| Exhibit R-2, RDT&E Budget Justification | | | | | | | Date: February 2005 | |
|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>RDT&E, Defense Wide/BA 3 | | | | R-1 Item Nomenclature: Joint Wargaming Simulation Management Office, PE 0603832D8Z | | | | |
| | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 |
| Cost ($ in millions) | 40.678 | 44.942 | 34.928 | 35.616 | 38.345 | 38.655 | 39.683 | 40.833 |
| JSM/P476 | 40.678 | 44.942 | 34.928 | 35.616 | 38.345 | 38.655 | 39.683 | 40.833 |

## (U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

M&S has been a critical component in the development, deployment and sustainment of military capability for many years. By the last decade of the twentieth century, it became evident to Congress and the Department that a focused effort was needed to harness the promise M&S for national defense. To provide strategic direction, the Executive Council for Modeling and Simulation (EXCIMS) developed a vision statement for DoD M&S which they reconfirmed in FY 1999. "Defense modeling and simulation will provide readily available, operationally valid environments for use by the DoD Components: (1) To train jointly, develop doctrine and tactics, formulate operational plans, and assess warfighting situations; and (2) To support technology assessment, system upgrade, prototype and full-scale development, and force structuring. Furthermore, common use of these environments will promote a closer interaction between the operations and acquisition communities in carrying out their respective responsibilities." (DoD5000.59-P)

In responding to the Congressional initiative to "… establish an Office of the Secretary of Defense level joint program office for simulation to coordinate simulation policy, to establish interoperability standards and protocols, to promote simulation within the military departments and to establish guidelines and objectives for [the] coordination [of] simulation, wargaming and training…." (SAC, SR101-521), the DMSO was created under the DDR&E with an S&T budget designed to " … promote the enhancements of DoD M&S technologies in support of operational needs and the acquisition process; develop common tools, methodologies, and databases; and establish standards and protocols promoting the internetting, data exchange, open system architecture, and software reusability of M&S applications." (DoD Directive 5000.59).

DMSO continues to direct a technical program that supports the effective use of simulation across the Department of Defense, provides the foundation for interoperability, enhances cost-effective use of simulation and serves as the laboratory for the development

of standards or policy. The need for effective M&S capability continues to grow. Transformation Planning Guidance provides a clear statement that transformation must span the way we fight, the way we do business and the way we work with others. The way we fight must be in Joint and Coalition contexts with the equipment, training and planning to enable that type of operation. The business end of Defense, the acquisition of equipment and capabilities, needs to be adaptive to new missions and the introduction of new technology at a far more rapid pace. Finally, Defense must engage other sectors of the US government and our international partners in more effective ways. All of these tasks rely on the ability to use M&S capability that is agile, responsive and interoperable.

M&S requires the appropriate mix of long and short-term investment. The architectural basis that enabled Millennium Challenge 02 and supports on-going experimentation was the result of long-term (7 years) investment at a significant level. The speed and agility of tomorrow's military operations as illustrated in Operation Iraqi Freedom signals the need to link operational systems to simulations that can provide added insight into complex, dynamic situations. USD (AT&L) must rely on effective M&S tools and techniques to assess the military utility of emerging technology and speed its introduction into military products.

Further non-technical requirements in DoDD 5000.59 are to develop a DoD M&S Master 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 for 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; develops VV&A policy that 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: a 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.

**B. Program Change Summary:**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Previous President's Budget: | 41.735 | 46.017 | 46.489 | 47.083 |
| Current FY 2006 President's Budget Submission: | 40.678 | 44.942 | 34.928 | 35.616 |
| Adjustments to Appropriated Value: | -1.057 | -1.075 | -11.561 | -11.467 |
| Congressional Program Reductions: | -0.294 | -1.075 | | |
| Congressional Rescissions: | | | | |
| Congressional Increases: | | | | |
| Reprogrammings: | | | -9.000 | -9.000 |
| SBIR/STTR Transfers: | -0.763 | | | |
| Undistributed Cuts: | | | -3.519 | -3.403 |
| Other: | | | +0.958 | +0.936 |

(U) C. Other Program Funding Summary: N/A

(U) D. Acquisition Strategy: N/A

(U) E. Performance Metrics**:** Performance in this program is monitored in the following ways:

a. for emergent S&T applications the metrics are centered about the number, quality and placement of publications in the open scientific literature;
b. for more mature S&T capability, the metrics involved presentation and publication of material in proceedings of conferences considered to be central to the development and adoption of M&S standards and best practices
c. for capabilities that can be represented in software products, the metrics include the ability to demonstrate capability in the context of major programs of record and the inclusion of capability in commercial products
d. for maturing capabilities, metrics include viable transition plans to include the agreement from the receiving user or acquisition organization
e. for standards, policy and best practices, the metrics include the number of programs, nationally and internationally, making use of these guidelines.

| Exhibit R-2a, RDT&E Project Justification | | | | | | | Date: February 2005 | |
|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>RDT&E, Defense Wide/BA 3 | | | | Project Name and Number: Joint Wargaming Simulation Management Office, PE 0603832D8Z | | | | |
| | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 |
| Cost ($ in millions) | 40.678 | 44.942 | 34.928 | 35.616 | 38.345 | 38.655 | 39.683 | 40.833 |
| | | | | | | | | |

**(U) A. Mission Description and Budget Item Justification**:

Warfighters, analysts who support decision-making by warfighters and DoD leaders, acquisition professionals who procure warfighting equipment and supplies, and manpower professionals who recruit and train warfighters all need better models and simulations.

Recognizing this and concerned about the uncoordinated efforts across DoD, Congress directed DoD to "… establish an Office of the Secretary of Defense level joint program office for simulation to coordinate simulation policy, to establish interoperability standards and protocols, to promote simulation within the military departments and to establish guidelines and objectives for [the] coordination [of] simulation, wargaming and training…." (SAC, SR101-521). DoD published DoDD 5000.59 creating Executive Council for Modeling and Simulation (EXCIMS) to "Advise and assist the USD(A&T) in strengthening the uses of M&S in the Department of Defense." EXCIMS developed a vision statement for all DoD M&S: "Defense modeling and simulation will provide readily available, operationally valid environments for use by the DoD Components: (1) To train jointly, develop doctrine and tactics, formulate operational plans, and assess warfighting situations; and (2) To support technology assessment, system upgrade, prototype and full-scale development, and force structuring. Furthermore, common use of these environments will promote a closer interaction between the operations and acquisition communities in carrying out their respective responsibilities."

Also under the direction of DoDD 5000.59, DoD created DMSO to "Function as the DoD focal point for M&S, and ensure that M&S technology development is consistent with other related initiatives." DMSO operates under DDR&E with an S&T budget designed to " … promote the enhancements of DoD M&S technologies in support of operational needs and the acquisition process; develop common tools, methodologies, and databases; and establish standards and protocols, data exchange, open system architecture, and software reusability of M&S applications."

More recently, Transformation Planning Guidance (TPG) provides a clear statement that transformation must span the way we fight, the way we do business and the way we work with others. The way we fight must be in Joint and Coalition contexts with the

equipment, training and planning that enables that type of operation. The business end of Defense – the acquisition of equipment and capabilities – needs to be adaptive to new missions and the introduction of new technology at a far more rapid pace. Finally, Defense must engage other sectors of the US government and our international partners in more effective ways. All of these transformation tasks need M&S capabilities that are agile, responsive and interoperable.

M&S tool development and use is spread throughout DoD across multiple disparate domains (e.g., analysis, training, acquisition, test and evaluation experimentation, and operations), across multiple disparate resolution levels (e.g., atomic, genomic, engineering, tactical, operational, & strategic), and across multiple owning organizations (e.g., Services, OSD, Joint Staff, COCOMs, and DoD agencies). Such M&S development efforts almost always produce tools and data that cannot be readily shared outside of the initial small set of user/developers. No one small set of users/developers is willing to make the investments in technology or in standardization of technology that is required to increase the utility of their M&S tools to the wider DoD community. Ultimately, this increases the costs and limits the utility of M&S tools. Improving this situation is the core function of DMSO, to provide the technologies and technology standardization necessary to reduce the costs and increase the utility of M&S tools across DoD.

This Program element provides these technologies and technology standards by via a DoD M&S Master Plan and a DoD M&S Investment Plan that moves DoD toward a common technical framework for M&S interoperability, natural environment representation, system authoritative representations, authoritative representations of systems and human performance; policies and procedures for the validation, verification and accreditation (VV&A) of M&S tools; a M&S Resource Repository; and improved M&S infrastructures (standards, tools, methodologies, etc.).

| Exhibit R-2a, RDT&E Project Justification | | | | | | | | Date: February 2005 |
|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>RDT&E, Defense Wide/BA 3 | | | | Project Name and Number:<br>M&S Policy and Technical Projects<br>Project A | | | | |
| | FY2004 | FY2005 | FY2006 | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 |
| M&S Policy and Technical Projects | 31.678 | 40.942 | 34.928 | 35.616 | 38.345 | 38.655 | 39.683 | 40.833 |
| | | | | | | | | |

**(U) A. Mission Description and Budget Item Justification:**

Warfighters, analysts who support decision-making by warfighters and DoD leaders, acquisition professionals who procure warfighting equipment and supplies, and manpower professionals who recruit and train warfighters all need better models and simulations (M&S). The Defense Modeling and Simulation Office (DMSO) directs a technical program that supports the development of better M&S across the Department of Defense. Key project elements are specifically targeted at: 1) improving the identification of M&S user capability needs and requirements; 2) facilitating he development of interoperable and authoritative M&S representations of the physical world; 3) promoting an integrated science and technology program focused on expanding and improving the scientific and technical underpinnings of DoD M&S; 4) improving the common technical framework for M&S that supports interoperability and re-use of M&S products; 5) improving the supporting services that enable a common M&S infrastructure to support the Department's operations.

**(U) B. FY 2004 Accomplishments:**

(U) Provided M&S mission planning tools and analysis capabilities that became part of the Department's operations in Iraq.

(U) Provided investments and oversight to Transformation Initiatives focused on providing the Department of Defense with the next generation of M&S tools and representation of military operations.

(U) Demonstrated Live-Virtual-Constructive capability in Urban Terrain using cost-effective technology in support of training transformation.

(U) Delivered "designed to order" weather and ocean scenarios in support of the Analytic Community.

(U) Delivered server capability to the experimentation community to deliver common data and environmental effects for experimentation and training.

(U) Enhanced training for coalition operations without having to provide certification for all non-US simulation components by making HLA RTI Certification and Federation Compliance Test Suites ready for export to our NATO allies through the Research and Technology Board.

(U) Continued providing standards, policies and product support for improving Joint community and Service tools to allow their

separate models, simulations and command and control systems to effectively operate in a common M&S environment

(U) Continued providing multi-year technology development programs targeted at improving the agility and cost-effectiveness of M&S in support of consistent, interoperable mission spaces that can be used for the full spectrum of military transformational initiatives.

(U) Continued acting as the USD(AT&L) action agent in developing M&S policies, plans and programs that support the effective and efficient management of the Department's M&S resources.

(U) Initiated the development of a DoD Modeling and Simulation Master Plan and a DoD Modeling and Simulation Investment Plan.

**(**U) Planned Program FY 2005-2007:

(U) Improve the identification of M&S user capability needs and requirements**.**

(U) Establish a process to identify and analyze validated needs and formal requirements – based upon end-user (operations, training, acquisition, etc) requirements – that are dependent upon or satisfied by M&S capabilities.

(U) Provide M&S capabilities to effectively plan, analyze & train for MOOTW in a timely manner.

(U) Facilitate the development of interoperable and authoritative M&S representations of the physical world.

(U) Synthetic Natural Environment Representation. Continue leading the DoD M&S community in establishing standards for environmental representation and the establishing processes to define, produce and deliver environmental data to simulations.

(U) Master Environmental Library. Develop direct and timely access to environment information through linked resource sites and a structured discovery and ordering process.

(U) Environmental Scenario Generator. Continue to develop a capability to rapidly generate a fully integrated environmental representation to include aspects of the ocean, atmosphere, space and terrain that is internally consistent, cost effective, and authoritative and meets the requirements of the warfighter.

(U) Human Performance Representation (HPR). Improve the DoD's ability to represent the human being and their decision making in simulations.

(U) Promote an integrated science and technology program focused on expanding and improving the scientific and technical (S&T) underpinnings of DoD M&S.

(U) Science and Technology. Facilitate and coordinate the enhancement of M&S in the DoD's strategic planning process for S&T.

(U) Improve the common technical framework for M&S that supports interoperability and re-use of M&S products.

(U) Provide Oversight of Departmental M&S Plans and Programs. Complete development and formal coordination of the DoD M&S Master Plan (MSMP) to establish M&S objectives for the Department for the next decade. Also, 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) DoD M&S Standards. Serve as the Standardization Management Activity (SMA)/Lead Standardization Activity (LSA) for DoD Modeling and Simulation. 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) Interagency and International M&S Cooperation. Establish a forum for interagency M&S coordination, cooperation, and standardization; Serve as the US representative to the NATO Modeling and Simulation Group (NMSG) to ensure support for M&S coordination, cooperation and standardization.

(U) Verification, Validation and Accreditation (VV&A). Advance the state of VV&A practice across DoD to include understanding the barriers to successful application of joint VV&A processes and removing them to ensure end-user confidence in the models and simulations produced.

(U) High Level Architecture (HLA). Provide program support to enable the interoperability of large scale distributed simulations.

(U) Knowledge Integration (KI). Capitalize on the increasing linkage between simulations and operational systems to allow warfighters to develop scenarios on operational planning tools and then transfer them to simulations in a automated fashion.

(U) Integration of Simulations and C4I Systems. Facilitate the use of simulations in training and in operations by developing M&S integration strategies with C4I systems.

(U) Composable Modeling and Simulation Framework. Continue to refine the definition of composability and establish the necessary technical, business, and operational initiatives to foster development of composable modules for M&S.

(U) Establish a Community of Interest for M&S support to the GIG. Work with DISA and NII and the broader

producer/consumer community to identify and implement common M&S services for the GIG.

(U) Improving the supporting services that enable a common M&S infrastructure to support the Department's operations.

U) M&S Education and Training Programs. Sponsor Visiting Professors regarding M&S instruction at the three Military Academies and the National Defense University.

**(U) C. Other Program Funding Summary:** N/A

| Fiscal Year (FY) 2006 Budget Estimates<br>Exhibit R-2a, RDT&E Project Justification | | | | | | | February 2005 | |
|---|---|---|---|---|---|---|---|---|
| DEFENSE-WIDE, RDT&E (400)<br>BUDGET ACTIVITY 3 | | | | Joint Wargaming Simulation Management Office<br>PE 0603832D8Z<br>M&S for Improved Acquisition of Defense Systems<br>**Project B** | | | | |
| Cost ($ in millions) | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 |
| M&S for Improved Acquisition of Defense Systems | 9.000 | 4.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**(U) A. Mission Description and Budget Item Justification**

US military force capabilities are today highly dependent upon interoperability within complex systems-of-systems. The shift toward increasing reliance on network centric operations, and systems of increasing complexity linked together in more complex systems-of-systems, will increase the dependency on seamless interoperability across military service and national boundaries, and effective performance by each individual system. The defense acquisition systems engineering process - to design, develop, and test the systems - must exploit the demonstrated value of M&S more effectively to field improved capabilities soonest, with sufficient confidence the fielded capabilities will perform effectively in the systems-of-systems joint mission environment. It is simply not practical to create actual systems-of-systems environments within the acquisition systems engineering processes, but M&S can provide the capability to represent that environment to properly design, develop, and test the individual systems. An increasing body of evidence, including reports by the National Research Council, industry associations, and various DoD organizations all point to the need to transform the acquisition culture, processes, and technology to leverage and exploit to a greater extent the power of M&S for defense systems engineering and test.

Accordingly, this project initiates a series of activities to enhance defense systems engineering and test culture, processes, and technology to begin to better leverage M&S technology and collaborative processes. OSD leadership of these activities is essential to provide the focus and interest to assure participation and cooperation of the military departments. All the components must be included in this effort to provide effective joint acquisition environments just as military operations are joint. From the start, this effort will assess progress and problems, develop and implement a strategy, and then continue and sustain the initiative by building upon lessons learned and successes.

(**U) B**. **Accomplishments**. FY 2004 accomplishments include coordinating user requirements; completing background technical research; and drafting program plans, resource requirements, schedules, and milestones.

(U) Planned Program FY 2004 – FY 2005:

(U) FY 2004 Accomplishment: In FY 2004, this project will initiate various technical efforts targeted on 2 goals:

1. Establish a centralized, focused effort in OUSD(AT&L) to improve the application of M&S technology across acquisition programs.
2. Plan and initiate a series of technical analysis activities with a goal of developing and instituting a capability to analyze joint integrated architectures to assure they are viable representations of the architecture intended for specific mission areas, and that the generated force capability represented by the architecture is realistic.

Goal 1 Plans: Establish a small community of interest across the DoD acquisition community intended to define a specific vision and roadmap for improving application of M&S in acquisition. FY 2004 is intended to be primarily a planning effort.

Goal 2 Plans: Initiate technical efforts to establish the capability to assess joint integrated architectures. These activities are coordinated with the various Functional Capability Boards of the Joint Staff. Specific objectives include:

- Define a methodology to conduct first order analyses of joint integrated architectures.
- Conduct proof-of-principle implementation of the first order analysis, and determine whether the technology of architecture representation and architecture based analysis is adequate to address user needs.
- Based on findings from the proof-of-principle implementation, define requirements for M&S technology development and application.
- Support development of behavior models and analysis tools to explore solutions to military needs in the precision engagement mission area.
- Support development of a software development roadmap focused on evolution of Service systems to an integrated joint fires network.
- Pursue incorporation of advanced information technologies to resolve interoperability problems.
- Expand M&S tool sets to include trade-space analysis for simulation mission space environments. Support integration of results into Service efforts.
- Initiate activity to develop standards and protocols, including common data models and commercial standards, in order to move toward a consistent, interoperable mission space for trade-off analysis.
- Explore use of software technology to assemble mission scenarios rapidly for execution.
- Integrate data bases associated with establishing a capability for simulation of course of action analysis.
- Investigate underlying technologies and standards to support the ability to rapidly compose mission space models with known, measurable accuracy.
- Assemble a suite of reusable system data to support system level architecture development and analysis.
- Establish baseline portfolios (roadmaps) for current systems in each Functional Capabilities Board.

(U) FY 2005 Plans: Initiate a series of RDT&E activities to exploit the capabilities of M&S to improve effectiveness of Systems

Engineering (SE) and test of defense systems, and systems-of-systems, to support achievement of joint mission capabilities.

- Define SE M&S policy and guidance necessary to transform culture in defense systems acquisition programs, to facilitate improving effective use of M&S.
  - Establish a small OSD-led steering committee with the military components.
  - Assess and define how M&S is to be integrated into DoD SE and program processes, including use of the Simulation Support Plans. Start by developing a baseline of current use, then develop a strategy to achieve the "how to" end state.
  - Develop DoD policy and guidance, including policy for M&S and information sharing, M&S and data ownership, contracting, and other areas such as consideration of M&S progress in acquisition decision reviews.
  - Establish a training capability expanding on policy, guidance and best practices; "push" education and training to defense acquisition programs.
  - Initiate and lead focused interchange (SE M&S Community of Interest) between DoD, industry, and academia to maintain and inform the community on best practices.
- Assess and recommend improvements to M&S infrastructure to facilitate interoperability and consistent exchange of defense systems M&S and data across DoD and industry.
  - Examine the various data standards and define a strategy for use of standards in the system engineering process in a consistent manner across defense acquisition to facilitate M&S data and content interchange. Build upon lessons learned from JDEP reference Federated Object Model.
  - Initiate activity to mature the Joint Distributed Engineering Plant (JDEP) as a key DoD component-level means for systems-of-systems engineering integration and test.
  - Define appropriate directory services for SE M&S information sharing, and develop a plan to provide services.
- Provide incentives for defense system Program Managers to develop M&S tools which support DoD-wide systems-of-system engineering, and adopt best practices.
  - Establish a council of PM and industry representatives to contribute to prioritization of investments in JDEP infrastructure to support continued maturation of JDEP capability to support all warfare mission areas.
  - Develop a plan and initiate pilot efforts to demonstrate value of systems-of-systems engineering M&S approaches. Pilot projects will include both investment in M&S tools that contribute, and adoption of best practices across the life cycle of a program.

**(U) C. Other Program Funding Summary:** N/A