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BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N
PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	13,445	19,755	6,812	7,832	8,118	8,305	8,504	8,712
R2222 MODELING & SIMULATION	6,948	7,176	6,812	7,832	8,118	8,305	8,504	8,712
R2810 MODELING AND SIMULATION TO SUPPORT C4ISR DEVELOPMENT	6,497	5,943	0	0	0	0	0	0
R9653 GLOBAL ENGINEERING METHODOLOGY INITIATIVE FOR NAVAL INTEGRATION AND INTEROPERABILITY	0	2,772	0	0	0	0	0	0
R9654 JOINT ANALYTICAL MODELING IMPROVEMENT PROGRAM (JAMIP) JWARS	0	3,864	0	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element addresses projects under the Navy Modeling and Simulation (M&S) Management Office. It supports technical and management initiatives directed by Congress, Department of Defense (DoD), Secretary of the Navy (SECNAV), and Chief of Naval Operations (CNO) with the aim of bringing organization and focus to the development and use of M&S throughout the Navy and DoD. It provides a central agency for the formulation and implementation of policy and guidance in M&S, and represents Navy interests in Joint and other Agency initiatives. It funds efforts to define and coordinate the corporate Navy M&S policy and guidance to evolve an interoperable and reusable core M&S capability consistent with the M&S technical framework prescribed by DoD. Efforts are organized around four product areas: (1) Engineering Studies and Analysis: identifies and measures the relevance of existing and emerging standards, technologies and services necessary to guide Navy M&S use; (2) Products and Services: promotes the policy, standards and technologies necessary to guide more efficient development and use of M&S across the Navy, including development and management of the Navy Modeling and Simulation Information Service (NMSIS); (3) M&S Quality Assurance Program: establishes and manages a disciplined process of model Verification, Validation and Accreditation (VV&A) and establishes and manages a Modeling and Simulation Support Plan (MSSP) as required by current directives; and (4) Simulation Experiments: supports M&S use in Navy exercises and

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experiments across a wide variety of warfighting and supporting communities. Specifically, Simulation
Experiments integrate appropriate models and simulations into Fleet exercises to test, validate and evaluate
for possible transition the M&S tools to enable seamless access and use of operationally relevant M&S products
in support of Navy operations, training, acquisition, analysis and assessment.

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PROGRAM ELEMENT: 0308601N
PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT

PROGRAM CHANGE SUMMARY:

	FY 2004	FY 2005	FY 2006	FY 2007
FY 2005 President's Budget Submission	13,475	7,262	7,564	8,653
Cong Rescissions/Adjustments/Undist. Reductions	0	-202	0	0
Congressional Action	0	12,700	0	0
Non-Pay Inflation Adjustments	-6	0	0	0
Technical Adjustment	0	0	-756	-865
Program Adjustments	0	-5	-3	-3
Rate Adjustments	0	0	7	47
SBIR Assessment	-24	0	0	0
FY 2006/2007 President's Budget Submission	13,445	19,755	6,812	7,832

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

Schedule: Not applicable.

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FY 2006/2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET   DATE: Feb 2005

Exhibit R-2a

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
PROJECT NUMBER: R2222   PROJECT TITLE: MODELING & SIMULATION

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
R2222 MODELING & SIMULATION	6,948	7,176	6,812	7,832	8,118	8,305	8,504	8,712

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project addresses critical coordination of Navy Modeling and Simulation (M&S) efforts, integrates individual programs into a coherent whole, promotes reuse of resources, and aligns Navy efforts with Joint programs. It develops and maintains a comprehensive repository of models, simulations and authoritative data to support broad-based Navy requirements. It promotes reusability through the Quality Assurance process for models, simulations and data, and enhances interoperability by coordinating and reviewing Navy's transition to DoD-mandated High Level Architecture (HLA) for distributed simulations. The program participates in fleet exercise experiments, distributive simulations and demonstrations such as Fleet Battle Experiments (FBE), Virtual at Sea Training (VAST), and Virtual Missile Range (VMR).

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2004	FY 2005	FY 2006	FY 2007
ENGINEERING STUDIES AND ANALYSIS	1,196	1,062	1,026	1,156

This activity conducts engineering studies and analyses aimed at determining the feasibility and applicability of proposed standards or technical approaches to Navy Modeling and Simulation (M&S), and at investigating Service-unique requirements for standards or guidance. Individual efforts focus on developing or evaluating approaches to optimize training, assessments and acquisition functional/mission objectives through more efficient development and use of M&S. This activity develops methodologies and standards that will result in model and data reusability and interoperability through the formulation of a technical framework. These standards will support the full range of architecture and engineering design and analysis requirements across the Navy. This activity also provides an M&S degree program through the Naval Postgraduate School, Modeling Virtual Environments and Simulation (MOVES) curriculum.

FY 2006/2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET   DATE: Feb 2005
Exhibit R-2a

BUDGET ACTIVITY: 07
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PROJECT NUMBER: R2222   PROJECT TITLE: MODELING & SIMULATION

FY 2004 Accomplishments:

•   Demonstrated the Embedded Simulation Infrastructure requirements and capability to develop robust simulations within the DII COE and the Global Command and Control System/Maritime (GCCS/M).
•   Designed additional common simulation "building-block" functions required within Defense Information Infrastructure (DII) Common Operating Environment (COE) based Command, Control, Communications, Computers and Intelligence (C4I) systems to support simulation development.
•   The MOVES Institute, in tandem with the MOVES degree program, provided military relevant thesis topics for research.
•   Developed a prototype network Information Assurance (IA) assessment tool to support evaluation of network performance (throughput, delay, network overhead, packet loss and related network Quality of Service metrics), the effects of countermeasures, IA security policies and to identify potential network vulnerabilities.

FY 2005 Plans:

•   Segment the Embedded Simulation Infrastructure and the two Mission Applications and prepare the documentation for test and release in GCCS and GCCS/M.
•   Develop a set of standards for communications M&S for the U.S. Navy.
•   Continue to work with the MOVES Institute and the MOVES degree program to provide military relevant thesis topics for research.

FY 2006 Plans:

•   Continue efforts with the Embedded Simulation Infrastructure and the Mission Applications and develop and validate the documentation for test and release in GCCS and GCCS/M.
•   Continue to develop a set of standards for communications M&S for the U.S. Navy.
•   Continue to work with the MOVES Institute and the MOVES degree program in tandem to provide military relevant thesis topics for research.

FY 2007 Plans:

•   Continue efforts with the Embedded Simulation Infrastructure and the Mission Applications and develop and validate the documentation for test and release in GCCS and GCCS/M.

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PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
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- Continue to develop a set of standards for communications M&S for the U.S. Navy.
- Continue to work with the MOVES Institute and the MOVES degree program in tandem to provide military relevant thesis topics for research.

	FY 2004	FY 2005	FY 2006	FY 2007
PRODUCTS AND SERVICES	2,392	2,124	2,001	2,363

This activity supports development of common services, tools, databases and standards to ensure the integration and connectivity of modeling and simulation (M&S) products employed in Naval assessments, in training and acquisition, and among operational communities. It manages and maintains the Navy Modeling and Simulations Information System (NMSIS), as a central M&S information resource to support informed M&S investment decision making across Navy. It provides essential planning and coordination of M&S efforts with other Services, the Office of Secretary of Defense (OSD), the Joint Staff, and other agencies to develop policies and procedures necessary for M&S standardization within the Navy. It provides annual updates to the Naval M&S Catalog, Master Plan, and Investment Strategy.

FY 2004 Accomplishments:

- Implemented the requirements to perform as the Functional Data Manager for M&S as submitted by Department of Navy (DON) Chief Information Officer (CIO) and defined by Secretary of Navy Instruction (SECNAVINST) 5000.36.
- Promoted and enhanced the state-of-practice and technology within the Navy M&S community.
- Continued the development, servicing and use of NMSIS as directed under applicable DoD Directive (DIR), and SECNAVINST, and Chief of Naval Operation Instruction (OPNAVINST).
- Organized and facilitated a continuing series of quarterly Navy M&S Technical Interchange meetings to bring together the Navy M&S community for a direct interchange of M&S requirements, technology, standards and experience.
- Continued to foster and develop the Navy M&S Standards Process that draws M&S experts from the acquisition, training, operational communities, and industry.

FY 2005 Plans:

- Promote and enhance state-of-practice and technology within the Navy M&S community.
- Continue the development, servicing and use of NMSIS as directed under applicable DoD DIR, SECNAVINST,

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
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and OPNAVINST.
•   Organize and facilitate a continuing series of quarterly Navy M&S Technical Interchange Meetings to
bring together the Navy M&S community for a direct interchange of M&S requirements, technology, standards and
experience.
•   Continue to foster and develop the Navy M&S Standards Process that draws M&S experts from the
acquisition, training, operational communities, and industry.

FY 2006 Plans:

•   Promote and enhance state-of-practice and technology within the Navy M&S community.
•   Continue the development, servicing and use of NMSIS as directed under applicable DoD DIR, SECNAVINST,
and OPNAVINST.
•   Organize and facilitate quarterly Navy M&S Technical Interchange Meetings to bring together the Navy M&S
community for a direct interchange of M&S requirements, technology, standards and experience.
•   Continue to foster and develop the Navy M&S Standards Process that draws M&S experts from the
acquisition, training, operational communities, and industry.

FY 2007 Plans:

•   Promote and enhance state-of-practice and technology within the Navy M&S community.
•   Continue the development, servicing and use of NMSIS as directed under applicable DoD DIR, SECNAVINST,
and OPNAVINST.
•   Organize and facilitate quarterly Navy M&S Technical Interchange Meetings to bring together the Navy M&S
community for a direct interchange of M&S requirements, technology, standards and experience.
•   Continue to foster and develop the Navy M&S Standards Process that draws M&S experts from the
acquisition, training, operational communities, and industry.

	FY 2004	FY 2005	FY 2006	FY 2007
M&S QUALITY ASSURANCE PROGRAM	704	626	583	743

This activity implements and manages the Modeling and Simulation (M&S) Quality Assurance development of the
Verification, Validation and Accreditation (VV&A) process and guidelines for modeling, simulation, and data.
It reviews both new and legacy M&S VV&A plans and reports, and develops and maintains the Naval M&S VV&A
repository. It establishes and implements a VV&A training curriculum for developers and accreditors, and

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PROJECT NUMBER: R2222   PROJECT TITLE: MODELING & SIMULATION

provides an annual VV&A assessment to CNO.

FY 2004 Accomplishments:

- Developed Details of Architecture Implementation within the VV&A Handbook.
- Developed a prototype cost model for estimating the verification and validation (V&V) costs.
- Tailored VV&A awareness training for Program Managers.
- Researched and identified formal statistical methods to validate M&S in order to establish credibility beyond the real world boundaries.
- Researched and provided M&S acquisition and development guidance.

FY 2005 Plans:

- Develop case studies within the VV&A Handbook.
- Incorporate information developed for training/education into the VV&A Handbook.
- Coordinate with Department of Defense (DoD) and Services to identify new data entry fields for VV&A common to all M&S Resource Repositories.
- Coordinate with the Navy Modeling and Simulations Information System (NMSIS) effort to update VV&A data entry fields and Beta test new data entry fields as required.
- Research and develop methodologies for evaluating commercial off the shelf (COTS) tools used to develop valid M&S.

FY 2006 Plans:

- Develop further case studies within the VV&A Handbook.
- Incorporate information developed for training/education into the VV&A Handbook.
- Coordinate with DoD and Services to identify new data entry fields for VV&A common to all M&S Resource Repositories.
- Coordinate with the NMSIS effort to update VV&A data entry fields and Beta test new data entry fields as required.
- Research and develop methodologies for evaluating COTS tools used to develop valid M&S.

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PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
PROJECT NUMBER: R2222   PROJECT TITLE: MODELING & SIMULATION

FY 2007 Plans:

•   Develop further case studies within the VV&A Handbook.
•   Incorporate information developed for training/education into the VV&A Handbook.
•   Coordinate with DoD and Services to identify new data entry fields for VV&A common to all M&S Resource Repositories.
•   Coordinate with the NMSIS effort to update VV&A data entry fields and Beta test new data entry fields as required.
•   Research and develop methodologies for evaluating COTS tools used to develop valid M&S.

	FY 2004	FY 2005	FY 2006	FY 2007
SIMULATION EXPERIMENTS	2,656	3,364	3,202	3,570

This activity supports Fleet exercises and experiments through the application of distributed simulations across a wide variety of warfighting and supporting communities. Specifically, it develops and integrates appropriate models and simulations into the Fleet Battle Experiments (FBE), and develops simulation efforts to test and evolve the standards for models, interfaces, and data. It supports development of tools necessary to enable the seamless access and use of operationally relevant M&S products to support Navy training, warfare assessments and acquisition requirements.

FY 2004 Accomplishments:

•   Continued to define Fleet training initiatives and M&S enhancements.
•   Supported Fleet Battle Experiment – Kilo (FBE-K) using a synergetic M&S approach.
•   Defined the Landing Platform Dock (LPD 17) Amphibious Ship Use Case Environment Concept Model.
•   Continued development of Virtual at Sea Training Deployable Prototype (VAST DP) to exercise Naval Surface Fire Support (NSFS) missions. Supported inclusion of tactical aircraft (TACAIR) in the VAST training system to complete the combined arms team training capability.
•   Continued development of a Virtual at Sea Training – Aviation Component (VAST-AC) to allow USN/USMC TACAIR to participate in mission specific training to include amphibious or urban operations training by providing close air support (CAS) services against synthetic targets within a synthetic environment.
•   Continued development of Maritime Virtual Environmental Data Specifications (MARVEDS) focused on the standard environmental data as distributed to multiple Program Executive Offices (PEOs).
•   Expanded the Virtual Missile Range (VMR) capability to include the North Atlantic Treaty Organization

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BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
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(NATO) SeaSparrow Missile System and upgraded threats.
•   Provided direct support to CVN-21 and Multi-Mission Aircraft (MMA) programs to develop their initial simulation environments.
•   Provided direct support to Navy component, Joint Training Confederation (JTC) at Joint Force Command (JFCOM) and Korea Battle Center (Ulchi Focus Lens)

FY 2005 Plans:

•   Continue to define Fleet training initiatives and M&S enhancements.
•   Perform FBE-L and the Olympic Challenge series of Joint experimentations using a synergetic M&S approach.
•   Continue development of the VAST range concept to provide the capability to conduct training in a virtual environment that would normally require a land-based training range, or would otherwise be cost or schedule prohibitive.
•   Document the elements of the maritime virtual environment and effects models that can be used effectively to enable reuse in naval simulations – best practices where standards are not yet feasible.
•   Continue upgrade of VMR virtual threat capabilities.

FY 2006 Plans:

•   Continue to define Fleet training initiatives and M&S enhancements.
•   Support FBEs and the Olympic Challenge series of Joint experimentations using a synergetic M&S approach.
•   Continue development of the VAST range concept to provide the capability to conduct training in a virtual environment that would normally require a land-based training range, or would otherwise be cost or schedule prohibitive.
•   Document the elements of the maritime virtual environment and effects models that can be used effectively to enable reuse in Naval simulations – best practices where standards are not yet feasible.
•   Continue upgrade of VMR virtual threat capabilities.

FY 2007 Plans:

•   Continue to define Fleet training initiatives and M&S enhancements.
•   Support FBEs and the Olympic Challenge series of Joint experimentations using a synergetic M&S approach.

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BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
PROJECT NUMBER: R2222   PROJECT TITLE: MODELING & SIMULATION

• 	Continue development of the VAST range concept to provide the capability to conduct training in a virtual environment that would normally require a land-based training range, or would otherwise be cost or schedule prohibitive.
• 	Document the elements of the maritime virtual environment and effects models that can be used effectively to enable reuse in Naval simulations – best practices where standards are not yet feasible.
• 	Continue upgrade of VMR virtual threat capabilities.

C.   OTHER PROGRAM FUNDING SUMMARY:
NAVY RELATED RDT&E:
    PE 0603235N (Common Picture Advanced Technology)

NON-NAVY RELATED RDT&E:
    Not applicable.

D.   ACQUISITION STRATEGY:
Not applicable.

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FY 2006/2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET   DATE: Feb 2005
Exhibit R-2a

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
PROJECT NUMBER: Various   PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

R2810	FY 2004	FY 2005
MODELING AND SIMULATION TO SUPPORT C4ISR DEVELOPMENT	6,497	5,943

FY 2004: This effort provided for enhancement of technologies that support fleet training, distributed simulation, and production engineering. The program supported Modeling & Simulation initiatives in architecture assessment, command and control assessment, model development to support network/communications analysis, and production engineering and training, to include the development of composite standards for simulations architectures.

FY 2005: This effort provides for development of emerging technologies in support of the Navy and DOD transformation. These technologies will be enhanced by the use of various modeling and simulation techniques that afford a more efficient and effective use of resources in an evolving environment. The premise surrounding this effort is the better the Navy can model and simulate actions/techniques to create greater interoperability amongst joint forces, the greater the success rate will be once the effort is integrated into the operational environment.

R9653	FY 2004	FY 2005
GLOBAL ENGINEERING METHODOLOGY INITIATIVE FOR NAVAL INTEGRATION AND INTEROPERABILITY	0	2,772

FY 2005: This effort integrates Navy Tool for Interoperability Risk Assessment (NTIRA) data with system attribute data from other authoritative sources. Systems and attributes will be assigned to a mission thread by reading authoritative sources (i.e., Global Engineering Methodology Initiative for Integration and Interoperablity (GEMINII)/ForceNet Implementation Base Line (FIBL). End-to-end "interaction requirements" and dependencies will be defined between the systems supporting the mission activities and C2 processes. This model will measure composeability and adaptability of the end-to-end system architecture in support of the mission thread and C2 process, and optimize between legacy and FORCEnet Distributed Services. An interface to M&S systems for additional modeling (performance or warfighting effects) of these threads will be provided.

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PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
PROJECT NUMBER: Various   PROJECT TITLE: Congressional Plus-Ups

R9654	FY 2004	FY 2005
JOINT ANALYTICAL MODELING IMPROVEMENT PROGRAM (JAMIP) JWARS	0	3,864

FY 2005: This effort addresses the significant limitations of existing theater-level simulations to provide analytic support to senior officials. JAMIP involves a four-pronged approach to upgrade the capability of joint modeling to accurately assess the capabilities of Navy forces and programs to execute U.S. strategy within the constraints of resources. Current JAMIP goals are to continue development of the top-priority joint warfare model and to provide data support for the integration and enhancement of existing models as directed by the Deputy Secretary of Defense and endorsed by the Vice Chairman of the Joint Chiefs of Staff. One of the primary components of JAMIP is the development of the Joint Warfare System (JWARS), which will be a state-of-the-art, closed-form, constructive simulation of multi-sided, joint warfare for analysis. JWARS is also used in the Global Engineering Methods Initiative for Integration and Interoperability (GEMINII) War Room Assessment Toolset. Assessments are formal processes that demonstrate the implications of proposed solutions with the insight of modeling applications. The GEMINII Process was developed to facilitate performance of capability-based assessments that define composable mission services. The toolset is currently used for Program Objective Memorandum (POM)-type assessments and JWARS provides insights to the effects on the warfighter.

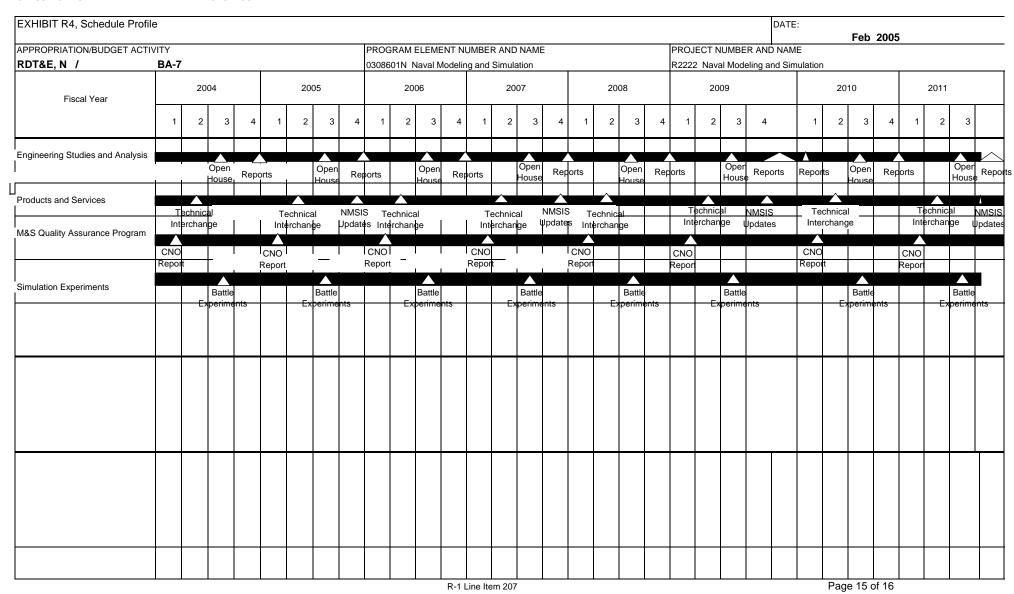# UNCLASSIFIED

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BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0308601N   PROGRAM ELEMENT TITLE: MODELING AND SIMULATION SUPPORT
PROJECT NUMBER: Various   PROJECT TITLE: Congressional Plus-Ups

Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-05 Cost	FY-05 Award Date	FY-06 Cost	FY-06 Award Date	FY-07 Cost	FY-07 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Navy M&S Info Sys Development	Various	Various		933	TBD	995	TBD	1173	TBD	Cont.	Cont.	Cont.
Quality Assurance	Various	Various		633	TBD	583	TBD	738	TBD	Cont.	Cont.	Cont.
Subtotal Product Development				1566		1578		1911		Cont.	Cont.	Cont.
M&S Services	Various	Various		1217	TBD	1005	TBD	1177	TBD	Cont.	Cont.	Cont.
Subtotal Support				1217		1005	TBD	1177		Cont.	Cont.	Cont.
Simulation Experiments	Various	Various		3404	TBD	3200		3550		Cont.	Cont.	Cont.
Subtotal T&E				3404		3200		3550		Cont	Cont.	Cont.
Engineering Studies/Analyses	Various	Various		1075	TBD	1025	TBD	1150	TBD	Cont	Cont.	Cont.
Program Management												
Subtotal Management				1075		1025		1150		Cont	Cont.	Cont.
Total Cost				7262		6808		7788		Cont	Cont.	Cont.

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EXHIBIT R4, Schedule Profile	DATE: Feb 2005

APPROPRIATION/BUDGET ACTIVITY	PROGRAM ELEMENT NUMBER AND NAME	PROJECT NUMBER AND NAME
RDT&E, N / BA-7	0308601N Naval Modeling and Simulation	R2222 Naval Modeling and Simulation

Fiscal Year	2004				2005				2006				2007				2008				2009				2010				2011		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3

Engineering Studies and Analysis
Open House, Reports (recurring across fiscal years)

Products and Services
Technical Interchange, NMSIS Updates (recurring)

M&S Quality Assurance Program
CNO Report (recurring)

Simulation Experiments
Battle Experiments (recurring)

R-1 Line Item 207

* Not required for Budget Activities 1, 2, 3, and 6

Exhibit R-4, Schedule Profile
(Exhibit R-4, page 1 of 2)

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Exhibit R-4a, Schedule Detail								DATE: **Feb 2005**	
APPROPRIATION/BUDGET ACTIVITY **RDT&E, N BA-7**		PROGRAM ELEMENT 308601N Naval Modeling and Simulation						PROJECT NUMBER AND NAME R2222 Naval Model and Simulation	
Schedule Profile	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	
Engineering Studies and Analysis	3Q-4Q	3Q-4Q	3Q-4Q	3Q-4Q	3Q-4Q	3Q-4Q	3Q-4Q	3Q-4Q	
Products and Services	2Q-4Q	2Q-4Q	2Q-4Q	2Q-4Q	2Q-4Q	2Q-4Q	2Q-4Q	2Q-4Q	
M&S Quality Assurance Program	1Q	1Q	1Q	1Q	1Q	1Q	1Q	1Q	
Simulation Experiments	3Q	3Q	3Q-4Q	3Q	3Q	3Q	3Q	3Q	

Exhibit R-4a, Schedule Detail
(Exhibit R-4a, page 2 of 2)