Exhibit R-2a, RDT&E Project Justification							Date February 2003	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				**PROJECT NAME and NUMBER** Joint Wargaming Simulation Management Office **PE 0603832D8Z**				
	FY2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Cost ($ in millions)	46.104	46.337	44.887	46.075	46.558	47.161	48.875	49.870
Total Program Element (PE) Cost Joint Wargaming Simulation Management Office	46.104	46.337	44.887	46.075	46.558	47.161	48.875	49.870

(U) A. Mission Description and Budget Item Justification: DoD Directive (DoDD) 5000.59 established the DoD modeling and simulation (M&S) Joint Wargaming Simulation Program. It required the Department to improve its oversight, coordination, responsiveness, and communication of DoD M&S by investing in, and promoting the enhancements of DoD M&S technologies. These technologies were to support Service and Joint operational needs, accelerate the acquisition process, establish standards and protocols promoting reuse of M&S components while maintaining commonality in their usage. Further non-technical requirements in DoDD 5000.59 are to develop a DoD M&S Master Plan with a supporting investment plan; policies and procedures for the validation, verification and accreditation (VV&A) of DoD M&S; designate DoD M&S Executive Agents; establish a Defense Modeling and Simulation Office (DMSO) and establish a M&S Information Repository. DMSO is responsible for developing the DoD modeling and simulation infrastructure (standards, tools, methodologies, etc.) that meet the Department's requirements from Joint Warfighting usage across the domains of analysis, acquisition, training, experimentation, and operations. To accomplish this DMSO stimulates activities for Service cooperation, coordination, and consolidation of effort; establishes interoperability policy, standards and protocols; VV&A policy leverages the expansion of science and technology; and promotes the appropriate use of M&S within the Department. This Program element specifically facilitates cost-effective M&S utilization across the Department through: common technical framework for M&S which enables interoperability with other systems; timely delivery of the natural environment and common authoritative representations; oversight of authoritative representations of systems and human performance; M&S policy and guidance to meet M&S end-user needs; and a means to share the benefits of M&S.

(U) C. Other Program Funding Summary: Not Applicable

(U) D. Acquisition Strategy: Not Applicable

(U) E. Major Performers: Not Applicable.

	Exhibit R-2a, RDT&E Project Justification							Date: February /2003
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number: Joint Wargaming Simulation Management Office PE 0603832D8Z Joint Programs				
	FY2002	**FY2003**	**FY2004**	**FY2005**	**FY2006**	**FY2007**	**FY2008**	**FY2009**
Joint Programs	5.051	4.310	3.861	3.364	2.934	2.972	3.422	3.441

U) A. Mission Description and Budget Item Justification: The Joint community and Services require infrastructure tools to allow their separate models and simulations to effectively operate in a common interoperable environment. The Joint Programs project ensures DMSO standards and products support the full spectrum of simulation users while promoting interoperability through all technical areas. It also enriches the support tools of the DoD analysis, acquisition, training, experimentation, and operations communities. This project transitions M&S capabilities into major Joint Programs of record, and drives commercialization of the Runtime Infrastructure (RTI). The Joint Programs supports the integration of the RTI into the Joint Simulation System (JSIMS) as well as provide interoperability to the JFCOM/JWFC efforts. This project provides M&S assistance to major Joint and Service customers to assist with their understanding and use of High Level Architecture (HLA) and verifies HLA tools and components, and Synthetic Environment Data Representation Interchange Specification (SEDRIS) specifications.

(U) B. Accomplishments: Through investment from the Joint Programs effort, the High Level Architecture, established as a standard by the Institute of Electrical and Electronics Engineers (IEEE) in 2000, served as the enabling technology for the following Joint and Service Programs:

Experimentation. the ability to explore new tactics and doctrine. DMSO provided expert technical and policy assistance to JFCOM to use the HLA effectively and is expected to be the enabling technology supporting continued experimentation. Specifically, new capability provided errorless joining and departure of simulations from the Federation during execution, a capability needed by a number of other programs.

Joint and Coalition Force Training. DMSO provided several critical components to the Combined Forces Command's (Korea) Ulchi-Focus Lens including the ability to initialize simulations rapidly to support the operational tempo of the exercises and the first instance where the HLA was used to link US legacy simulations with new coalition capabilities (in this case Korean simulations).

Joint Training. While the final disposition of the Joint Simulation System (JSIMS) is unknown, DMSO at the request of OSD provided the needed infrastructure for the successful execution of the test event in 2002.

Experimentation. JFCOM used the SEDRIS-developed SEE-IT tool as the only means of examining the various databases in the MC02 event for errors, discontinuities and discrepancies that could halt or invalidate the operation of the overall simulation. DMSO also supported a limited VV&A process for MC02.

(U) Planned Program FY03-06:

(U) Transition the Development Agent (DA) for Runtime Infrastructure (RTI) for JSIMS to multi-service simulation training programs. Continue to assist in the RTI performance assessment and testing within the JSIMS program as requested by OSD. Support advanced distributed simulation exercises, and increase HLA RTI optimization and performance to meet warfighter needs. Partner with JFCOM or the Services to develop prototype software to work in concert with the RTI, that addresses security gateway issues among different levels of classified simulations within JSIMS.
(U) The CINC/Service program will support fielding of the JTLS-JCATS interface during appropriate JFCOM exercises during FY03. The program will also

support fielding of the CJ21-JTC interface during UFL03. Finally, the program will continue to support CINC/Service M&S needs and initiatives as appropriate.
(U) Develop DoD M&S Implementation and Investment Plans for execution of DoD M&S goals and objectives in concert with individual Service efforts.
(U) Complete development and implementation of the HLA RTI Certification test suite and the Federation Compliance Test Suite for use by JSIMS, JFCOM/JWFC, and other simulation efforts within the Services.

(U) C. Other Program Funding Summary: Not Applicable

	Exhibit R-2a, RDT&E Project Justification						Date: February 2003	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number: Joint Wargaming Simulation Management Office, PE 0603832D8Z Transformation				
Cost ($ in millions)	**FY2002**	**FY2003**	**FY2004**	**FY2005**	**FY2006**	**FY2007**	**FY2008**	**FY2009**
Project Name /No./Subtotal Cost Transformation	4.300	5.144	5.297	6.267	7.403	7.640	8.505	8.728

(U) A. Mission Description and Budget Item Justification: Transformation Initiatives focus on providing the Department of Defense with the next generation of M&S tools and representation of the content of military operations needed to achieve the goals set out by JV2020, Quadrennial Defense Review (QDR), and Transformation objectives. The operators and acquisition community need M&S tools to meet changing requirements, analyze alternatives, develop CONOPS for new systems, develop and test new systems, and once they are fielded, to train using these new systems. Acquisition and operations are moving from the platform-centric paradigms into new network-centric and capabilities-based warfare. The way we develop, buy, train, and support the new systems, must also change. DMSO investments in transformation are directed at developing consistent architectures and interoperable components to create composable mission space environments from simulations, as the Services evolve their specific personnel and equipment transformation support programs. Service and Joint programs involved in DMSO's efforts to enable transformation include: collaboration with Joint Synthetic Battlespace (JSB, USAF), Joint Virtual Battlespace (JVB, USA), Fleet Battle Experiments (FBE, USN), Marine Air to Ground Task Force (MAGTF) Expeditionary Family of Fighting Vehicles (MEFFV, USMC) and Joint Experimentation (DCEE, JFCOM/JWFC.

(U) **B. Accomplishments:** While focused on simulation programs that support Service Transformation efforts, this program also brought to successful conclusion the Smart Sensor Web initiative in AT&L that had been floundering. In addition, DMSO investment prevented two Service programs with related aims from taking paths that would have prevented their outcomes from functioning together. The following capabilities were delivered:
a. For Air Force's Joint Synthetic Battlespace, material encoding standards and Electro-optic and infrared sensor federate specification to be used by Army.
b. For Army's Joint Virtual Battlespace, common descriptors in the Federation Object Model in the HLA for an aerial common sensor and future combat systems communications, both of which will be used by Air Force.
c. Provided VV&A documentation to the JDEP program stemming from prior efforts in VV&A with the Services.

(U) Planned Program FY03-05:
(U) Cost effective and responsive application of M&S to Service Transformation programs requires the appropriate integration of emerging commercial capabilities as well as the introduction of DoD-specific technologies. Plans are in place to continue with the application of advanced information technologies to the interoperability problems that exist and continually emerge because of the expanding application of M&S. Technologies targeted for application include: advanced time management techniques, HLA in next generation internet, mobile computing environments, high performance computing platforms, intelligent agent technologies, and the use of component architecture principles from software and hardware developments, to support implementation within evolving warfighter requirements.
(U) One of the limiting factors in creating composable mission space environments is the inability to compose these needed environments quickly, especially when specifying military operations. This project will incorporate knowledge acquisition tools for rapid military operations content composition for composable mission-space environments.
(U) Current M&S efforts are somewhat composable, but only within a limited set of options. The lack of data to analyze the applicability of components to a particular mission space, and the lack of automated tools with which to assess the risk associated with component use in a particular context is a hindering factor. In order to mitigate this problem, this project will expand M&S tool sets to include analysis of trade-spaces when building simulated mission space environments, analysis of alternative technologies, rapid scenario development, and data discovery about current/future M&S efforts.
(U) A proven set of M&S standards, common tools and processes, is the key to ensure responsive composability for Service M&S support programs, and to allow seamless multi-Service integration. As new technologies are found to be helpful in composing mission space environments, DMSO will support the

integration of experimentation results into Service efforts, and develop tools to ensure the Services build the composable environment in a consistent, non-stovepipe, standardized manner and demonstrate it meets user requirements.
(U) For the Service education and training community learning, followed by doing, is an effective and highly desired state of knowledge transmittal. As M&S components are developed for system development, analysis, and operations, efforts will be undertaken to ensure that they are reused for education and training. As the composable standards and processes improve, DMSO will continue to improve the capability to provide simulations (perhaps even those used in system development) as additional learning assets in new system training.

(U) C. Other Program Funding Summary: Not Applicable

	Exhibit R-2a, RDT&E Project Justification						Date: February 2003	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number Joint Wargaming Simulation Management Office PE 0603832D8Z Asymmetric Warfare and Homeland Defense				
ost ($ in millions)	**FY2002**	**FY2003**	**FY2004**	**FY2005**	**FY2006**	**FY2007**	**FY2008**	**FY2009**
Project Name /No./Subtotal Cost Asymmetric Warfare and Homeland Defense	5.300	7.461	6.015	7.465	7.124	7.216	7.332	7.232

(U) A. Mission Description and Budget Item Justification: Modeling and Simulation affords decision makers the use of Course of Action (COA) analysis tools to wargame the best response before committing to action. Modeling and Simulation aids in understanding unconventional threats by predicting human behavior and developing decision support tools. The key is to detect and identify the threat before the threat becomes reality. Improved information operations through computational models and social science theory allow commanders to shape engagement without force. The Asymmetric Warfare focus provides the unit order of battle toolset to Combatant Commanders and Federal agencies to begin modeling capabilities of quasi-military and rogue state terrorist organizations of interest. It also promotes the federation of the Joint Combat and Tactical Simulation (JCATS) and the Diplomatic and Military Operations in a Non-Warfighting Domain (DIAMOND) to provide M&S to OOTW mission areas and other areas like Joint Forces in Urban Operations. It supported the integration of JCATS with the Joint Theatre Level Simulation (JTLS), coupling the faster than real time simulation for rapid execution to the individual view of the battlefield in JCATS. The Mout Course of Action Training Tool (MCATT) and First Responders Situation Awareness Tool (FiRST) couple simulation capability with advanced graphics to provide a planning environment for operational forces or for first responders in any crisis situation where urban operations are a critical component. Every effort is being made to transition these DoD capabilities to the forces responsible for Homeland Defense.

(U) B. Accomplishments: The work for FY02 focused on the completion of proof of concept efforts to the point where primary users capable of sustaining them could receive them in FY03.

a. JTLS was integrated with JCATS and is being finalized in FY03 for delivery to JFCOM for continued use.

b. The Flexible Asymmetric Simulation Toolkit (FAST) was integrated with the British model DIAMOND which provides capability for simulating behaviors that include multiple sides in changing relationships common when military forces interact with local governmental and non-governmental organizations.

c. New visualization and 3D modeling techniques were coupled with the JCATS simulation to provide mission rehearsal and planning capability for operations in urban areas. A version of this tool was delivered to the USMC prior to deployment in the Middle East. NIMA and NSA are also interested in using and enhancing it for their own use.

d. The same tool was modified with communications capability for the New York City Police Department in the wake of 9/11. It provides situation awareness in the urban jungle and adds the capability to track rescue workers through individual tracking devices.

e. The Joint Operations in Urban Synthetic Terrain (JOUST) was initiated.

(U) Planned Program FY03-06:

(U) The FY03 investment in this area has been increased in response to the increased number of asymmetric contingency scenarios that surfaced in the aftermath of 9/11. Working closely with DoD and federal intelligence, Homeland Defense, law-enforcement, transportation, and emergency response organizations; develop models for the range of terrorist and other unconventional actions that use unrestricted, unlawful or inhumane Rules of Engagement (ROEs) (e.g., targeting civilians, economic centers, information systems, and religious/symbolic icons). Develop military tactical and para-military M&S that can incorporate unconventional ROEs to respond to these threats, as well as approaches for planning, rehearsal, and training for emergency responses to successful threat actions. Demonstrate, within a synthetic environment, the utility of these M&S military tactical scenarios and their transition to civilian usage. Provide the venue to train jointly from home Base, Post or Station by constructing a virtual environment enabling a

common operational picture across multiple services and platforms. The end state will be economical and efficient joint training, at multiple levels of fidelity and echelon, to both improve readiness and to validate TTPs. The future direction of this project will be responsive to the M&S needs of the DoD, the Department of Homeland Defense and NORTHCOM.

(U) C. Other Program Funding Summary: Not Applicable

	Exhibit R-2a, RDT&E Project Justification						Date: February 2003	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number: Joint Wargaming Simulation Management Office PE 0603832D8Z Technology Development				
Cost ($ in millions)	**FY2002**	**FY2003**	**FY2004**	**FY2005**	**FY2006**	**FY2007**	**FY2008**	**FY2009**
Project Name /No./Subtotal Cost Technology Development	20.959	20.664	20.736	20.022	20.022	20.183	20.430	21.145

(U) A. Mission Description and Budget Item Justification: In accordance with its mission to field DoD M&S technology that is critical to transforming the DoD acquisition and experimentation processes and following the guidance expressed in DoDD 5000.59, DMSO supports development of technology in the following areas: composable mission space environments readily available and adaptable for multiple uses, the representation and delivery of dynamic natural environmental information and their effects to simulations, the representation of human performance both in simulations themselves and as intelligent systems to function in the place of simulation controllers, and the linking of simulations to command and control systems for operational use in planning and mission rehearsal. Further, DMSO supports such technical development as is needed to create meaningful verification, validation and accreditation processes and to support implementation of the strategic vision for M&S across the Department. Underlying all of these technologies is the development of standards and protocols including common data models and the ability to use and influence the development of commercial standards in domains where it is not cost-effective of prudent for DoD to establish separate standards (for example, communications protocols and web standards). Continuing technology development is critical to the representation of a consistent, interoperable mission space that can be used in trade-space analysis, the analysis of alternative and evaluation of emerging technologies, doctrine and tactics for the full spectrum of military transformational initiatives. DMSO supports multi-year technology development programs that enable the creation of cost-effective, responsive M&S capabilities including: development of robust criteria for composable simulation systems, ability to define and represent the appropriate level of human performance and decision making, and the definition and development of jointly interoperable and composable mission spaces for use in acquisition, training, analysis, experimentation, and operations.

(U) B. Accomplishments:

(U) Composable Mission Space Environments. The High Level Architecture provided the means for linking simulations and passing data between them; however, achieving the goal of fully composable mission spaces necessitates the ability to transfer context or content between simulations. The few technical tasks remaining for the HLA are contained under this topic area as are efforts to provide intercommunication of content between diverse architecture and systems. Thus work with Advanced Distributed Learning (ADL) and web-based technologies was done in FY02 under Composable Mission Space Environments.

a. A critical capability for maintaining warfighter readiness is the ability to make simulation tools available for training in the distributed learning environment. DMSO developed the ability to link HLA compliant simulations to the Sharable Content Object Reference Model (SCORM) developed by Department's Advanced Distributed Learning (ADL) initiative. Following the successful demonstration of calling a simulation from an ADL module, DMSO commenced developing a training module for a new Army C4I system due for deployment in the Middle East. There was no other practical means for training Army personnel on a system being introduced during deployment.
b. Achieved IEEE approval for Federation Development and Execution Process as IEEE 1516.3
c. Established and initiated multi-service and industry technical interchange fora in three areas: state of the art of technical foundation for composable M&S, collaborative environments for composing and executing simulations and feasibility of an extensible M&S framework (XMSF) based on commercial rather than DoD standards (web based)
d. First demonstration of a web-based RTI which in combination with emerging communication protocols will be the basis for the next generation of simulations. XML (Extensible Mark-up Language) is emerging as the internationally accepted means of expressing content to the extent that the command structures in NATO (generic hub) are currently being translated into XML for use with command and control systems.

(U) Synthetic Natural Environment Representation: The ability to represent correctly military equipment and operations in a synthetic battlespace is dependent on representing the natural environment in which the operations take place. The Synthetic Environment Data Representation and Interchange Specification (SEDRIS) has developed a consistent terminology for describing the elements of the natural environment, a standard for coding that representation, a format for transmitting environmental data and a spatial reference model, all of which are currently in the process of being approved as international standards. This past

year has seen two of the SEDRIS components progress significantly toward acceptance by the International Standards Organization (ISO). The Integrated Natural Environment (INE) project is developing a capability for producing environmental scenarios; that is, the full complement of land, ocean, atmospheric and space data, consistent in time and space and of suitable resolution for supporting the underlying training, acquisition, analysis, experimentation, and operational scenarios. The SEDRIS capability makes possible the unambiguous specification and transfer of the environmental data. The Master Environmental Library (MEL) is a brokering system that permits users to access resources maintained by environmental data providers and determine the availability of data to support their needs. When data is not available, the Environmental Scenario Generator (ESG) provides the capability to collect and/or produce the environmental data required. The incorporation of security software into the MEL system in FY02 makes it fully compliant with SIPRnet and NIPRnet requirements and thus ready for full use. The INE project in FY02 stood up its initial "just in time" production facility. Based on experience in developing environmental scenarios (for Navy's Global Wargames and Fleet Battle Experiments, Air Force's Joint Synthetic Battlespace, and JFCOM/J9's Millennium Challenge 02) the new facility provides the ability to build environmental scenarios and immediately initiate the required data production process. Programs that have used the SEDRIS and INE capabilities include JSIMS, JWARS (PA&E and J8), Millennium Challenge, Joint Synthetic Battlespace, Joint Virtual Battlespace (Army), and Fleet Battle Experiments.

(U) Military environment representation: In addition to the natural environment, the composable synthetic battlespace requires a representation of military operations including command structures, usual military component groupings (formations, carrier battle groups, air wings), and military messaging. The Knowledge Integration (KI) program is a continuing effort to provide this information in a robustly defined, computable, and executable format to enable rapid scenario development and execution. The Army uses the Unit Order of Battle for both simulations and C4I systems, particularly in support of the Future Combat System's Command, Control and Communication (C3) project. Additionally, when the US forces had to reduce their footprint in Saudi Arabia, the KI program provided tools used to determine the appropriate reduction of space and personnel while maintaining required military capability.

(U) Integration of Simulations and C4I Systems: A key enabler in providing rapid course of action analysis capability is the direct connection of C4I systems with the simulation used to provide mission rehearsal and analysis. This program has initiated the instantiation of the High Level Architecture's (HLA) Runtime Infrastructure (RTI) into the Global Command and Control System (GCCS), the common environment for military command and control applications. By providing the RTI as a segment within the GCCS Common Operational Environment (COE), simulations can link directly to the databases used and updated within the military C4I structure. This technology is finding application through the Joint Programs and Asymmetric Warfare initiatives. Success stories reported by these programs include use by the Global Wargames and Chang-Jo exercises.

(U) Representation of Human Performance: Today's simulations lack the ability to provide a technically robust, computable representation of human decision-making and performance. Representation of agile, responsive threat behaviors, against which we train and analyze capability, depends upon investment in human performance representation technology. DMSO has contributed significantly to the current level of capability, which includes the incorporation of rule bases for military training and tactics into the representation of humans in military scenarios. Continuing effort is focused on the addition of affective behaviors (behavior motivated by fear, group dynamics and other emotive factors) to the inventory of representations. The affective behaviors are represented as "performance mediators" and are now ready for evaluation in the context of military scenarios. Additionally, non-linear and emergent behaviors have been investigated through the use of agent-based simulations. This capability in the form of a simulation structure called Machiavelli is being transitioned to the combined intelligence communities as a potential way to analyze concepts. Over the past year, DMSO investments produced the following accomplishments.

a. Demonstrated the ability to replace human operators in a simulation exercise with an intelligent tool capable of adjudicating performance more quickly and reliably than the human controller. The Intelligent Mission Controller Node (IMCN) was demonstrated as part of the Ulchi-Focus Lens Exercise in Korea where it was left operational because of its superior performance.
b. Collaborating test laboratories were established at Old Dominion University (with easy access to JFCOM), at the Institute for Creative Technology established by the Army at the University of Southern California and at an industrial site run by Microanalysis and Design.
c. The University of Pennsylvania delivered the initial demonstration of Performance Moderator Functions to DMSO. These affective behavior attributes (fear, fatigue, etc.) will be tested in the collaborating labs.
d. Modifications to the Commander's Behavior Module developed for Navy by CACI was delivered to DMSO as a computational framework in which diverse human performance models could be installed and tested.
e. Machiavelli, an effort partially supported by DMSO was transitioned by DMSO to the Intelligence community for use in experimenting with emergent behavior.

(U) Interoperability Frameworks for M&S: The High Level Architecture and its Runtime Infrastructure provides the ability to connect simulations and provide the transfer of data between them using standards to which any simulation developer can build. The establishment of an IEEE standard, IEEE 1516, backed by tools and verifications processes created the foundation for turning RTI development over to the commercial sector. By so doing, DMSO was able to provide the foundational work for the standard, have it accepted internationally, and then eliminate the maintenance costs for continued use of that standard. Programs using the RTI include major DoD simulations (JSIMS, Joint Semi-Automated Forces, Joint Experimentation Exercises, JVB, JSB) and international efforts among our NATO and TTCP allies.

(U) Planned Program FY03-06:

(U) Synthetic Natural Environment Representation: Production of environmental data is the beginning of making simulations appropriately sensitive to the environment. Reliable delivery of environmental data during execution must be established. Data distribution management for large environmental databases has been proven problematic. Establishing environmentally valid simulations requires that the effects of the environment on systems must be consistent across the simulations. Development of classes of environmental servers could address the need.

a. Develop expanded access to ocean environmental data.
b. Tie atmospheric data production to ocean and space data systems.
c. Increase participation of MSEA's with ultimate view of transitioning capability to operational production sites.
d. Establish interface with the operational Tactical Environmental Data System (TEDS) Services.
e. Establish baseline and versioning for OASES.
f. Explore data pull rather than data push architectures for delivery of large, dynamic databases.
g. Develop architectural framework for environmental effects servers.
h. Extend environmental data to sub-surface descriptions and effects.
i. Collaborate with industry and MSEA for terrain in establishing clear lines for responsibility for delivering components of terrain databases.

(U) Knowledge Integration (KI): The ability to assemble scenarios rapidly for execution requires the complete description of the military environment as well as the natural environment. The key activity in providing this capability is the Military Domain Representation Framework and the tools that provide transfer of information from the domain of the military analyst into that of the simulation developer. This initiative will explore the use of software technologies emerging from the Defense Advanced Research Projects Agency and from the research community so that the military environment can be represented by software components that are capable of self-organization and error detection. This will support the rapid development and use of software components that represent elements of the military domain such as the Unified Joint Task List and the Mission Essential Task List in the Defense Planning Guide Illustrative Planning Scenarios. Further, work will continue to extend the representation of the military environment into the C4I systems to enable rapid course of action analysis. Additional databases will be expressed under KI including selected DIA operations knowledge systems. As the KI products are developed they will be integrated with existing capability and tested in selected joint exercises and systems including the Global Information Grid (AF), Army Objective Force and C3 Driver, and Air Force Combined Air Operations Center.

(U) Integration of Simulations and C4I Systems: The continuing requirement for easily usable simulations for course of action analysis is the guiding factor for this technology area. Building upon capabilities developed through the integration of the RTI with the GCCS system, the work will center on the inclusion of additional key databases not already interfaced. In addition, there are a number of critically important databases that are not part of the set available through the GCCS. The project will identify these databases in order prioritized by the user (J7, J8 and J9) and develop the means needed to provide flexible and reliable access to them. Standardization of interfaces and data models is required to move to general, cost-effective interfacing. Collaborate with NATO and TTCP in investigating the use of XML describing equipment, mission and command.

a. Complete establishment of RTI as a COE component.
b. Establish a standard for interfacing COE data to simulations.
c. Complete anexecutable mission content data model and language for automatically connecting mission context to military objects.
d. Work with SIMCI to extend battle management language.
e. Provide common access to operational databases and link to JWARS for course of action evaluation.
f. Interface DARPA's multi-agent grid with simulations and C4I systems to enable automated plan monitoring and re-evaluation.

(U) Human Performance Representation (HPR): The ability to represent the human and human decision making in simulation has been identified as a critical gap by simulation users. The HPR project will capitalize on the performance moderator research, advances in software agent behaviors and architectures, component modularization in distributed learning technology and the coincident establishment of test laboratories for human performance modeling research to provide next generation of human performance representation. Prioritization of representations will be coordinated with principal users including JWARS and JFCOM who have expressed particular needs. The program will rest upon a build/experiment/test paradigm, creating an increasingly capable modular representation with each successive build. The research will focus on behavior representations required for transformation initiatives. The ability to represent threat behaviors will be coordinated with DARPA and key intelligence agencies through the Modeling and Simulation Executive Agent for Threat Representation. These efforts will include continued development of the Machiavelli framework in collaboration with CIA and DIA.

a. Test several approaches for building a, crowd federate, evaluate and deliver crowd federate to JFCOM and other users.
b. Evaluate the ability of the commanders behavior module to serve as a test platform for testing human performance models.
c. Evaluate and incorporate performance modifier functions in human performance models.
d. Establish means for acquiring data that can be used to validate human performance models. Set test and evaluation criteria.
e. Determine the availability of data for modeling and evaluating cultural factors in human and organizational performance.
f. Extend capabilities of the IMCN to expanded use in replacing human simulation controllers.
g. Continue collaboration with intelligence agencies in the area of emergent behaviors.
h. Investigate tools for cataloging requirements and performance factors for human performance modeling.
i. Lead the Human Performance Technical Committee in pursuing DoD and Service special short-term projects in human performance.

(U) Composable Mission Space Environments: Current capability to rapidly compose models with known, measurable accuracy is neither easy nor cost-effective unless simulations are specifically constructed to work together. The first step in establishing robust capability is building the formal foundation and specifying limitations. A key to setting capabilities and limitations is understanding and codifying the ways the Department uses simulation. Current programs will form the empirical environment in which to evaluate concepts and frameworks. Exemplars will include interfacing with other diverse frameworks like SCORM and web technologies.

a. Follow the SCORM to HLA linkage by refining the process so that it can be a community standard available to address quickly training deficiencies.
b. Continue to build one common mission space environment with the JSB, JVB, and DCEE using the Base Object Module as a trial specification; using the production of additional sensor federates as the occasion for refining metadata for composability; solve data distribution management for large, dynamic environmental databases.
c. Complete the testing of the IEEE 1516 specification.
d. Investigate the ability to link the TMAP representations used by the intelligence community as a composable component in an HLA-based federation.
e. Conduct workshops in the established tracks: composability, XMSF, and collaborative environments.
f. Investigate underlying technologies and standards that could support composability, to include collaborative environments emerging standards.
g. Continue architecture management meetings, extending their scope to new frameworks for composable mission space environments.

(U) C. Other Program Funding Summary: Not Applicable

	Exhibit R-2a, RDT&E Project Justification						Date: February 2003	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number Joint Wargaming Simulation Management Office PE 0603832D8Z Policy and Guidance				
Cost ($ in millions)	**FY2002**	**FY2003**	**FY2004**	**FY2005**	**FY2006**	**FY2007**	**FY2008**	**FY2009**
Project Name /No./Subtotal Cost Policy and Guidance	10.494	8.758	8.978	8.957	9.075	9.150	9.186	9.324

(U) A. Mission Description and Budget Item Justification: By DoD policy, the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) has responsibility for modeling and simulation (M&S) management, oversight, and policy development. DMSO, as the USD(AT&L)'s action agent, develops DoD modeling and simulation (M&S) policies, plans and programs that support effective and efficient management of the Department's M&S resources. DMSO also oversees DoD M&S activities to identify opportunities for cooperation, coordination, collaboration and consolidation of effort; establishes Departmental interoperability standards and protocols; promotes the effective and efficient use of M&S within the Department; and supports the DoD M&S management system established by DoD Directive 5000.59. These responsibilities stemming from the DoD Directive 5000.59 and the Congressional language that preceded it can be characterized into four broad categories:
(1) Oversight of Departmental M&S plans and programs;
(2) Establishment of DoD M&S standards and best practices;
(3) Interagency and International M&S cooperation; and
(4) Establishment of M&S education and training programs.

(U) B. FY 02 Accomplishments:
(U) (1) Oversight of Departmental M&S Plans and Programs. DMSO ensured alignment of the Department's M&S efforts with the key Administration and Departmental policies and guidance (e.g., President's Management Agenda, the Joint Vision 2020, the Government Performance Results Act, the Training Transformation Strategic Plan, Quadrennial Defense Review, etc.). DMSO developed a DoD M&S Strategic Plan, identifying goals and objectives for the next ten years. An Implementation Plan that establishes DoD M&S milestones and funding will follow this effort. DMSO continued to support the Department's M&S management structure, the Executive Council for Modeling and Simulation, and its committee structure. In FY 02, the EXCIMS's committees focused on improving: representations of the physical environment in DoD models and simulations; confidence in the results of DoD models and simulations by establishing verification, validation and accreditation policies and procedure; architecture standards for computer-based M&S; representations of human performance and behavior in M&S; coordination and cooperation of major DoD M&S initiatives (e.g., Air Force's Joint Synthetic Battlespace, Army's Joint Virtual Battlespace, OSD's Joint Distributed Engineering Plant, etc).

(U) (2) Establishment of DoD M&S Standards and Best Practices. DMSO continued to develop and coordinate DoD Instruction 5000.61, "DoD [M&S] Verification, Validation and Accreditation (VV&A)" which updates and enhances Departmental policies increasing user confidence in M&S results. FY02 saw the continuing revision and update of the M&S VV&A Recommended Practices Guide." This web-based document identifies and documents successful procedures used by major DoD acquisition and M&S programs so that future program managers benefit from lessons learned. To expand best practices more broadly, DMSO also began efforts to implement a Capability Maturity Model for simulations.

(U) (3) Interagency and International M&S Cooperation. DMSO continues to maintain information exchanges with other US governmental organizations. FY02 was marked by significant exchanges with NASA and with the Department of Commerce (DoC). DMSO worked with NASA to adopt the DoD-developed High Level Architecture (HLA) for new NASA programs. The intent is to implement NASA simulations using the HLA. At DoC, the HLA is also being promoted as a way to work with vehicle engineering, design and manufacture. These initiatives enhance HLA commercialization efforts by providing a larger market, thereby reducing the Department's share of maintenance and support costs. DMSO was also active in the international arena. As the US representative organization to the NATO Modeling and Simulation Group (NMSG), DMSO is working to have the HLA adopted through NATO's standardization agreement (STANAG) process. DMSO also worked with its counterpart M&S policy organizations in Australia, Canada, and United Kingdom to coordinate policy and technology efforts. These efforts are critical for such programs as distributed simulation to support mission training, an effort that could save the US large expenditures in moving forces to

Europe for coalition training. DMSO organized and hosted an international workshop in Modeling and Simulation for Operations Other Than War for The Technical Cooperation Program (TTCP), which includes Australia, Canada, New Zealand, United Kingdom and the United States. In collaboration with the TTCP nations, DMSO hosted the first collaborative meeting of the Defense M&S Offices from the TTCP nations as a first step to increasing cooperation and harmonizing work across these nations to the benefit of all.

(U) (4) Establishment of M&S education and training programs. DMSO continued to support the professional military education of future DoD leaders through support of visiting professors at the military academies and the National Defense University. A DoD M&S Education Consortium, consisting of government and academia, was established to help provide guidance and formal direction of M&S education. The FY02 program culminated with WARLORDS, a highly successful, simulation-based contest involving all the military academies and their choices of warfare simulations. DMSO has established a collaboration website that allows all consortium members to post articles, papers, coordinate consortium activities and assign tasks. DMSO supports the dissemination of M&S information and data through the M&S Information and Analysis Center (MSIAC).

(U) Planned Program FY03-06:

(U) (1) Oversight of Departmental M&S Plans and Programs. (U) An M&S Strategic Plan (MSSP) is necessary to provide guidance across the DoD M&S community detailing the goals and objectives for M&S over the next ten years. Continued development, coordination and publication of the DoD M&S Strategic Plan (MSSP) is necessary to tie M&S goals to the priorities of the current Administration (President's Management Agenda) as well as to the existing Government Performance and Results Act. The DoD MSSP identifies M&S priorities and builds upon existing 1995 DoD M&S Master Plan (MSMP), the Warfighter M&S Needs Assessment, the 1995 MSMP Assessment as well as results of the Integration Task Force, M&S grand challenges, and component MSMPs. In the upcoming year, this document will be formally coordinated with the M&S community and published.

(U) DMSO will continue to serve as the DoD focal point for M&S and as the USD(AT&L)'s action agent for the administration and support of the DoD M&S management structure.

- (U) In order to more fully establish policy in support of DoD 5000.59 the following must be accomplished: (U) Develop new DoD Issuance to define the authorities, functions, responsibilities and relationships of DoD Modeling and Simulation Executive Agents (MSEAs). This effort will clarify the role of DoD MSEAs for developing and managing common-, general- and joint-use DoD M&S applications. It will capture lessons learned from the four organizations (Navy, Air Force, NIMA and DIA) that currently perform the MSEA role.
- (U) Develop new DoD Issuance on "Transfer and Release of DoD Models and Simulations and Related Technologies" to provide a single source of policy and procedural guidance for the DoD M&S community. This information currently resides in more than 30 different DoD Issuances.
- (U) Develop new DoD Issuance to establish a DoD-level Modeling and Simulation Awards Program to formally recognize modeling and simulation accomplishments by DoD military and civilian personnel. This effort will use lessons learned in the current informal program to develop the formal program.
- (U) Conduct a five-year review and update DoD 5000.59-M, "DoD Modeling and Simulation (M&S) Glossary," during calendar year 2003 as required by DoD 5025.1-M, "DoD Directives System Procedures." This continues efforts to provide standardized M&S terminology and is comparable in scope to Joint Publication 1-02, "DoD Dictionary of Military and Associated Terms."
- (U) Conduct a five-year review and update of DoD Directive 5000.59, "DoD Modeling and Simulation (M&S) Management," during calendar year 2003 as required by DoD 5025.1-M, "DoD Directives System Procedures." This effort will review current DoD M&S policies and responsibilities.
- (U) Establish VV&A Recommended Practices Guide as DoD Issuance.

(U) DoD 5000.59 directs the establishment of a Modeling and Simulation Information Analysis Center (MSIAC) as well as a Modeling and Simulation Resource Repository (MSRR). The MSIAC brings modeling and simulation technology to the war fighter and weapon system developer by harnessing information technology for operational requirements. The MSRR is provided for operational requirements through the use of Internet and SIPRNET web sites. DMSO will work with the DoD Components to establish an Executive Steering Committee to provide broad-based DoD oversight and guidance to the MSIAC.

(U) (2). Establishment Of DoD M&S Standards and Best Practices.

(U) Standardization Management Activity (SMA)/Lead Standardization Activity (LSA) for DoD Modeling And Simulation. DoD Directive 5000.59, "DoD

Modeling and Simulation (M&S) Management," states that it is DoD policy to "… establish standards and protocols promoting the internetting, data exchange, open system architecture, and software reusability of M&S [modeling and simulation] applications. Those standards shall be consistent with current national, Federal, DoD-wide, and, where practicable international systems for open systems." In direct support of this policy and to ensure appropriate oversight and management of M&S standards activities and processes, the DMSO will take on the role of being a DoD Standardization Management Activity (SMA) as the Lead Standardization Activity (LSA) for DoD M&S beginning in FY 2003. The SMA and LSA functions implement aspects of Sections 2451 and 2452 of Title 10, United States Code, and DoD Instruction 4120.24, "Defense Standardization Program (DSP)." The LSA function, as outlined in DoD 4120.24-M, "[DSP] Policies and Procedures," involves participation in the Department's standards development and adoption processes, including those accomplished by Non-Governmental Standards Bodies as well as those developed through US participation in the development and ratification of International Standardization Agreements (ISAs). The initial LSA management function will focus on the formal adoption of the non-governmental standards efforts done in support of the High Level Architecture and SEDRIS as recognized DoD adopted standards. Beginning in FY04, the DMSO will, as the DoD SMA for M&S standards, oversee the additional standardization projects, including those of the other DoD Components, and enlarge the scope of its LSA management to more broadly address the Department's M&S standards and standardization, including participation and oversight of M&S-related ISAs. In FY05 and the out years, these efforts should produce a growing number of M&S-related standards that may require additional resources to manage and administer. The growing number of adopted M&S standards will have to be added to and maintained as part of the Acquisition Streamlining and Standardization Information System (ASSIST) database and Department of Defense Index of Specifications and Standards (DoDISS) publication. Over the FYDP, the number and scope of DoD M&S standards activities and projects is expected to increase and may require additional resources to manage and maintain approved standards and ensure that new and existing standards support emerging and maturing technologies. The goal is to develop and maintain M&S standards that improve military operational readiness within the Department of Defense and with our allies and coalition partners, reduce the cost of M&S ownership, and allow for ready insertion of new and transformational M&S capabilities and technologies.

(U) A Capability Maturity Model (CMM) is a reference model that provides guidance for improving organizational performance. CMMs are repositories for best practices that have proven effective across the government and industry in areas such as people, requirements management, configuration and project management, quality assurance, test and evaluation, acquisition and transition. During the past decade, DoD Components acquired some M&S systems from contractors certified at CMM level 3 and the resulting systems did not meet expectations. Therefore, a comprehensive integrated Capability Maturity Model (iCMM) for M&S is critical. Upon completion of the DoD M&S Best Practices Guide, DMSO will review approved iCMMs and develop guidance on the use of an existing/approved iCMM or develop a DoD M&S iCMM. Further efforts in this area include the quantification, verification, and implementation of the M&S iCMM.

(U) (3) Interagency and International M&S Cooperation. DMSO will continue to work the Interagency (IA) and International arenas. In the IA arena, DMSO will work to establish a forum for IA coordination, cooperation, and standardization. In NATO, DMSO will continue to act as the US representative to the NMSG to ensure support for M&S coordination, cooperation and standardization. DMSO will continue to engage with its foreign military M&S policy counterpart organizations to promote M&S coordination and cooperation.

(U) (4) Establishment of M&S Education and Training Programs. Awareness, education and training and collaboration are key components to the successful and effective use of models and simulation within the DoD. The DMSO sponsors Visiting Professors at the three Military Academies, the National Defense University. Through this effort the DoD M&S initiatives and success stories are incorporated into the school curricula and used to educate the future M&S users (warfighters and support personnel). The DMSO also provides awareness education to DoD personnel through presentations at numerous conferences, seminars and meetings. M&S education must expand beyond the classroom. DMSO will, using web-based technology, provide an introductory M&S course expanding immediate access to our warfighters regardless of their physical location. Additional, DMSO will publish research papers and articles to increase the knowledge base of DoD decision makers. While our focus has been on Military Academies, our education efforts must also expand to include our Senior Non-commissioned Officer Academies. During the FY03-05 timeframe, DMSO will unify its awareness and education efforts, and working with the services and other DoD components, establish a program that incorporates all aspects of M&S awareness, education, and training in support of the warfighter. To meet this objective,

DMSO has established a DoD M&S Familiarization Course eliminating the current M&S Staff Officers Course and several tutorials and workshops. DMSO has

scheduled seven regional presentations of the M&S Familiarization Courses during FY03. Additionally, in collaboration with the National Security Agency, DMSO will develop criteria for the establishment of M&S Education Centers of Excellence. Transition the DoD M&S Education Program to the National Defense University, beginning in FY04.

(U) C. Other Program Funding Summary: Not Applicable