public, and private sectors of education and training.

Dr. Sanchez became immediately involved in the development of two games in support of Science, Technology, Engineering, and Math (STEM) initiatives. One game, designed for high school and college level physics education, is targeting student attrition and student desire to remain as physics majors. Using a Massively Multiplayer Online Game, it is hoped that students will not only have a test lab in which to practice physics principles outside the classroom through casual adoption of gameplay, but that game players will form communities of support in which they develop peer mentoring relationships with other players. Another
game being developed (in partnership with the charter school Achievable Dream and NASA) will target algebra, a subject that is considered to be a gateway to STEM in middle school curriculums.

ODU took on the major task of enlarging the interdisciplinary M&S faculty by the initial hiring of tenure track faculty who will be conducting M&S research in their respective disciplines at VMASC. Seventeen new hires were approved and searches began in ODU’s six colleges. Two of VMASC’s senior researchers accepted positions at the University: Dr. Andreas Tolk in the Department of Engineering Management and Systems Engineering and Dr. Yuzhong Shen in the Electrical and Computer Engineering Department. By the end of the summer 2007 semester the following additional positions were filled:

- Dr. Michael Fontaine, Batten College of Engineering and Technology
- Dr. Patrick Hester, Batten College of Engineering and Technology
- Dr. Juli Hao, Batten College of Engineering and Technology
- Dr. Jiang Li, Batten College of Engineering and Technology
- Dr. Kate Lyons, Batten College of Engineering and Technology
- Dr. Zia Rahman, Batten College of Engineering and Technology
- Dr. Tal Ezer, College of Science
- Dr. Poornima Madhavan, College of Science
- Dr. Gianluca DeLeo, College of Health Sciences
- Dr. Holly Gaff, College of Health Sciences
- Dr. Li Li, College of Liberal Arts
- Dr. Dean Chatfield, College of Business
- Dr. Ginger Watson, College of Education

Student research also became the focus in 2006 starting with developing the first Modeling, Simulation & Gaming Student Capstone Conference. The Conference would feature student research and student projects central to MS&G. Also participating in the conference would be faculty and judges who volunteer their time to impart direct support to their students’ research, facilitate the various conference tracks, serve as judges for each of the tracks, and provide overall assistance to this conference. Students would be invited from universities and colleges across the country and they would be presenting their research to a wide audience of fellow students, faculty, judges, and individuals from the military and industry sectors. For some, the conference would serve as a culmination of their research and academic careers. The conference would take place on April 19, 2007.

As a corollary to the conference, Mike McGinnis announced the establishment of a new award that would be presented to the outstanding student presentations in each area of research: the Gene Newman Award for Excellence in M&S Research. This award would honor Mr. Eugene Newman for his pioneering effort in supporting and advancing modeling and simulation. Mr. Newman played a significant role in the creation of VMASC by realizing the need for credentialed experts in the M&S workforce, both military and industry. His foresight has affected both the economic development and the high level of expertise in the M&S community of Hampton Roads. Students receiving this award will have proven themselves to be outstanding researchers and practitioners of modeling and simulation.

To encourage research collaboration among the M&S community of educators in Hampton Roads, a workshop was held in November to bring together faculty from Norfolk State, Hampton University, College William and Mary, Old Dominion University, Tidewater Community College, Thomas Nelson Community College, and teachers from Virginia Beach and Newport News Schools. The Partners in M&S Education Workshop focused on M&S as a discipline and its many applications. After a morning of introductions and discussion about sup-
porting M&S education, the workshop divided into four break-out sessions for roundtable discussions relative to M&S Education, Research and Development, M&S Body of Knowledge, and Developing an Organization for Professional Accreditation. Importantly, the workshop afforded all attendees an opportunity to meet their colleagues associated with the M&S discipline from schools across the region.

LTC Mark C. Strong served as the 2006 Army War College Fellow. LTC Strong holds a B.S. in Aerospace Engineering from the United States Military Academy and a M.A. in Management from Webster University. Since 1997, LTC Strong has served in a wide variety of command and staff positions of progressive responsibility for the Army National Guard. In 2003, LTC Strong took command of the 1-113th Field Artillery and subsequently deployed to Iraq in support of the 30th Heavy Separate Brigade (North Carolina Army National Guard) assigned to the 1st Infantry Division. His research was directed by Dr. Mike McGinnis and Dr. John Bonin of the US Army War College. LTC Strong looked at the organizational design requirements for Service Headquarters to operate as Joint Task Force (JTF) headquarters. His study developed three alternatives to organization of a JTF capable headquarters, and it used the Analytic Hierarchy Process as a method to evaluate competing headquarters design alternatives. He also investigated the use of multi-agent systems modeling as an efficient tool to analyze JTF headquarters staff sections.
VMASC was established in 1997 to stimulate and lead the growth of modeling and simulation as both an academic discipline and an industry within the Hampton Roads Region and throughout the Commonwealth of Virginia. To this end, the Center continues to pursue key initiatives in its four mission areas:

1) M&S research and development in both basic sciences and across a range of application areas
2) Workforce development enabled by the ODU M&S academic program through graduates who enter the workforce as well as student internships
3) Technical and consulting services on topics related to modeling, simulation, visualization and analysis to regional, state and federal governments, academic institutions and industries in any of the key application domains where VMASC has expertise
4) Economic development of modeling and simulation by being an incubator for small businesses and teaming with industry enterprises in the region.

In the summer of 2006, a change in VMASC leadership prompted a fresh look at the Center’s organizational structure and its programs. An offsite meeting was conducted to review and assess the state of M&S and VMASC vis-à-vis past performance, current state, and future goals. What resulted from that meeting was a new organizational model for VMASC that in the first year of implementation made VMASC a more effective and efficient research and development Center. At the offsite, VMASC managers and research faculty evaluated long term goals and objectives, analyzed performance measures, and identified redundant, unnecessary policies, processes and activities for elimination.

It was also noted that key programs for research and development, academic affairs, laboratories and technologies, student internships, M&S faculty research, and curriculum development had essentially been developed and managed as separate, stove-piped programs. This recognition helped us to find ways of moving the Center forward by aligning the programs to generate synergy across them.

Dr. Mike McGinnis, Executive Director

\[\ldots\] we also observed that key programs for R&D, academic affairs, laboratories and technologies, student internships, M&S faculty research and curriculum development had essentially been developed and managed as separate, stove-piped programs. This recognition helped us to find ways of moving the Center forward by aligning the programs to generate synergy across them.
zational change to include people, partnerships, protocols, performance measures, planning for action, and pragmatism—getting things done. During the weeks and months following the offsite, VMASC leadership continued to meet to discuss and refine initiatives and objectives for key areas of interest. Notable key areas and objectives included the following:

**Administration** Establish policy, assign responsibility, enforce accountability, and conduct oversight of personnel management, property accountability, management and expenditure of funds, research and academics, technology, use of space and facilities, building and maintaining relationships with industry, government and academic clients and partners, hosting special events, and accomplishing other tasks as required.

**Organization** Organize VMASC to accomplish missions. Assign personnel to key positions.

**Personnel Recruiting and Hiring** Oversee and approve selection of VMASC personnel. Engage VMASC in the search and hire processes for ODU M&S tenure track faculty. Personnel Development. Establish a program for developing and mentoring VMASC personnel, and affiliated personnel as appropriate.

**Modeling and Simulation Academic Program** Assist ODU with the growth of the M&S academic program and related M&S activities at ODU through advertising, student recruitment, thesis and dissertation advising, internships and job placement. Provide periodic updates to the ODU President, Provost, Graduate Program Coordinator, Deans, and Graduate Program Directors on issues relating to the ODU modeling and simulation graduate and undergraduate programs in the areas of course content, development, and delivery.

**Research & Outreach** Plan, conduct, direct, and supervise research in areas related to the ODU M&S research and application areas, and areas of interest to the ODU modeling and simulation academic program. Seek out and apply for federal and state research grants and reimbursable research tasks and projects funded by federal, state, and local agencies.

**Assessment** Establish a review and assessment program for evaluating the progress and success of VMASC programs and missions. Key areas include research and development, technical and consulting services, business and economic development, workforce development, academic program growth and related M&S activities such as scholarship, faculty and staff development, and administrative support.

**Scholarship** Present ODU and VMASC research at national conferences and submit papers for publication to prestigious conference proceedings and journals. Compete for awards and prizes in the areas of M&S fundamental and applied research.

**Governance** Serve as an advisor and consultant on M&S related issues to federal agencies, state of Virginia, Hampton Roads Region, and ODU. Serve on committees and boards of national societies as appropriate.

**New Building and Transition** Oversee activities relating to the construction of the new VMASC building and the move into the new building.

**Service** Engage in M&S related activities that promote VMASC, ODU, Hampton Roads community, state of Virginia, and the United States, and advance the Hampton Roads region as a nexus of M&S. With this agenda of defined objectives and new initiatives, McGinnis was able to measure and assess the challenges and accomplishments of the Center. The following is a review of
the 2006-2007 academic year:

**Organization** From 1997 through 2006, VMASC was managed using a hierarchical organizational structure where issues, information and decisions flowed through two positions: the VMASC Executive Director and the General Manager. This centralized approach, although highly efficient, compartmentalized information and decisions and limited the engagement of personnel from fully contributing to on-going activities and capitalizing on future opportunities.

During the VMASC offsite of August 2006, leadership discussed future growth and management models for improving the performance of the organization. Strong support formed for business and research and development strategy for expanding modeling and simulation research and development activities beyond the defense sector. In order to accommodate growth in new areas, VMASC would need a more open, flexible and agile organization – one that could leverage and engage the entire workforce in mission accomplishment.

Organizational functions were identified from VMASC missions and requirements mandated by the Commonwealth and ODU. Programs and program director positions were formed along functionality lines to accomplish missions. These included: Research and Development, Operations Research and Analysis, Computational Science, Academic Affairs, Business Development, and Technology and Laboratories. The result was a flat, matrix, function-oriented organization that shared information throughout the organization, spread responsibility and accountability for accomplishing missions across the organization, and engaged key personnel in decision-making. As a result:

- State funded research faculty leadership positions were established for staffing key programs to provide VMASC with a stable nucleus of core leaders and researchers. Program directors were given the responsibility, resources and accountability for running their programs and accomplishing missions
- Bi-monthly program director meetings were scheduled to improve communications and information flow throughout VMASC. The meetings allowed for key issues to be discussed openly and decisions were made. Input from all Program Directors was solicited prior to decisions being made by the Executive Director. This venue provided an important forum for getting Program Director buy in and to feel ownership of VMASC areas of responsibility.

**Faculty and Staff Recruitment and Hires** During the past two years, VMASC has undergone significant personnel turnover that included three changes in Executive Director, as well as turnover in the positions of chief scientist, BattleLab director, business development, general manager, administrative assistant to the executive director, and the departure of eight research and project scientists. Organizational personnel churn was very disruptive to VMASC’s continuity in some areas causing a loss of momentum and initiative in others. Another problem was the imbalance that existed between VMASC administrative support staff (7) and technical support staff (2). This had become a significant limitation to the advancement of VMASC’s technological capabilities. Steps were taken to realign the workforce which is today better balanced with five administrative and four technical personnel on staff. This resulted in an immediate improvement in technical support to research faculty and scientists.
The year also saw a number of new personnel searches that resulted in outstanding new hires of faculty researchers, research and project scientists, and M&S faculty. In each search, VMASC and ODU sought personnel with the right combination of professional credentials and team-focused attributes that fit with VMASC’s new culture, organization, and business model. Significant M&S hires at VMASC and ODU in 2006-2007 included:

- Dr. John Sokolowski, Director of Research
- Dr. Catherine Banks, Director of Academic Services
- Dr. Yiannis Papelis, Director of Computational M&S
- Dr. Stacie Ringleb, Medical Cluster Lead
- Dr. Alicia Sanchez, GBL Education Cluster Lead
- Corie Forrest, Senior Media Specialist
- David Ralph, Lab Technician
- Richard Howell, Visualization and Network Technician;
- Laura Vann, Administrative Assistant for Academic Affairs (part-time)
- Cheryl Sparrer, Administrative Assistant to the Executive Director
- Tenure track M&S faculty have been hired (thirteen).

**Academic Program** The designation of VMASC as an ODU-level Center of Excellence for Modeling and Simulation led ODU to transition oversight of the ODU M&S academic program from VMASC and the College of Engineering to the ODU Provost and Graduate Program Director. However, VMASC continued to support the M&S academic program through the following key initiatives:

- Advertised the academic program online, at national conferences and through visits to Virginia colleges and universities, student recruitment, establishment of new Ph.D. internships, theses and dissertation advising and M&S graduate job placement
- Organized and hosted monthly ODU M&S tenure track faculty meetings to share information, coordinate research opportunities, pass on lessons learns and develop policies for management of M&S faculty related issues
- Organized and hosted the first annual ODU / VMASC M&S Student Capstone Conference that involved 90 attendees from five colleges and universities
- Linked ODU M&S academic areas of interest and the M&S Capstone Conference to enrich student and faculty experience
- Established the Gene Newman Student Award to be given annually for excellence in modeling & simulation
- Organized and hosted the first annual ODU/VMASC Partners in M&S Education Workshop, a Faculty Forum for Modeling, Simulation and Game-based Learning
- Coordinated the Graduate Research Assistantship and Graduate Teaching Assistantship Programs in support of ODU M&S faculty and students
- Coordinated and selected VMASC internships for ODU M&S students with VMASC programs, industry and government partners
- Provided faculty and administrative support for the M&S Student Study Abroad program to provide academic and cultural enrichment opportunities for M&S graduate students

**Faculty and Staff Development** VMASC informally began a Faculty and Staff Development and Mentoring Program which was instituted in three phases.

1) Pursued ways of coupling M&S research with needs of VMASC clients and partners, M&S tenure track faculty research application areas and the ODU M&S academic program. The objective is to generate meaningful and fruitful activities between VMASC
and ODU M&S faculty

2) Provided opportunities for all VMASC personnel to provide and receive regular feedback on personal and organizational performance

3) Proactively engaged and involved VMASC Program Directors and other key personnel in VMASC issues and meetings involving key stakeholders at ODU, regional and state level, and with research partners. This has given Program Directors, research faculty and staff exposure to key ODU leaders and other stakeholders resulting in better situational awareness and has improved VMASC’s ability to work as a team. It seems to also have led to VMASC Program Directors being better informed and imparted a clearer collective sense of stakeholder needs and a feeling of program ownership

**Outreach & Communications** In an effort to better communicate VMASC initiatives and to keep our partners better informed on M&S news, VMASC began to publish a monthly newsletter. We also initiated an outreach program to personally meet and visit, on a periodic basis, key ODU leaders, deans, chairs, M&S faculty and students, local and state leaders, industry academic and government stakeholders. This has improved relations and communications. Updated and improved information and web technologies across VMASC in areas such as website design, internet services, and data base management

**Assessment** During the past year, VMASC also began work on an organizational and program assessment model for benchmarking programs, measuring progress, and the return on investment over time. Assessments included:

- The number of applications submitted for grants and other funding opportunities; total funding; funds awarded; funds pending
- Soliciting feedback from graduating students during exit interviews; and reach out to them at 1-year, 5-year and 10-year intervals to get feedback on what the program contributed to their successes; solicit feedback from clients, research partners, and industry members
- Benchmark VMASC against other university and state M&S centers and institutes
- Update the M&S economic impact study
- Scholarship prizes, awards and publications by VMASC and affiliated M&S faculty and students, paper and conference publications by VMASC, and affiliated M&S faculty and students, patents
- Academic Program and Workforce Development measured by the number students enrolled in M&S graduate programs, the number of dissertation committees formed, number of M&S program graduates
- Student and Client Outreach measured by the number of student internships, postdocs, and long term research relationships measured by CRADA and Memorandum of Understanding agreements

**Service and Governance** This past year, VMASC made significant service type contributions to ODU, Hampton Roads, the Commonwealth of Virginia, and national societies and organizations as an advisor on M&S research and related activities. These include:

- Served the Hampton Roads on numerous committees and working groups to advance modeling and simulation. Service and outreach opportunities included the National Center of Simulation Board of Advisors, committee member for the National Simulation Training Association and the National Defense Industry Association, State of Virginia M&S Advisory Council, Naval Postgraduate School MOVES Institute
Board of Advisors, Hampton Roads Partnership, Hampton Roads Research Partnership, Hampton Roads Technology Council, Hampton Roads Economic Development Association, and Virginia Economic Bridge keynote speaker

A review of VMASC business practices revealed policies for governing VMASC were either not in existence or were not adequate for basic VMASC operations. Established and published, or are currently drafting, policies in the following areas:

- Index of Memoranda
- VMASC Mission
- Conference Room Scheduling and Use
- Laboratory Scheduling and Use
- Dress Code and Leave
- Travel and Reimbursement
- Annual Event Calendar
- Employee Recognition
- Employee Pay, Promotions and Evaluations
- Research Proposal Development and Submissions
- VMASC Indirect Costs Policy
- Property Accountability and Inventory

The changes to VMASC culture, organization, personnel hires, and business development discussed above have allowed VMASC to move forward in the areas of grant proposal submissions and research, while opening new business opportunities.

**VMASC Research FY2007 Effort**

- Proposals Submitted: 70
- Proposal Dollar Value: $15,573,587
- Awarded Dollar Value: $9,639,178
- Percent success: 62%

Despite the high level of change and the personnel turnover, VMASC responded very well to calls for research proposals. The research awards for the year, including the previous nine years, are shown below.

**M&S Conference Services** To further VMASC’s role as a leader in the M&S industry, the Center undertook a new initiative to provide a full spectrum of conference
services support for M&S conferences held in the Hampton Roads region. The first opportunities in conference services have been site host for the combined Simulation Interoperability Workshop (SIW) held in Norfolk in March 2007, and conference service provider for MODSIM World 2007 Conference scheduled for September 2007 at the Virginia Beach Convention Center. VMASC competed for and won a conference services contract for this event funded at $142K.

- **Expanding Hampton Roads through Modeling and Simulation Clusters** Part of the VMASC strategic vision and road map for modeling and simulation called for the expansion of the M&S industry and discipline through the creation of VMASC M&S research clusters for growing and expanding M&S in the Hampton Roads region and across the state of Virginia. The first VMASC clusters are in the process of forming in the areas of emergency management, game based learning education, and medical modeling and simulation.

- **M&S Student Recruitment Program** Established a new student outreach program for national recruitment of M&S students to the ODU graduate programs and set aside scholarship funds to cover tuition and stipend.

- **Annual VMASC Cycle** Another change that improved VMASC operations was the alignment of the VMASC business and research annual cycles on a July 1 through 30 June cycle. This synchronized the ODU/VMASC academic calendar, research cycle, state funding cycle, and the VMASC budget cycle.

- **Commonwealth of Virginia** VMASC engaged this past year with the State of Virginia on a range of M&S issues.

  - VMASC was asked by the Secretary of Technology to organize and serve as a panel moderator for the National 9th Annual, Commonwealth of Virginia, Innovative Technology Symposium (COVITS);
  - Per House Bill (HB) 2030, which establishes a Virginia M&S Advisory Council, VMASC will serve as the executive agent for that council to promote M&S throughout the state of Virginia.
  - VMASC engaged in three state funded M&S projects:
    - Evacuation Study
    - Transportation Study (APM Terminal)
    - Resiliency Study

- **VMASC 10 Year History** With the publication of this document, VMASC has published its first 10 year history. In addition, we will organize and host several events to mark the passing of this year.

- **M&S Texts** VMASC has undertaken the writing and publication of two M&S texts – one that supports the core courses in the mathematics, sciences and engineering disciplines, and one that supports M&S core courses in the humanities and social sciences disciplines. Text editors have prepared a draft outline for each text and Wiley has been approached for publication services.

- **M&S Economic Impact Study** VMASC has the lead in updating the 2004 M&S Impact Study that will be completed in the July to August 2007 timeframe.

- **M&S Strategy for Hampton Roads & Virginia** VMASC is leading a collaborative effort to write a modeling and simulation strategy for the Hampton Roads region and the Commonwealth of Virginia. This is expected to be completed by summer of early fall 2007.

- **M&S Branding & Marketing** Finally, VMASC has undertaken and funded a communications campaign to brand, market, and promote VMASC, ODU, and the Hampton Roads region as a state and national nexus for modeling and simulation. A professional marketing company, Earworks of Virginia Beach, is contracted for this effort.

As one reflects upon the long road traveled by VMASC, it is clear that there has been a decade of forward movement and development. McGinnis and his team must continue to advance the Center while expanding its significance in the modeling and simulation com-
 community. Below are the Goals, Objectives & Challenges for 2008 and Beyond, as outlined by the Executive Director.

People Our greatest challenge this coming year will be to continue to build the VMASC team and to keep the team together. We must continue to seek out and hire talented, self-motivated, and self-disciplined individuals who are good fits with VMASC culture.

Partnerships A year ago an informal poll of our partners revealed that less than twenty percent felt a relationship with VMASC added value to their organization or business. We have made a great deal of progress to turn that attitude around. There is lots of evidence pointing to it. However, we must continue to bring a total commitment to excellence when working with our partners that exceeds their expectations and ensures that they receive a high return on their investments of time, effort, and funds when collaborating or partnering with VMASC.

Protocols In the areas of policy, process, and procedures, VMASC must continue to develop new protocols while adhering to existing ones across all areas and activities. This will be key to reaching a high level of efficiency in the organization.

Performance Measurement VMASC must continue to benchmark and measure progress, in a quantifiable way, across all our key programs and activity areas. This must be done in an honest and straightforward manner and be part of our commitment to continual process improvement. By sharing performance information and soliciting feedback we will bring out the best ideas and strategies we need to continue to improve.

With the continued support of ODU, our industry, government and academic partners in the Hampton Roads region and the State of Virginia, VMASC will continue to lead the growth of modeling and simulation here and throughout the state.

The General Assembly 2007 Session continued to enthusiastically support modeling and simulation in the Commonwealth. Delegate John Cosgrove introduced House Bill 2030 creating a Modeling and Simulation Advisory Council whose mission is to advise the Governor on policy and funding priorities to promote the modeling and simulation industry in the Commonwealth. Delegate Cosgrove represents House District 78; his office is in Chesapeake.

The Army War College sent LTC Anthony Abbott as the 2007 Fellow. LTC Abbott enlisted into the Georgia Army National Guard in 1987 has received a Reserve Army commission as a Second Lieutenant in the Field Artillery. LTC Abbott has a Bachelor of Science Degree in Chemistry Education from Georgia Southern College and a Master of Science Degree in Secondary Science Education from Georgia Southern University. His military education includes the FA Officer Basic Course, the FA Officer Advanced Course, the Paladin Commander’s Course, the ADA Officer Advanced Course, the Combined Arms Services Staff School, the Command and General Staff College, the MP Orientation Course, and the Military Police Pre-Command Course. He is conducting research in the area of Homeland Security/Emergency Management.
On April 19th the first Modeling, Simulation, and Gaming (MS&G) Student Capstone Conference was held at Old Dominion University. The conference featured students from universities and schools across the country to include The College of William and Mary, University of Virginia, Auburn University, and West Point Military Academy as well as students representing three ODU colleges: Frank Batten College of Engineering and Technology, College of Sciences, and College of Health Sciences. Students presented their research to members of the modeling, simulation and gaming community in academe, industry, and government.

There were five tracks and each track was assigned judges who selected the top three presentations. The judges came from Devry University, Eastern Virginia Medical School, University of Ottawa, the Virginia Transportation Research Council (VDOT), the Hampton Roads Planning District Commission, NASA, and the US Joint Forces Command. The students with outstanding presentations were recognized at the evening banquet and capstone awards. Students receiving the first place award were given the Gene Newman Award for Excellence in M&S Research. Students receiving this award have proven themselves to be outstanding researchers and practitioners of modeling and simulation. Mr. and Mrs. Newman were present at the banquet. Mr. Newman is currently serving in an advisory role to the JWFC. He had served as Technical Director of the JWFC from July 1997 through January 2002.

Also in attendance were a number of visiting faculty from colleges and universities across the country:

- USMA (LTC Robert Kewley and Professor Patrick Driscoll)
- University of Virginia, Dr. Paul Reynolds
- College of William and Mary, Dr. Larry Leemis
- Johns Hopkins Applied Physics Lab, Dr. Thomas Meyers
- Auburn University, Volkan Ustun, Ph.D. Candidate

The VMASC industry partners supported this conference by sponsoring all components of the conference:

- The Evening Reception Maersk Line Limited – Steve Carmel
- The Awards Banquet Alion Science and Technology – Jack McGinn
- The Tracks (5)

This award, established in 2006, is in recognition of Mr. Eugene G. Newman for his tireless effort in advancing modeling and simulation education, research, and development. Mr. Newman played a significant role in the creation of VMASC (in 1997) by realizing the need for credentialed experts in the M&S workforce in the military and in industry. His foresight has affected both the economic development and the high level of expertise in the M&S community of Hampton Roads.
(Track sponsorship provided for the certificates, awards, and monetary gifts of $100, $50, and $25 which were presented to the students).

1) Education / Gaming
2) Homeland Security / Military M&S
3) Medical and Science M&S
4) M&S Body of Knowledge and Application
5) Transportation

SAIC
Lockheed Martin
Northrop Grumman
DDL Omni
GD/IT
James V. Koch: VMASC’s current development was only a dream in 1997. I well remember being quizzed critically by a group of faculty senators who thought the funds and positions I had decided to invest in VMASC could better be utilized elsewhere in the institution. It’s gratifying to see the immense payoff that Old Dominion University, Hampton Roads and the Commonwealth have received from these initial investments. Congratulations! Keep the ball rolling.

Gene Newman: VMASC is the result of unintended consequences; ninety percent of what took place is the result of unintended consequences. What went forward as an idea in providing the best [M&S] workforce for the JTASC led to the successes in education and economic development that we see today.

Tom Mastaglio: VMASC has and continues to create the buzz that people hear – it is at the forefront of the collective psyche in Hampton Roads [businesses] as it is finally getting to the point where some executives are saying, ‘I need to figure out what this [M&S] can do for me.’

Bowen Loftin: VMASC has been and continues to be an enabler in the usefulness of M&S in many domains. Research and applications combined with education allow for the development of the theoretical underpinnings that enhance the curriculum and add to the body of knowledge.

John (Jack) McGinn, Chairman of the VMASC Board of Advisors: This is an aggressive and very active period for our M&S Industry. M&S as we have known it, with its focus on the military domain for warfighter training and experimentation, has made tremendous technological and application advances over the past ten years. We are now positioned to leverage the technologies and techniques pioneered in support of our industry and apply them to emerging M&S domains such as Games for Education, Emergency Management, and Medical to name a few.

VMASC has supported this rapid growth with its pioneering efforts in establishing advanced M&S education opportunities, its forward looking inter-disciplinary approach to developing a well rounded engineer for the future, and its aggressive research in the development and application of M&S technologies for multiple domains.

As we move ahead, VMASC will continue to provide an increasingly vital role as a catalyst for intellectual and economic growth of the larger M&S industry and a standard bearer for M&S excellence across all domains.
Appendix 1

Twelve Charter Members 1997

Aerotech Research
BMH*
Booz-Allen & Hamilton
Down Home Enterprises
Lockheed Martin
Logicon
Northrop Grumman
O’Connell & Associates
ProModel Corporation
SAIC
Strategic Perspectives Incorporated
Veda Incorporated

*Alion Science and Technology
APPENDIX 2
BOARD OF ADVISERS:
CHAIRMEN AND CO-CHAIRMEN

2000-2002
Edward Brady, Strategic Perspectives, Inc.
Timothy Oliver, Booz-Allen & Hamilton

2002-2004
Charles Venable, SAIC
Maurice Gauthier, CSC

2004-2006
Robert Harper, Northrop Grumman
Richard Marr, Lockheed Martin

2006-2008
John McGinn, Alion Science and Technology
Craig Langman, General Dynamics IT
Academic Members
Christopher Newport University
College of William & Mary
Eastern Virginia Medical School
George Mason University
James Madison University
Naval Post Graduate School
Norfolk State University
Old Dominion University
Tidewater Community College
University of Virginia
Virginia Center for Innovative Technology
Virginia Commonwealth University
Virginia Polytechnic Institute and State University (Va. Tech)
San Diego City College

Government Members
Defense Modeling and Simulation Office
Army Capabilities Integration Center
Air Force Agency for M&S
Air Force Operational Plans & Joint Matters
Air Force Research Lab
Army Research Institute
City of Suffolk
Combat Direction Systems Activity NAVSEA (CDSA) Dam Neck
Commander Operational Test and Evaluation Force (COMOPTEVFOR)
Hampton Roads Economic Development Alliance
Hampton Roads Partnership
Hampton Roads Partnership
Joint War Fighting Center
Military Traffic Management Command - Surface Deployment and Distribution Command
- Transportation Engineering Agency (SDDC-TEA)
NASA Langley Research Center
Supreme Allied Commander Transformation
US Joint Forces Command
Va. Beach Police Dept.

Industry Partners
ALION Science & Technology / BMH Associates
Analytical Mechanics Associates, Inc.
The Boeing Company
Booz-Allen & Hamilton, Inc.
C2 Technologies, Inc.
Continental Realty Services
DDL Omni Engineering, LLC
Earworks Media
Evidence Based Research, Inc.
General Dynamics – (AIS / Veridian)
General Dynamics - IT (GDIT)
Liberty Property Limited Partnership
Lockheed Martin Center for Innovation
MYMIC LLC
Northrop Grumman
SAIC
SESI, Inc.
SIMIS
SyColeman Corporation, L3COM
Tidewater Technology Group
Ultra Technologies, Inc.
Visense
WernerAnderson, Inc.
Whitney, Bradley & Brown Inc.

**In-Kind Membership**
Aegis Technologies / Pitch AB
Agent Oriented Software, Inc.
BreakAway, Ltd.
Brooks Automation
Collabworx
Global Information Systems Technology, Inc. (GIST)
Hewlett Packard Company
MAK Technologies
MultiGen - Paradigm
Pelican Technologies & Solutions
Rockwell Software, Inc.
SEPATON, Inc.
Systematic Software Engineering
Terrain Experts, Inc. (TERREX)
Virtools Canada, Inc.
VITECH Corporation
VRCO, Inc.
Engenuity Technologies, Inc.
APPENDIX 4
ARMY WAR COLLEGE FELLOWS

2000  LTC Neil Johnson
2001  LTC George Smith
2002  Major Karl Neal
2003  LTC Sandi Dittig
2004  LTC Michael LoQuasto
2005  LTC Jerry Wood
2006  LTC Mark Strong
2007  LTC Anthony Abbott
Selling Simulation

By Roland Mielke

It’s been a long day. You’ve spent most of your time in meetings, reviewing promotional materials and statistical reports and talking on the telephone to several economic development directors. And still your desk is covered with paper. You’re eyeing the clock and it’s already inching past 7 o’clock. You sigh: tonight’s dinner doesn’t look like it will get here anytime soon.

You’ve been preoccupied because as marketing director of a major American company, you’ve been charged with finding a site for a new business center. Your bosses have told you it should be somewhere in the mid-Atlantic region; Maryland, Virginia and Delaware were several states mentioned. So you’ve spent the past few weeks hunting for just the right site. You’ve been courted by economic development staffers from a dozen cities and you think you’ve put on a few extra pounds from all the good lunches to which you’ve been treated. Now it’s decision time. Are you ready to make your best and final recommendation to the higher-ups?

One presentation does stick in your mind. One of your visitors from southeastern Virginia presented you with a computer CD-ROM. You slide it into your notebook PC, and voila: a visual tour of a three-dimensional model of the site proposed for your company. It’s a parcel within an as-yet-undeveloped commerce park, accurately modeled using data from the city’s Geographical Information System and detailed architectural renderings of proposed entrance structures. Using a pull-down menu system and drag-and-drop mouse commands, you’re able to become an instant architect by placing buildings, roads, parking lots and even landscaping to gain a feel for your intended business center. Using the mouse as a steering wheel, you can drive through the commerce park to view your virtual business center from every possible angle and perspective.

With another simple command, you soar skyward to view the entirety of Hampton Roads. You immediately see the location of your business center in relation to shipping ports, airports, major highway systems and other major centers of commerce. With still another click of a button, the availability of water and sewer connections, electrical and communication services, and other necessary utilities is displayed.

Hey, not bad, you tell yourself. This could be it. Maybe dinner won’t be as late as you thought.

Virginia’s First Commercial Simulation Center

Sound futuristic? Not to those of us working at the Virginia Modeling, Analysis and Simula-
VMASC is a cooperative venture between business, government and academia, including a consortium of Virginia universities. Their collective goals are to transfer new simulation technology between the U.S. Department of Defense and civilian organizations, and to use simulation technology to develop business applications and promote regional economic development. The Center is administered by Old Dominion’s College of Engineering and Technology and is sponsored jointly by the University, the Department of Defense, the Commonwealth of Virginia, and the City of Suffolk.

Old Dominion’s College of Engineering and Technology is developing a graduate program in simulation, which will be offered to students by fall 1998. VMASC will support this program, as well as similar programs at other state universities, by providing faculty and students opportunities to apply their expertise and research findings in the real-world laboratories of industry and government organizations.

As the first organization of our kind in the state, we find ourselves in an enviable location. Hampton Roads has become this country’s center for the military application of computer simulation technology. The region contains three major military training and education centers: the Joint Training, Analysis and Simulation Center (JTASC), the Joint Warfighting Center (JWFC), and the Armed Forces Staff College.

In addition, Hampton Roads is home to the major service doctrine commands and numerous operational commands, all of which use state-of-the-art computer simulation techniques for training, evaluation, and operations planning and management. By simulating battles and exercises on a computer, instead of using actual tanks, planes and ships, the military saves time and millions of dollars in resources. At VMASC we intend to leverage this same technology for use by the business world.

**On The Near Horizon**

Although the Center opened in July 1997, in less than a year three projects are already in progress. In addition to the venture with the City of Portsmouth, VMASC is working with the U.S. Army’s Military Transportation Management Command to develop a series of eight simulation packages to plan the movement of troops and equipment to points of crisis anywhere in the world. One of these simulations, PORTSIM, is designed to predict the movement of military cargo through a seaport. VMASC scientists and engineers are enhancing the capabilities of PORTSIM by modeling the effect of commercial cargo flow on the handling and processing of military equipment and supplies.

A third project, funded by the Lockheed Martin Corporation, involves the development of new and more efficient methodologies for specifying the behavior of what computer scientists call “objects”: computer models of real-world entities. The results of this project should reduce the time and effort required to develop new computer models.

A number of other potential projects are in the discussion or proposal stage. VMASC is working with several large manufacturing companies to define simulation tools to capture the product distribution process. These tools will permit decision makers to ask “what if” ques-
tions designed to improve customer service and reduce distribution costs.

We are in discussions with a major operator of theme parks concerning customer-flow simulation as a tool to reduce time spent in lines. We are also proposing the development of a simulation exercise to train local government officials for emergency preparedness, and a simulation to assist the Virginia Department of Mental Health to implement a new and more uniform process for managing publicly funded health care.

Down The Simulation Road

VMASC envisions a future in which desktop simulation tools are as common as word processing, spreadsheet and database tools are today. These tools will be based on networked, business-enterprise models supported by readily available and accurate databases that can be quickly and easily updated with satellite and map data available over the Internet. These simulations will provide the user with tremendous new capabilities for interactive decision making and team-centered training and rehearsal.

VMASC has the capability to develop and apply prototype enterprise business models. Enterprise models capture at the macro-level the salient features and processes of a complex business. These models are used to construct computer simulations that assist decision makers to better understand the current business climate and to investigate the options available for action.

VMASC wishes to adapt and apply this exciting new simulation technology in the commercial business sector. Today’s commercial simulations primarily are highly focused process simulations, which are used mainly for diagnostic purposes. Generally, they are constructed for stand-alone applications and are not able to exchange data with other similar simulations. When applied to training, the simulations tend to be limited to a single user on a single computer.

Tomorrow’s simulations will capture the entire complexity of a given business operation. The simulations will be constructed to standards that will allow several models, running on different hardware platforms, to work in unison. They will also allow multiple users, perhaps separated by great distances, to exchange information and to interact with one another as if they were all part of the same simulation. All this, and they will play on ordinary, networked personal computers.

Because the primary mission of VMASC is economic development, each VMASC project will include two commercial partners: an application partner and a technology partner. An application partner is the endpoint customer, the company for which a prototype simulation tool is being developed. This partner defines the project requirements and then evaluates the final product. A technology partner is a company that participates with VMASC in the development of a prototype simulation tool. This partner brings to the table project tools, expertise or manpower.

At the project conclusion, the application partner has gained a new management tool to help provide a competitive advantage in the marketplace. The technology partner has acquired new expertise, software, or possibly even a new product. Regional economic development occurs because of the additional jobs and investments due to the expanded market sector of the technology partner and the competitive advantage gained by the application partner.

VMASC’s mandate is to help commercial business utilize the exciting new simulation technology now being developed for the military using our tax dollars. Our goal is nothing less than to make Hampton Roads and Virginia this country’s epicenter for the commercial application of computer simulation technology.
APPENDIX 6
QUEST SUMMER 2002 CAN COMPUTER SIMULATION AID PHYSICAL THERAPY

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Med School 1.0: Can Computer Simulation Aid Physician Training?

By Bowen Loftin

The public perception of medicine in the United States is one of high technology brought to bear on the diagnosis and treatment of disease. That perception is partially accurate, but it does not extend to the education and training of the medical practitioner. The Virginia Modeling, Analysis and Simulation Center (VMASC), one of Old Dominion’s Enterprise Centers within the University’s College of Engineering and Technology, in collaboration with Eastern Virginia Medical School (EVMS) and other organizations, is involved in enabling the use of modeling and simulation technologies in the production of the next generation of doctors, nurses and other medical professionals.

“See one, do one, teach one.” This simple set of phrases has characterized medical education and training for over 4,000 years. Today’s physician is largely the product of an apprenticeship program that uses patients in hospitals as the primary elements of the “classroom.” Little changed in the past century to affect this traditional process. During this same century, however, we saw both the invention of the airplane and the maturation of flight simulation as the primary training tool for the aviator. Today, every commercial pilot masters a new aircraft in simulation. We have reached the point where the best flight simulators are virtually indistinguishable from the real thing. VMASC and its partners are committed to moving the field of medical education and training into at least the 20th century equivalent of flight training — and, hopefully, beyond.

The foundations of medical modeling and simulation have been laid down over the past 30 years. A major impetus in transferring modeling and simulation technology to the medical field has been the U.S. military. During the Gulf War, Col. Richard Satava, MD, realized that many of the medical personnel under his command — largely reservists recalled from their civilian practices for the war — had little recent experience treating the type of casualties typically found in war. Fortunately, the Gulf War was an almost bloodless one for the United States. Col. Satava, however, returned home convinced that the same approach to training fighter pilots and tank crews for the Gulf War should be adapted to training (and refreshing) military medical personnel. Ultimately, the Defense Advanced Research Projects Agency and, more recently, the U.S. Army Medical Research and Materiel Command developed extensive programs to create the needed technologies.

Transforming Medical Study

During 2001, VMASC and EVMS established the National Center for Collaboration in Medical Modeling and Simulation. The center was officially named by the 107th Congress as part of...
the 2002 Defense Appropriations Bill. Other partners include the Naval Medical Center Port-
mouth and the Uniformed Services University of the Health Sciences.

The ultimate goal of this new center is to completely transform the way in which medical
personnel are educated and trained. We envision the day when a medical student interviews
a “virtual” patient and proceeds to perform a physical examination of that patient. The virtual
patient — a single example of a large range of human anatomical and physiological vari-
ability — will nevertheless replicate the many injuries and diseases that the student should
encounter while training. The availability of this approach to medical instruction will reduce,
if not eliminate, the need for animal models and real patients that are the basis for preparing
today’s medical professionals.

The starting point for our development of medical modeling and simulation is the creation
of models of human anatomy. During the 1990s, the National Library of Medicine estab-
lished the Visible Human Project, an effort to digitize a complete human male and female.
To accomplish this task, a male and a female cadaver were acquired, completely scanned
via X-ray and Magnetic Resonance Imaging, and then frozen. The frozen bodies were then
thinly sliced, from head to toe, and the slices carefully photographed in high resolution. The
resulting images were used to assemble three-dimensional models of both cadavers. Finally,
anatomists carefully classified the different tissues, organs and structures in each of the two
bodies. These two datasets are publicly available and have been incorporated into many
products for anatomical study.

Much, however, remains to be done. These two subjects are but two examples representing
a vast range of human size and anatomical differences, and yet have taken millions of dollars
and many years of work to produce. VMASC has, for a number of years, been developing
methods to accelerate and, ultimately, automate the generation of three-dimensional mod-
els of human anatomy from patient-specific data. Once these techniques are in place, the
production of the many hundreds of models needed for medical training will be significantly
faster and cheaper.

Judging Competency

An anatomical model is only the beginning. We must also model the physiological behavior
of the anatomy so that disease and injuries can be accurately depicted and so that a physical
examination of the anatomy can be supported. In other words, the student must be able to
prod, pull, puncture, cut and squeeze the tissues. This is an extremely difficult task because
each of our tissue types can behave very differently.

Consider, for example, the difference between skin and bone. Today, we can build phys-
ics-based models that can produce “real” behavior, but these models cannot be computed
quickly. Clearly, when these models are used for training, they must be able to respond to
stimuli immediately. In order to accomplish this “real time” response, VMASC has been devel-
op ing hybrid models that use both physics and empirical data from real tissues in order to
accurately produce a simulacrum of physical reality.

VMASC has also undertaken the assembly of these models into complete simulations. This
step involves the integration of software with hardware that provides three-dimensional
visual displays, the ability to touch and feel the models, and interfaces for communication
between the simulator and the trainee. Such interfaces include not only typical computer
menus, but also interaction through the recognition and production of speech. Finally, and
perhaps most importantly, we must evaluate the true utility of these simulations in perform-
ing training.
Will students using these simulations be equipped as well as or better than students using animal models and real patients for training? To answer this question, Old Dominion faculty from the Department of Psychology have joined the VMASC team and will work with both medical students and residents at EVMS, the Naval Medical Center Portsmouth and the Uniformed Services University of the Health Sciences. The physicians from these institutions will be the final judges of the degree to which the simulations are successful.

The new center formed by VMASC and EVMS is assuming a leadership role in transforming medical training from its centuries-old reliance on apprenticeship training to one based, in large measure, on modern modeling and simulation technologies. We are convinced that this transformation will result in significant improvements in the quality of and access to health care in the 21st century.
The fortuitous happened during the summer of 2005 when Col. Michael McGinnis, 51, began planning out his Army career at the same time that Old Dominion University’s Virginia Modeling, Analysis and Simulation Center (VMASC) began searching for a new executive director.

A key figure in Army modeling and simulation programs, when he learned about the VMASC job last summer, he eagerly sought the opportunity to begin his private sector career at one of the nation’s most prestigious modeling and simulation facilities, he said. He accepted the job in November, and he will come to VMASC in June after he has completed the academic year at West Point and retired from the Army.

“When I retire, I will have spent half of a 29-year military career leading high-technology, cutting-edge organizations doing modeling and simulation,” he said. “This is a very good fit for me.”

ODU President Roseann P. Reiner agreed. “Col. McGinnis has broad experience in research, teaching and academic leadership. He has been an effective team and program builder. He is a highly reputable engineer in the fields of modeling, simulation, analysis and visualization,” she said.

“We are proud of the accomplishment of VMASC, the fine work of bowls Loftin and Roland Mielke, and all the support we received from the Army leadership,” she continued. “We are pleased to announce the appointment of Col. Michael McGinnis as the executive director of VMASC, which is an integral part of a Hampton Roads modeling-simulation and visualization cluster of industry, government and academic entities focused on military and commercial applications. Many of the applications involve training, experimentation, and decision making under realistic simulated conditions. Others involve testing of strategies and equipment. In partnership with economic development organizations, VMASC is a Catalyst for $500 million per year in regional economic activity.

Since 1997, when it was founded, VMASC has been an integral part of a Hampton Roads modeling-simulation and visualization cluster of industry, government and academic entities focused on military and commercial applications. Many of the applications involve training, experimentation, and decision making under realistic simulated conditions. Others involve testing of strategies and equipment. In partnership with economic development organizations, VMASC is a Catalyst for $500 million per year in regional economic activity.

McGinnis has been a systems engineering department head at West Point for the last six years, and during that time has been a regular member of official U.S. delegations to international symposia involving computer simulations. In 2002-03 he directed a task force for the secretary of the Army that used modeling and analysis to reexamine the way the Army builds and deploys combat brigades.

As director in 1997-99 of the Army Training and Doctrine Command (TRADOC) Analysis Center in Monterey, Calif., McGinnis built a remarkable research program and gained an international reputation in advanced computer simulation. He gave a keynote speech on Emerging
Trends in Modeling and Simulation Technologies as a conference of 400 engineers and scientists in Australia in 1998. Under his leadership, reimbursement research in systems engineering at West Point increased from $500,000 in 1999 to $3 million in 2005, and he was credited for expanding the institution’s research partnerships with both the Department of Defense and private industry.

He has served on a National Council of Sciences committee looking into the future of modeling and simulation and said he had been impressed by the work of VMASC researchers and academicians. “I am humbly and honored to have been chosen” to lead VMASC, McGinnis said. The center is “already very well positioned as a leader in these fields. A lot of credit must go to the people who are at VMASC now, and I hope that we can keep this team together.”

Mohamad A. Karim, ODU’s vice president for research, said he and other who interviewed candidates for the job were influenced by McGinnis’ academic background and the special projects he has directed for the Army. “Col. McGinnis brings strong leadership experience in modeling, simulation and visualization, as well as systems engineering,” Karim said.

McGinnis, who grew up in the small farming community of Winterset, Nebraska, graduated from West Point in 1977. He holds master’s degrees in applied mathematics and operations research and statistics (1986) from Rensselaer Polytechnic Institute, a master’s in national security and strategic studies from the U.S. Naval War College (1996) and a doctoral degree in systems and industrial engineering from the University of Arizona (1994).

Richard Whalen, the retired Navy captain who is Old Dominion’s director of military activities, said the selection of McGinnis should “enhance the strong ties VMASC has enjoyed with the U.S. military.” He noted the colonel’s service as an artillery officer and added, “I’m especially delighted that the university is adding yet another seasoned leader at VMASC whose military career included significant warfare specialty experience, as well as distinguished academic and research achievements.”

“Col. McGinnis is eminently qualified to be executive director,” said Robert R. Harper Jr., a Northrop Grumman Mission Systems executive who chairs the VMASC advisory board. “Industry partners of VMASC look forward to working with him. This is a positive step for VMASC and ODU as we move forward in this region with modeling and simulation.”

Emergency Management Training, Analysis and Simulation Center (EMTASC), which is being housed in VMASC in Suffolk until its own facility is constructed. EMTASC was created in August by then Virginia Gov. Mark R. Warner. It will use modeling and simulation in support of homeland security and other emergency-response management functions.

Earlier this year, Warner authorized $1.45 million in state funds to spur growth of modeling and simulation in Hampton Roads. A recent study commissioned by VMASC predicted that the initial economic impact of these technologies could grow from about $500 million in 2005 to $1 billion over the next five years.

VMASC headquarters are in a rented building in northern Suffolk and “VMASC East” facilities are on the ODU campus in Norfolk. The university announced in January that an $11.6 million building for VMASC will be developed just north of the Interstate 664 corridor, about two miles from the current headquarters. The facility is expected to be built by fall 2007.

The northern Suffolk “Sim City” also is home to the Department of Defense’s Joint War Fighting Center (JWFC) and the Joint Battle Center (JBC), co-located in the U.S. Joint Forces Command’s Joint Training, Analysis and Simulation Center (JTASC).

Companies that are involved in modeling and simulation in “Sim City” on ODU’s campus in Hampton Roads include all of the larger defense contractors as well as many specialized small- and medium-sized companies. Among them are Lockheed Martin, Northrop Grumman Mission Systems, General Dynamics Advanced Information Systems, Boeing, Raytheon, CACI, Alion Science, Lockheed Enterprises, DDL, Omni, Warner-Anderson and BMN Associates. VMASC manages the ODU master’s and doctoral programs in modeling and simulation. In 2003, the university became the first institution in the country to award a doctorate in the field. Currently, 66 master’s students and 34 doctoral students are enrolled in the graduate modeling and simulation programs. The VMASC research and administrative staff and affiliated university faculty members number about 65.

Looking ahead, McGinnis said, “We must find ways to challenge our students to require them to apply what they have learned in the classroom about humanities, sciences, mathematics and engineering to solving real-world problems. These problems exist today and are what ODU graduates will encounter throughout their professional careers.”
HB 2030 Modeling and Simulation Advisory Council; created. 2007 Session John A. Cosgrove

Summary as introduced:

Modeling and Simulation Advisory Council; created. Creates the Modeling and Simulation Advisory Council to advise the Governor on policy and funding priorities to promote the modeling and simulation industry in the Commonwealth.

VIRGINIA ACTS OF ASSEMBLY -- CHAPTER

An Act to amend the Code of Virginia by adding in Chapter 26 of Title 2.2 an article numbered 32, consisting of sections numbered 2.2-2698 and 2.2-2699, relating to the Modeling and Simulation Advisory Council.

[H 2030]
Approved

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding in Chapter 26 of Title 2.2 an article numbered 32, consisting of sections numbered 2.2-2698 and 2.2-2699, as follows:

§ 2.2-2698. Modeling and Simulation Advisory Council; purpose; membership; chairman.

A. The Modeling and Simulation Advisory Council (the Council) is established as an advisory council, within the meaning of § 2.2-2100, in the executive branch of state government. The purpose of the Council shall be to advise the Governor on policy and funding priorities to promote the modeling and simulation industry in the Commonwealth.

B. The Council shall consist of 13 members as follows: three legislative members of the House of Delegates and two citizen representatives of the modeling and simulation industry to be appointed by the Speaker of the House of Delegates; one legislative member of the Senate and one citizen representative of the modeling and simulation industry to be appointed by the Senate Committee on Rules; three citizen representatives of the modeling and simulation industry to be appointed by the Governor; the Secretary of Technology and the Secretary of Commerce and Trade or their designees; and the Executive Director of the Virginia Modeling, Analysis and Simulation Center.

Ex officio members shall serve terms coincident with their terms of office. Other members shall be appointed for a term of two years and shall be eligible for reappointment.
C. The Council shall elect a chairman and a vice-chairman annually from among its membership. A majority of the members shall constitute a quorum. The Council shall meet biannually and at such other times as may be called by the chairman or a majority of the Council. Staff to the Council shall be provided by the office of the Secretary of Technology.

§ 2.2-2699. Powers and duties of the Council.

The Council shall have the power and duty to:

1. Advise the Governor on funding priorities for modeling and simulation programs at the Commonwealth's institutions of higher education.

2. Develop policy initiatives and advise the Governor on strategies to promote the modeling and simulation industry in the Commonwealth.

3. Advise the Virginia Economic Development Partnership regarding (i) attracting new modeling and simulation businesses to the Commonwealth and (ii) assisting the development of the Commonwealth's existing modeling and simulation industry.

4. Develop recommendations in conjunction with the Virginia Economic Development Partnership on how to market the Commonwealth's modeling and simulation capabilities to all businesses and industries, especially those not fully utilizing modeling and simulation applications.

5. Develop recommendations that will assist in making Virginia a national leader in the modeling and simulation industry.

http://leg1.state.va.us/cgi-bin/legp524.exe?071+ful+HB2030ER