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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1999			
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Joint Wargaming Simulation Management Office PE 0603832D8Z			
<i>COST(In Millions)</i>	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	60.059	60.518	68.456	68.250	70.552	71.954	73.456	74.899	Continuing	Continuing
JSM/P476	60.059	60.518	68.456	68.250	70.552	71.954	73.456	74.899	Continuing	Continuing

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

(U) **BRIEF DESCRIPTION OF ELEMENT**

(U) The Defense Modeling and Simulation Office has corporate-level responsibility for the cooperation and synergism of modeling and simulation (M&S) activities within the Department of Defense. M&S has demonstrated the capability to revolutionize the way in which the Department makes decisions and conducts its operations. Working as a system of systems, M&S can support a full range of applications (e.g. joint training, doctrine development, formulation and assessment of operational plans, mission rehearsal, force structuring and the acquisition of new systems). To ensure effective and efficient use of M&S, the Department has developed a strategy fostering interoperability and re-use, embodied in the Department of Defense Modeling and Simulation Master Plan, which serves as the basis for execution of this program. The major element of the strategy is development of a common technical framework (CTF) for M&S consisting of three components: the High Level Architecture (the most important); Conceptual Models of the Mission Space (CMMS); and Data Standardization. Supporting these is a broad range of shared common services which include environmental representation; human and organizational behavioral representation; verification, validation and accreditation of simulations; a modeling and simulation resource repository; a modeling and simulation operational support activity; and outreach and education initiatives to ensure standardized and timely implementation of the plan. As a result of this effort, the Department will be able to improve readiness, enhance mission rehearsal, optimize investment decisions, and achieve cost-effective acquisitions.

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(U) **Project Number and Title: P476 JSM**

(U) **PROGRAM ACCOMPLISHMENTS AND PLANS**

(U) **FY1998 Accomplishments:**

(U) Continued development of support software for testing and Federation Object Model (FOM) development; incorporated modification to legacy systems to interoperate through the HLA; completed competitive procurement process for Runtime Infrastructure (RTI) software; continued development, integration, test and standardization; began HLA compliance testing and simulation certification. (\$ 27.428 Million)

(U) Integrated operational Conceptual Models of the Mission Space (CMMS) into M&S Resource Repository (MSRR); continued to integrate Component knowledge acquisition projects into CMMS; provided CMMS Toolset products to support campaign-level analysis and training related knowledge acquisition by integrating the Joint Simulation System (JSIMS), Joint Warfare System (JWARS), National Air and Space (Warfare) Model (NASM), Warfighters' Simulation 2000 (WARSIM 2000), and JSIMS Maritime knowledge acquisition products into the CMMS Library; conducted CMMS evaluation experiments to establish scope, priority, and compatibility of acquisition and operational test and evaluation related CMMS requirements for subsequent inclusion in the CMMS Toolset; continued to develop security policies for the CMMS Library. (\$ 2.890 Million)

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(U) Completed initial build of HLA related data standards and the associated Object Model Data Dictionary System (OMDDS) and made them available through the internet; completed the identification and designation of an additional 500 Authoritative Data Sources (ADS) and structured the ADS database for formal life-cycle maintenance; began development of a registration template as a specification for identifying, registering, and assessing data products; demonstrated distributed data quality guidelines, tools, and utilities; established CSS and associated DIFs for HLA OMDD, Order of Battle (OB), and Synthetic Environments (through the Synthetic Environment Data Representations Interchange Specification (SEDRIS)); began integration of end-user data verification and validation (V&V) guidelines into the Model and Simulation Verification, Validation, and Accreditation (VV&A) RPG; began development of data producer Data Quality Assurance Guidelines; completed development and initial deployment of the Data Verification Interactive Editor (DAVIE) data quality tool; continued development of data standards for the authoritative representation of the natural environment, units and systems with a focus on the SEDRIS for the natural environment; obtained IEEE approval of the IDEF1X97 modeling language; conducted a formal comparison of IDEF1X97, UML, and STEP to specify complex data; executed the mission of Functional Data Administration for M&S in accordance with DoD 8320.1. (\$ 4.200 Million)

(U) Completed initial development of a weather scenario generation capability for use by simulation developers and exercise planners in specifying consistent and correlated scenarios to achieve analysis, testing, and training simulation evaluation objectives; established the initial operational criteria for the MEL and rehosted its access site from research laboratory to the M&S Operational Support Activity; developed the software capability for access to resources over the SIPRNet; keywords redefined and metadata descriptions reworked for improved system performance and interface with other MSRR Libraries. (\$ 12.500 Million)

(U) Completed National Research Council report on modeling human and organizational behavior which outlined future investments in this critical area. (\$ 1 Million)

(U) Initiated Phase 1 of the VV&A Recommended Practices Guide revision; produced draft guide for the program manager and developed foundation for a guide for the VV&A practitioner; integrated the concepts of M&S and end-user data V&V (referred to as VV&A and VV&C); developed first-order VV&A history templates as well as templates which capture information related to producer quality assurance activities. (\$ 1.300 Million)

(U) Completed development of and developmental testing on the initial MSRR prototype, including necessary research and engineering to operate the same software on both the unclassified Internet and classified SIPRNet in conformance with current security guidance; software released three times, which included independent developmental and operational testing associated with each release; completed system engineering associated with installation of the initial prototype at the Modeling and Simulation Operational Support Activity (MSOSA); trained the registrar and established help desk functions. (\$ 4.740 Million)

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(U) Assessed Modeling and Simulation Operational Support Activity (MSOSA) performance and adjusted structure and procedures to meet evolving user needs, including access to planning tools and other modeling and simulation assets; upgraded MSOSA operational support system to incorporate current developments in electronic information research and network technologies. (\$ 3.500 Million)

(U) Expanded awareness of DoD's M&S initiatives worldwide through full participation in major M&S conferences, and support for 12 related technical conferences and seminars; developed greater visibility throughout DoD and the M&S industry via an aggressive web-based public affairs/outreach program; assisted NATO partners established US-like M&S standards, procedures, and policies. (\$ 1.200 Million)

(U) Finalized DoD-wide M&S education and training plan; conducted first formal DoD-level M&S education courses with the execution of 10 iterations of the M&S Staff Officers Course; expanded M&S formal courses of instruction with the development of the Executive-level Course, the Program Managers Course, and an M&S primer course; conducted technical seminars, workshops and symposia on M&S; inserted M&S technology into major joint warfighter exercises. (\$ 1.300 Million)

(U) **FY1999 Plans:**

(U) Continue development of HLA technology, prototypes of enhanced capabilities and applications of advanced technology; expand support, including high performance infrastructure for users of modeling and simulation, to enable them to exploit fully the increased capabilities that will be fielded under the HLA initiative, to include JSIMS and JWARS; design, develop and prototype the M&S technologies required to implement technology needed to federate simulations operating at different levels of security to support applications for training, analysis and acquisition. (\$ 26.200 Million)

(U) Develop and deliver the third and fourth operational builds of the CMMS Toolset to support integration and exchange of simulation implementation-independent functional descriptions of military operations and tasks; focus on the knowledge engineering activities conducted by simulation development subject matter experts who employ conceptual models to design and implement HLA Federations and M&S applications; CMMS Toolset support for simulation developer knowledge engineering activities will be demonstrated by direct collaboration with JWARS and JSIMS Enterprise simulation developers and with HLA transition efforts; CMMS Toolset will be extended to support engineering and engagement level of detail required in acquisition and operational test and evaluation applications; experiments will be conducted to establish the scope, priority, and compatibility of requirements to support a multitude of equipment and systems characteristics and performance specifications. (\$ 3.200 Million)

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(U) Continue development of HLA related data standards and associated OMDD efforts; develop and deliver the first and second operational builds of the OB data access Toolset; provide OB data access Toolset support for M&S community via direct collaboration with the OSD PA&E Joint Data System, the JSIMS Enterprise, and selected HLA transition efforts; extend the registration template to support additional repository requirements and security and release policies and procedures; develop and coordinate producer Data Quality Assurance guidelines; distribute/install Data Quality tools at additional DoD locations; begin CSS, associated DIFs, and data standards development for targets/facilities information; continue to nominate and obtain final standards approval for other M&S data elements for inclusion in the DoD Data Dictionary System (DDDS); provide Functional Data Administration for M&S in accordance with DoDD 8320.1. (\$ 2.500 Million)

(U) Complete interchange mechanism full definition and expand technology insertion efforts to further develop test capabilities; expand software tools for SEDRIS transmittal generation and verification; initiate SEDRIS standardization through established standards organizations both nationally and internationally; evaluate sources and document procedures for the use of alternate sources for database generation, to include commercial options; provide additional tools, reference datasets, policies and procedures for the generation of integrated databases expanding existing terrain and ocean capabilities and integrating atmospheric data and effects; initial exploitation of atmospheric scintillation effects in simulations; expand representational resource experiments in high-resolution Simulation Based Acquisition (SB A)-related areas; complete development of a weather scenario generation capability; provide initial procedures for data acquisition through littoral classification and climatological data manipulation; initiate operational capability for MEL with both Internet and SIPRNet capability; complete metadata specification and implementation in access and resource site software; incorporate atmosphere and space models and algorithms catalog, and expand resource availability across the MEL system. (\$ 10.518 Million)

(U) Continue extension of conceptual model of mission space technical framework to human and organizational behavior; examine limits of SEDRIS data model for human behavior; establish Special Interest Area on the World Wide Web. (\$ 1.500 Million)

(U) Transition VV&A guidance from the theoretical to the application level; develop V&V methodology as it applies to federations, SBA, Analysis of Alternatives, and new development efforts (e.g., JWARS and JSIMS); support VV&A advancement through information exchange (VV&A history templates) and curriculum development; define VV&A tool concepts. (\$ 3.000 Million)

(U) Modify and enhance MSRR common, physical and software infra structure based on network and database state-of-art and user requirements, including federation with other repositories, to form a collaborative, distributed repository system; continue documentation of MSRR; continue population of the MSRR system providing: (a) directories /catalogs; (b) data standardization resources (e.g., process and data models, data dictionary); (c) reusable data, algorithms, models and simulations; and (d) tools for browsing and accessing, linking across resources, configuration management, etc.; initiate transition to appropriate agency; modify software based on user requirements.(\$ 4.200 Million)

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(U) Continue MSOSA operations providing one-on-one assistance/education to the M&S community while transitioning to the new Modeling and Simulation Information Analysis Center (MSIAC) organization.(\$ 4.500 Million)

(U) Continue emphasis on outreach activities to include expanded M&S conference support and web-based public affairs activities. (\$ 1.400 Million)

(U) Institute development of fully interactive user, staff officer, manager and executive level courses that address training, acquisition and analysis domains; conduct technical seminars, workshops and symposia; develop, field and populate web-based electronic libraries to make all M&S course of instruction immediately available to the M&S community; widely disseminate M&S formal instruction through production and distribution of videos and CD-ROMS; insert M&S technology into major joint warfighter exercises; refine and enhance the capability of the models and simulations developed to support DoD's acquisition process. (\$ 3.500 Million)

(U) **FY2000 Plans:**

(U) Apply increased advanced integrated automation to federation development and operation, demonstrating additional (20%) reduced costs to create a new federation; use advanced experimentation to support domestic and international standards organizations. (\$ 26.897 Million)

(U) Transition the CMMS Toolset to operational status; update and maintain the CSS, DIFs, and KAT Tools, CMMS Library, and supporting conversion, quality assurance, integration, and analysis tools; update and maintain the CMMS Recommended Practices Guide; support operational use of the CMMS Toolset by the M&S community; adapt components of the CMMS Toolset to support equipment and systems characteristics and performance specifications; conduct experiments to establish the scope, priority and compatibility with human behavior representations. (\$ 3.360 Million)

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(U) Transition OMDDS to operational status; update and maintain HLA related data standards and required M&S ADS data; develop and deliver the third and fourth operational builds of the OB data access Toolset; review and update Data Quality Assurance guidelines; review and update DAVIE tool; distribute/install DAVIE tool at additional DoD locations; review and update DE-RPG to ensure appropriateness; maintain existing DIFs; continue to develop CSS, associated DIFs, and data standards for additional environmental representations, units/systems, and operations /human behavior; continue to nominate and obtain final standards approval for other M&S data elements for inclusion in the DDDS; assess Data Security requirements for on-going M&S efforts; provide Functional Data Administration for M&S in accordance with DoDD 8320.1. (\$ 6.900 Million)

(U) Continue SEDRIS path toward national and international standardization; complete user defined interchange experiments; initiate establishment of a consortium to manage SEDRIS products and definition in consort with target standardization organizations; develop integrated ocean database generation procedures that support transition from deep to shallow water operations and provide correlated environmental effects for SBA, training and analysis; high-resolution atmospheric effects and target scene depiction will also be studied in multi-resolution scenarios; initial work in space data use in simulation will emphasize growing interest in solar maximum events; continue to expand resource listings to include model and algorithm coverage for all environmental domains; compliance with evolving international metadata standards will be addressed; additional MEL services will be assessed from an established users and implementers consortium comprised of Military, Government, Industry and Academic members from both domestic and international organizations. (\$ 12.900 Million)

(U) Initiate recommended practices guide for enhancing simulations with human and organizational behavior representations; continue special interest area in human behavior. (\$ 1.400 Million)

(U) Expand scope of VV&A guidance to address system and human behavior representations, live player interoperability, and fidelity issues; prototype VV&A tool concepts. (\$ 2.900 Million)

(U) Maintain resource repositories to enable/encourage the reuse of models, simulations and related assets; federate with additional repositories within DoD; develop specialized structures, as necessary, to support innovative DoD programs which will increasingly depend on reuse; increase emphasis on offering incentives to M&S community to populate the repositories. (\$ 4.400 Million)

(U) Initiate transition from MSOSA to MSIAC. MSIAC will operate under yearly core-level of funding. (\$ 4.700 Million)

(U) Continue emphasis on outreach activities to include expanded M&S conference support and web-based public affairs activities. (\$ 1.500 Million)

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(U) Execute transition of existing formal M&S courses of instruction to other agencies. DMSO will concentrate on effort to greatly expand the development and distribution of new courses to support the entire M&S community through electronic technologies. (\$ 3.500 Million)

(U) **FY2001 Plans:**

(U) Demonstrate runtime infrastructure advances using next-generation software and hardware to increase (20%) performance for the same cost, using commercial software to replace 50% of customer software; continue to use advanced experimentation for enhanced standards, policies and procedures. (\$ 26.167 Million)

(U) Continue to support operational usage of the CMMS Toolset; continue adaptation of CMMS Toolset to support equipment and systems characteristics and performance specifications; adapt components of the CMMS Toolset to support human behavior representation as appropriate; update and maintain the CMMS RPG; continue the development of CSS and associated DIFs for CMMS subject matter descriptions; update and maintain knowledge acquisition tools and utilities to support CMMS activities. (\$ 3.200 Million)

(U) Transition Order of Battle data access Toolset to operational status; support operational usage of OMDDS; update and maintain HLA related data standards and required M&S ADS data; develop and deliver the first and second operational builds of the Targets and Facilities data access Toolset; review and update Data Quality Assurance guidelines; review and update DAVIE tool; distribute/install DAVIE tool at additional DoD locations; review and update DE-RPG to ensure appropriateness; maintain existing DIFs; continue to develop CSS, associated DIFs, and data standards for additional environmental representations, units/systems, and operations/human behavior; continue to nominate and obtain final standards approval for other M&S data elements for inclusion in the DDDS; assess Data Security requirements for on-going M&S efforts; provide Functional Data Administration for M&S in accordance with DoDD 8320.1. (\$ 6.700 Million)

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(U) Complete national and international SEDRIS standardization to include formal establishment of a management consortium; initiate investigation in the use and expansion of the SEDRIS data representation model in supporting dynamic changes in the physical environment; investigate very high resolution database designs that incorporate computer-added design files, and micro-climate environmental information for use in dynamic fly-throughs in urban terrain; continue to reduce integrated database generation timelines to meet evolving operational mission planning and mission rehearsal timeline requirements; demonstrate production and operational use of measures of database consistency to assess interoperability potential and tailor database design, generation and/or modification activities in establishing simulation federations and conducting exercise scenarios; complete initial pass at model and algorithm discovery and access in all environmental domains; fully link the MEL system with the National Spatial Data Infrastructure and appropriate international systems to ensure a robust capability to support U.S. DoD needs thus establishing a “one stop shop” capability for all environmental information needs. (\$ 1300 Million)

(U) Initiate the development of technologies and tools to support incorporation of authoritative representations of human and organizational behavior into DoD simulations. (\$ 1.300 Million)

(U) Expand scope of VV&A guidance to address complex cognitive processes and dynamic environment including terrain and atmosphere; populate VV&A tool sets. (\$ 2.841 Million)

(U) Maintain resource repositories to enable/encourage the reuse of models, simulations and related assets; increase emphasis on offering incentives to M&S community to populate the repositories.(\$ 4.600 Million)

(U) Complete transition from MSOSA to MSIAC; MSIAC will operate under yearly core-level of funding.(\$ 4.843 Million)

(U) Continue emphasis on outreach activities to include expanded M&S conference support and web-based public affairs activities. (\$ 1.600 Million)

(U) Complete transition of existing formal M&S courses of instruction to other agencies; expand the development and distribution of new courses to support the entire M&S community through electronic technologies.(\$ 4.00 Million)

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(U) B. <u>Program Change Summary</u>	<u>FY1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>FY2001</u>	<u>Total Cost</u>
Previous Presidents Budget	61.46	70.696	69.636	69.484	Continuing
Appropriated Value	64.338	61.496	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-4.069	-0.977			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.32	-0.266	
c. Other	-0.21	0	-1.5	-1.5	
Current Presidents Budget	60.059	60.518	68.456	68.25	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

- (U) Funding:** Funding changes are the result of below threshold program adjustments and revisions in inflation projections.
- (U) Schedule:** N/A
- (U) Technical:** Funding changes are the result of below threshold program adjustments and revisions in inflation projections.
- (U) C. OTHER PROGRAM FUNDING SUMMARY COST:** N/A
- (U) D. ACQUISITION STRATEGY:** N/A
- (U) E. SCHEDULE PROFILE:** N/A