

EXHIBIT R-2, RDT&E Budget Item Justification	DATE: <b>February 2007</b>
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APPROPRIATION/BUDGET ACTIVITY	R-1 ITEM NOMENCLATURE							
RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY /	BA-4 PE 0603207N Air/Ocean Tactical Applications							
COST (\$ in Millions)	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total PE Cost	30.699	32.654	47.914	36.215	41.012	34.198	31.256	30.264
2341 METOC Data Acquisition	8.669	10.663	24.509	11.497	11.238	9.264	9.063	9.267
2342 METOC Data Assimilation and Modeling	9.054	10.753	14.511	17.075	21.648	17.386	14.462	13.078
2343 Tactical METOC Applications	7.381	8.652	7.678	6.373	6.805	6.229	6.387	6.549
2344 Precise Timing and Astrometry	1.285	1.590	1.216	1.270	1.321	1.319	1.344	1.370
2345 Littoral Battlespace Sensing, Fusion & Integration								
9999 Congressional Increases	4.310	0.996						

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The Air Ocean Tactical Applications (AOTA) Program Element is fully aligned with Navy's Sea Power 21 concept to enhance the future mission capabilities of the Navy-Marine Corps Team. New state-of-the-art government and commercial technologies are identified, transitioned, demonstrated and then integrated into Combat Systems and FORCEnet-related programs of record and Tactical Decision Aids (TDAs) that determine in real-time and near-real-time the operational effects of the physical environment on the performance of combat forces and their new and emerging platforms, sensors, systems and munitions. The AOTA program element focuses on sensing and characterizing the littoral and deep-strike battlespace in the context of regional conflicts and crisis response scenarios. Projects in this program element transition state-of-the-art sensing, assimilation, modeling and decision aid technologies from Government and commercial sources. Unique project development efforts include atmospheric and oceanographic data assimilation techniques, forecast models, data base management systems and associated software for use in mainframe, desktop and laptop computers. Global Geospatial Information and Services efforts within this program address the bathymetric and gravimetric needs of the Navy. Also developed are algorithms to process new satellite sensor data for integration into Navy and Marine Corps decision support systems and for display as part of the common operational and tactical pictures. In addition, the projects provide for demonstration and validation of specialized atmospheric and oceanographic instrumentation and measurement techniques, new sensors, communications and interfaces. Included are new capabilities to assess, predict and enhance the performance of current and emerging undersea warfare and mine warfare weapons systems. AOTA capabilities are designed to support the latest versions of the Global Command and Control System (GCCS), the new Network Enterprise Command and Control (NECC) system (formerly called Joint Command and Control (JC2)), and specific unit-level combat systems. This program also develops representations of the physical environment for incorporation into Navy and Marine Corps warfare trainers and simulations. Finally, this program develops technological upgrades for the U.S. Naval Observatory's Master Clock system to keep pace with the demands of modern military communications, cryptographic, intelligence, geolocation, and targeting systems; develops near-real-time earth orientation predictions; develops very precise determination of positions of both faint and bright stars; and supports satellite tracking and space debris studies. Funding increases in Projects 2341 and 2342 starting in FY06 reflect the development of a new ocean and atmospheric sensors, accelerated data fusion and assimilation techniques, and integration of these fused data into Navy and DoD networks in support of the Littoral Battlespace Sensing, Fusion and Integration (LBSF&I) program. These efforts will enhance Intelligence Preparation of the Environment (IPE) capabilities to meet Chief of Naval Operations (CNO) and Commander Fleet Forces Command (CFFC) requirements for remote autonomous, clandestine, littoral battlespace sensing in support of Sea Shield & Sea Basing.

This budget reflects changes in investment line description beginning in FY07. This change supports acquisition and development investment lines that support the vision, operations concept, and capability requirements. Changes consolidate and better define RDT&E efforts as well as better reflect the new Commander Naval Meteorological and Oceanographic Command (CNMOC) reorganization. The funding in this Program Element supports these investment lines: Sensors and Observing Systems (in-situ, unmanned, space, through the sensor); Assimilation and Prediction Models (Atmosphere, Ocean, Space); Database and Product Development (Atmosphere, Ocean, Acoustics, Geospatial Information and Services (GI&S)); Tactical Decision Aids (TDA) and Mission Planning; Precise Timing, Astrometry and Reference Frames; and Meteorological and Oceanographic (METOC) in the Information Technology (IT) Enterprise Environment.

FY06 includes Congressional Increases for 3 Dimensional Certification of Multibeam Array and Processing System (3D-CMAPS).

**(U) JUSTIFICATION FOR BUDGET ACTIVITY:** This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates systems for experimental test related to specific ship or aircraft applications.

## CLASSIFICATION:

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APPROPRIATION/BUDGET ACTIVITY <b>RESEARCH DEVELOPMENT TEST &amp; EVALUATION, NAVY / BA 4</b>		R-1 ITEM NOMENCLATURE PE 0603207N Air/Ocean Tactical Applications		
<b>(U) B. PROGRAM CHANGE SUMMARY:</b>				
(U) Funding:	FY 2006	FY 2007	FY08	FY09
FY07 Presidents Budget	31.187	31.778	30.895	31.868
FY08 Presidents Budget	30.699	32.654	47.914	36.215
Total Adjustments	(0.488)	0.876	17.019	4.347
Summary of Adjustments				
Program Adjustments		1.000	17.073	4.409
SBIR Tax	(0.416)			
Non-Enterprise related CIVPERS/CS Adjustments			(0.070)	(0.070)
FY 08 / FY 09 NWCF Rate Adj - NUWC				0.007
FY 08 / FY 09 NWCF Rate Adjustments-SPAWAR Sys Ctr			0.139	0.063
FY 08 / FY 09 NWCF Rate Adjustments-NRL			0.077	0.138
CIVPER/CS Adjustment for NETWARCOM Enterprise			(0.200)	(0.200)
Sec. 8106: Revised Economic Assumptions		(0.124)		
Small Business Innovation Research (SBIR) Tax	(0.028)			
Sec 8125 Revised Economic Assumptions	(0.013)			
Congressional Action 1% Reduction	(0.031)			
Subtotal	(0.488)	0.876	17.019	4.347
(U) Schedule:				
Not applicable				
(U) Technical:				
Not applicable				

## CLASSIFICATION:

EXHIBIT R-2a, RDT&E Project Justification							DATE: <b>February 2007</b>		
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>		PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications			PROJECT NUMBER AND NAME 2341 METOC Data Acquisition				
COST (\$ in Millions)		FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Project Cost		<b>8.669</b>	<b>10.663</b>	<b>24.509</b>	<b>11.497</b>	<b>11.238</b>	<b>9.264</b>	<b>9.063</b>	<b>9.267</b>
RDT&E Articles Qty									

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The major thrust of the Meteorology and Oceanography (METOC) Data Acquisition Project is to provide future mission capabilities to warfighters that will allow them to detect and monitor the conditions of the physical environment throughout the entire battlespace. New sensor technologies (including unmanned vehicles, tactical sensor exploitation, in-situ sensors, etc.) are identified and the most promising candidates are transitioned from the government's and commercial industry's technology base to this project. These new sensor technologies are then demonstrated, validated and integrated into operational programs of record for use by warfighters. These new sensor capabilities are to provide timely and accurate METOC data and products to operational and tactical level of war commanders. As the emphasis on Naval Warfare has evolved from blue water operations to the littoral and deep strike battlespace, METOC data requirements have likewise evolved. The littoral and deep strike regions are extremely dynamic and complex, characterized by strong and highly variable oceanographic and atmospheric conditions. As a result, the need to accurately characterize these conditions is more crucial than ever in planning and executing Amphibious Warfare, Mine Warfare, Special Operations, Anti-Submarine Warfare (ASW), and Strike Warfare operations. Routinely available data sources, such as climatology, oceanographic and meteorological numerical models, and satellite remote sensing are necessary but not sufficient to support these warfare areas in the littoral and deep strike regions. Current operational sensors, such as the standard balloon-launched radiosound, are deployed from platforms that are frequently located great distances from the target area of interest. The principal challenge is to provide a means for the collection and dissemination of METOC data in highly variable and dynamic littoral environmental conditions or in denied, remote or inaccessible areas over extended periods of time. The principal goals of this project are to: 1) provide the means to rapidly and automatically acquire a broad array of METOC data using both off-board and on-board sensors; 2) provide an on-scene assessment capability for the tactical commander; 3) provide the tactical commander with real-time METOC data and products for operational use; 4) demonstrate and validate the use of tactical workstations and desktop computers for processing and display of METOC data and products using latest networking technologies; 5) demonstrate and validate techniques which employ data compression, connectivity and interface technologies to ingest, store, process, distribute and display these METOC data and products; 6) develop new charting and bathymetric survey techniques necessary to reduce the existing shortfall in coastal hydrographic survey requirements; and, 7) develop an expanded database for predictive METOC models in areas of interest. In FY06 and FY07 a portion of project funding is directed towards the development of the USMC Meteorological Mobile Facility (Replacement) Next Generation (METMF(R) NG) due to emergent critical USMC capability requirements. These efforts will enhance Intelligence Preparation of the Environment (IPE) capabilities to meet CNO and CFFC (Commander, Fleet Forces Command) requirements for remote autonomous, clandestine, Littoral Battlespace Sensing (LBS) in support of Sea Shield & Sea Basing.

Funding increases in FY08 and beyond to support development of radar weather using Through-The-Sensor (TTS) techniques and development of ocean glider and Autonomous Undersea Vehicles (AUV), sensors, Tracking and Telemetry, and Mission Planning System (MPS) as part of the Littoral Battlespace Sensing, Fusion and Integration (LBSF&I) Program. These efforts are addressed in the Sensors and Observing Systems (Unmanned Vehicles) and in the Sensors and Observing Systems (Through-the-Sensor) descriptions.

**CLASSIFICATION:**

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APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition
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**(U) B. Accomplishments/Planned Program**

Acoustic Data Inversion/ Sensors and Observing Systems (Through-the-Sensor)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.462	1.629	4.834	2.633
RDT&E Articles Quantity				

FY06 -Continued development of the Geophysical Acoustic Inversion Toolkit (GAIT) Version 2 algorithms to Ocean Atmosphere Master Library (OAML). Begin development of advanced Precise Underwater Mapping (PUMA) through-the-sensor inversion algorithms designed to collected volumetric sound velocity and bottom backscatter.

FY07 - Deliver Geophysical Acoustic Inversion Toolkit (GAIT) Version 2 to Ocean Atmosphere Master Library (OAML). Begin integration into Fleet Combat Systems. Mature networked data sharing capabilities (from acoustic data inversion). Continue investigation of Precise Underwater Mapping (PUMA) volumetric sound velocity and backscatter inversion techniques. Complete integration of the AQS-20 inversion techniques into the Commander, Naval Meteorological and Oceanographic Command (CNMOC) Mine Warfare Workstation and the Mine Warfare Environmental Decision Aids Library (MEDAL). Continue development of the SPS-48E weather radar and SPY-1 Tactical Environmental Processor (TEP) work. Demonstrate and validate automated data acquisition and assimilation efforts as part of the Littoral Battlespace Sensing, Fusion and Integration (LBSF&I) program. Begin integration into Fleet Combat Systems. Test and validate Modular Ocean Data Assimilation System-Light (MODAS-L) string data ingest capability and volumetric sound velocity assimilation algorithms for OAML approval. Begin integration of these algorithms into submarine combat systems. Begin development of web-based submarine ambient noise assimilation capability (Acoustic Data Acquisition). Begin development of Military Aircraft Communications Addressing and Report System (ACARS).

FY08 - LBSF&I Program: Complete development of the SPS-48E and SPS-48G Radar Obsolescence and Availability (ROAR) Hazardous Weather Detection and Display Capability (HWDDC). Test and demonstrate the HWDDC system. Continue development of the SPY-1 TEP prototype. Complete related studies (communications, databasing, data flow, etc.) and system engineering plans. Complete development of the HWDDC requirements, specifications, and standards for the HWDDC system in preparation for procurement and for use in related JCIDS documentation. Begin development of TEP requirements, specifications, standards and system engineering plans for the TEP system for use in related JCIDS documentation.

Complete integration of GAIT Version 2 algorithms into Fleet Combat Systems, Anti-submarine Warfare (ASW) Tactical Decision Aids (TDAs) and for use aboard Naval Oceanographic Office (NAVOCEANO) assets. Commence development of the GAIT Version 3 algorithms. Engineering studies and preliminary design for a passive seabed classification system to be used aboard submarines, next-generation surface ships and aboard Maritime Patrol & Reconnaissance Aircraft (MPRA.) Continue development of ambient noise assimilation capability aboard submarines. Begin development of advanced geo-acoustic merging algorithms to support inversions. Conduct submarine fathometer (BQN-17) Automated Sediment Classification System (ASCS) validation. METOC Future Capabilities will continue development and test military ACARS and exploit Intelligence Surveillance & Reconnaissance (ISR) sensors for manned & unmanned platforms for environmental information. Continue with use of Naval Special Warfare (NSW), Mine Warfare tactical sensors for Through-the-Sensor (TTS) applications for environmental assessment and characterization. Develop, demonstrate & test TTS concept for undersea warfare systems.

FY09 - LBSF&I Program: Continue development of the SPY-1 TEP prototype. Continue development of TEP requirements, specifications, standards and system engineering plans for the TEP system for using in related JCIDS documentation. Continue development of the GAIT Version 3 algorithms to ASW TDAs. Continue development of a passive seabed classification system. Expand ambient noise assimilation capability to include current and future MPRA platforms like the Multi-Mission Maritime Aircraft (MMA) and future surface combatant platforms like the Littoral Combat Ship (LCS) and the Next Generation Destroyer (DD(X)). Meteorology and Oceanography (METOC) Future Capabilities will continue development and test military ACARS and exploit Intelligence, Surveillance, and Reconnaissance (ISR) sensors for manned & unmanned platforms for environmental information. Continue with use of NSW, Mine Warfare tactical sensors for TTS applications for environmental assessment and characterization. Verify & validate performance of TTS application on undersea systems.

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APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition

**(U) B. Accomplishments/Planned Program**

Autonomous Sensors (AUV/UAV)/ Sensors and Observing Systems (Unmanned Vehicles)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.462	1.993	10.984	1.030
RDT&E Articles Quantity				

FY06 - Delivered, tested and demonstrated prototype micro Autonomous Undersea Vehicle (AUV). Conducted preliminary studies in support of Littoral Battlespace Sensing, Fusion and Integration (LBSF&I) and developed Information Superiority Sensors (ISS) 60 command and control system interface. Conducted undersea vehicle modeling and simulation and engineering studies.

FY07- Deliver/test/demonstrate prototype Sensor Pod on operational Unmanned Aerial Vehicles (UAVs) of miniaturized sensor suites for mini/micro UAV platforms. Develop and test Network interoperability of miniaturized sensor suites for emergent UAV and AUV platforms (continued from autonomous sensors (AUV/UAV)). Ruggedize vehicles and begin development of a common command and control system. Develop prototype Autonomous Undersea Vehicles (AUV) (buoyancy) and other in-situ sensors in accordance with study results. Integrate new sensing capabilities into prototypes as part of the LBSF&I program.

FY08 - LBSF&I Program: Funding required to develop glider and unmanned underwater vehicle (UUV) prototypes and the planned tracking and telemetry components of the unmanned systems in preparation of milestone C. Sensor integration and validation/ verification tests will be initiated. Continue development of AUV and glider prototypes, including the development and testing of integrated sensors. Complete related studies (communications, databasing, data flow, etc.) and system engineering plans. Continue development of a common Tracking and Telemetry and vehicle mission planning system. Demonstrate the end-to-end system. Develop requirements, specifications, and standards for the AUV, glider, Tracking and Telemetry, and Mission Planning systems in preparation for procurement and for use in related Joint Capabilities Integration & Development System (JCIDS) documentation.

FY09 - LBSF&I Program: Complete development of end-to-end AUV and glider sensor systems. Correct discrepancies in platforms, sensor operations, tracking and telemetry, and mission planning systems based on lessons learned during FY08 testing and evaluation.

Ambient Noise Data/TDA/Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.462	1.767	3.738	3.499
RDT&E Articles Quantity				

FY06 - Delivered updated historical shipping noise database to the Ocean Atmosphere Master Library (OAML).

FY07 - Integrate the Dynamic Ambient Noise Prediction System (DAPS) Version 2 and updated historical shipping noise database into Fleet Anti-submarine Warfare (ASW) Combat Systems (specifically the Sonar Tactical Decision Aid Variants and Under Sea Warfare (USW) Decision Support System (DSS)). Development of Network based on DAPS. Add real-time ship tail Ambient Noise (AN) observations to the Shipping Noise (SN) database (from Ambient Noise Data). Continue the development of the next generation AN database modeled after the Global Data Base Variable Resolution (GDB-V) database. Conduct annual pre-release technical analysis and research of new National Geospatial Agency (NGA) products used by the Navy for navigation systems and maritime safety for Quality Control, Suitability of Use, and Interoperability. (from Digital MC and G Analysis Program (DMAP)). Continue to develop Tactical Decision Aids (TDA) uncertainty algorithms (from Acoustic Data Acquisition).

FY08 - Mapping, Charting & Geodesy (MC&G) product analysis and development. Architecture and design of Mission Planning Systems and support elements in support of littoral combat operations. Data analysis and processing development for environmental characterization for Mission Planner & Tactical Decision Aid use. Develop quality control, fusion and product uncertainty tools and techniques to transform data into information to support product development for mission planners and TDA use. Development of techniques and tools to guide adaptive sampling to optimize use of measurement assets. Develop advanced Geospatial Information and Services (GI&S) databases and data processing tools and techniques to support boundary conditions for numerical forecast models. Develop advanced data fusion tools and interface modules to ocean and atmospheric data assimilation systems.

FY09 - Continue to develop MC&G products and report result. Develop mission planning tools in support of littoral combat operations. Continue data analysis and processing development for environmental characterization for Mission Planner & Tactical Decision Aid use. Continue development, test and document quality control fusion and product uncertainty tools and techniques to transform data into information to support product development for mission planners and TDA use. Continue development and test techniques and tools to guide adaptive sampling to optimize use of measurement assets. Continue development, test and demonstrate advanced GI&S databases and data processing tools and techniques to support boundary conditions for numerical forecast models. Continue development and test advanced data fusion tools and interface modules to ocean and atmospheric data assimilation systems.

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**(U) B. Accomplishments/Planned Program**

Autonomous Clandestine Sensors/ Sensors and Observing Systems (Through-the-Sensor)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.462			
RDT&E Articles Quantity				

FY06 - Delivered prototype capable of automated data assimilation via the Network infrastructure and Tactical Environmental Data Services (TED Services).

FY07 - Efforts rolled into the Sensors and Observing Systems (Through-the-Sensor) investment line.

Data Connectivity/METOC in the IT Enterprise	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.462	1.482	0.419	1.305
RDT&E Articles Quantity				

FY06 - Delivered TED Services Version 3 prototype.

FY07 - Demonstrate and validate TED Services Version 3 and continue Network Global Information Grid (GIG) compatibility effort (from Data Connectivity).

FY08 - Finalize Naval Integrated Tactical Environmental Subsystem (NITES) Data (formerly known as Tactical Environmental Data (TED) Services) integration efforts and prepare for COMOPTEVFOR operational evaluation (OPEVAL) with Global Command and Control System - Maritime (GCCS-M) 4.1. Begin NITES Data development and test integration efforts with NITES Next Generation (NG).

FY09 - Support NITES NG development and begin concept exploration to migrate toward Network Enterprise Command and Control (NECC) (formerly Joint Command and Control (JC2)).

Acoustic Data Acquisition/ Sensors and Observing Systems (Through-the-Sensor)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.607			
RDT&E Articles Quantity				

FY06 - Delivered Modular Ocean Data Assimilation System-Light (MODAS-L) string data ingest algorithms. Delivered prototype volumetric sound velocity assimilation algorithms. Began development of submarine ambient noise assimilation capability. Continued the development of the next generation Ambient Noise database modeled after the Global Data Base Variable Resolution (GDB-V) database. Continued to develop Tactical Decision Aids (TDA) uncertainty algorithms.

FY07 - Efforts rolled into the Sensors and Observing Systems (Unmanned Vehicles) investment line.

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APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition
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**(U) B. Accomplishments/Planned Program**

Digital MC and G Analysis Program (DMAP)/ Tactical Decision Aid and Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.352			
RDT&E Articles Quantity				

FY06 - Delivered Annual Report.  
FY07 - Efforts rolled into the TDA and Mission Planning investment line.

Littoral Battlespace Data Acquisition/ Sensors and Observing Systems (In-Situ)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.000	2.392	3.534	3.030
RDT&E Articles Quantity				

FY06 - Developed initial Integrated Littoral Battlespace Data Acquisition Plan. Completed the AQS-20 through the sensor inversion rapid transition process. Conducted AQS-20 end-to-end demonstration. Continued work on the development of automated adaptive survey algorithms. Completed development of the joint National Oceanographic and Atmospheric Administration (NOAA)/USN International Oceanographic Observation System (IOOS). Continued development of an automated sensor placement mission planner. Began development of a prototype upper air measurement system.  
FY07 - Continue work on adaptive hydrographic survey work for transition to the T-AGS 60 class ships. Complete development of the joint NOAA/USN IOOS. Continue development of an advanced sensor placement mission planning system for Littoral Warfare Team (LWT) transition. Begin development of micro-miniature disposable wave and surf sensors. Complete development of a prototype upper air measurement system.  
FY08 - Develop advanced processing tools to work with insitu data sources to populate environmental database and support forward deployed oceanographic personnel. Continue development work, test and document adaptive hydrographic and seafloor survey work for transition to the unmanned vehicles, small surface craft and T-AGS 60 class ships. Develop micro-miniature oceanographic and atmospheric insitu sensors and systems. Development advanced insitu sensor systems to support very near shore situational awareness in support of mine warfare, Naval Special Warfare (NSW) and Expeditionary Warfare missions.  
FY09 - Continue to develop and demonstrate advanced processing tools to work with insitu data sources to populate environmental database and support forward deployed oceanographic personnel. Development and demonstration of advanced insitu sensor systems to support very near shore situational awareness in support of Mine Warfare, NSW and Expeditionary Warfare missions. Continue development, verify and validate performance and document adaptive hydrographic survey work for transition to the unmanned vehicles, small surface craft and T-AGS 60 class ships. Continue the development and demonstration of micro-miniature oceanographic and atmospheric in-situ sensors & systems. Utilize tactical and survey platforms for insitu measurements.

USMC Acquisition	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	4.400	1.400	1.000	
RDT&E Articles Quantity				

FY06 - Continued development of Marine Corps Meteorological Mobile Facility Replacement (METMF(R)) Next Generation (NG) Variant I Engineering Development Model (EDM), Variant II prototype.  
FY07 - Conduct METMF(R) NG software, hardware, radar, and communications upgrades. Deliver Variant I EDM and Variant II prototype.  
FY08 - Conduct operational testing of METMF (R) NG prototypes and prepare for delivery.

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<p><b>(U) C. OTHER PROGRAM FUNDING SUMMARY:</b></p> <p><u>Line Item No. &amp; Name</u></p> <p>Not Applicable</p> <p>RELATED RDT&amp;E: PE 0604218N, Air/Ocean Equipment Engineering - AN/SMQ-11 satellite receiver/recorder system engineering to receive data from on-orbit Defense Meteorological Satellite Program (DMSP) sensors onboard selected ships and shore sites.</p> <p><b>(U) D. ACQUISITION STRATEGY:</b></p> <p>Acquisition, management and contracting strategies are to support the METOC Data Acquisition Project to develop, demonstrate, and validate METOC data collection methods and sensors, and to evolve the ability to provide timely and accurate METOC data and products to the Tactical Commander, all with management oversight by the Program Executive Officer for Command, Control, Communications, Computers, and Intelligence and Space (PEO C4I &amp; Space).</p> <p><b>(U) E. MAJOR PERFORMERS:</b></p> <p>Not applicable</p> <p><b>(U) F. METRICS:</b></p> <p>Earned Value Management (EVM) is used for metrics reporting and risk management.</p>		

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Exhibit R-3 Cost Analysis (page 1)	DATE: <b>February 2007</b>
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APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition
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Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 07 Cost	FY 07 Award Date	FY 08 Cost	FY 08 Award Date	FY 09 Cost	FY 09 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Software Development	WX	NRL	30.720	5.507	N/A	8.750	N/A	5.413	N/A	CONT	CONT	
	WX	NAWC-AD Lake	0.923		N/A	0.850	N/A		N/A	CONT	CONT	
	CP	ARL/APL	5.294	0.437	N/A	0.750	N/A	0.450	N/A	CONT	CONT	
	WX	NSWC	2.992	0.305	N/A	0.675	N/A	0.400	N/A	CONT	CONT	
	CP	New Age	4.008	0.807	N/A	0.850	N/A	0.850	N/A	CONT	CONT	
	CP	PSI/R.L. Phillips	2.605	0.548	N/A	0.650	N/A	0.500	N/A	CONT	CONT	
	CP	Neptune	2.255	0.436	N/A	0.191	N/A		N/A	CONT	CONT	
	WX	FNMOC	1.661		N/A		N/A		N/A	CONT	CONT	
	N/A	MISC	13.784	1.268	N/A	5.573	N/A		N/A	CONT	CONT	
	CP	Smiths Detection	0.733	1.356	N/A		N/A		N/A	CONT	CONT	
	CP	TBD				5.820		3.684				
Subtotal Software Development			64.975	10.663		24.109		11.297		CONT	CONT	

Remarks:

Systems Engineering	CP	SSA/CSC	2.060	0.000	N/A		N/A		N/A	CONT	CONT	
Subtotal Support			2.060	0.000		0.000		0.000		CONT	CONT	

Remarks:

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Exhibit R-3 Cost Analysis (page 1)								DATE: <b>February 2007</b>				
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NUMBER AND NAME						
<b>RDT&amp;E, N / BA-4</b>			PE 0603207N Air/Ocean Tactical Applications			2341 METOC Data Acquisition						
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 07 Cost	FY 07 Award Date	FY 08 Cost	FY 08 Award Date	FY 09 Cost	FY 09 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	PD	OPTEVFOR	0.140		N/A		N/A		N/A	CONT	CONT	
		JITC				0.400		0.200				
Subtotal Software Development			0.140	0.000		0.400		0.200		CONT	CONT	
Remarks: Testing supports delivery of the Marine Corps Meteorological Mobile Facility Replacement (METMF(R)) Next Generation (NG) prototypes.												
Subtotal Support			0.000	0.000		0.000		0.000		CONT	CONT	
Remarks:												
Total Cost			49.880	10.663		24.509		11.497		CONT	CONT	



CLASSIFICATION:

EXHIBIT R4, Schedule Profile																								DATE: February 2007								
APPROPRIATION/BUDGET ACTIVITY				PROGRAM ELEMENT NUMBER AND NAME												PROJECT NUMBER AND NAME																
RDT&E, N / BA-4				PE 0603207N Air/Ocean Tactical Applications												2341 METOC Data Acquisition																
Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	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	4
Sensors/Obs Sys (Unmanned Vehicles)	AUV/Glider Prototype and Sensor Dev/C2 and Testing				DEM/VAL				DEM/VAL				DEM/VAL				DEM/VAL															
	TED Services				CNMOC AUV Sensor Integration				NEXTGEN Sensor Integration																							
	AUV/Glider Prototype and Sensor Dev/C2 and Testing																															
Sensors/Obs Sys (TTS)	GAIT Ver 2.0				HWDDC Prototype				GAIT Ver 2.0				DEM/VAL																			
	ACARS Prototype				ACARS V&V				DEM/VAL				DEM/VAL																			
	AQS-20/MIW TTS				TTS NSW/MIW Prototype				TTS NSW/MIW Sensor V&V				DEM/VAL																			
	SN Database NGA Prod Eval				AN Forecast				AN Archive Database				DEM/VAL				Expanded sensor/system Integration				DEM/VAL											
	UAV/TAGS-60 C2/Adap Surv				DEM/VAL				MC&G/GI&S Product/Database development & evaluation				Report				Adaptive sampling tools & systems Report															
TDA/Mission Planning	TED Services V3.0				DEM/VAL				TED Services V4.0 Data Transfer				TED Services V4.0				Automated Sensor Assimilation Data Transfer				GIG-ES Integration Data Transfer											
					DCGS-N Integration												DCGS-N Integration															
METOC in the IT Enterprise					Littoral Warfare insitu sensor prototype				DEM/VAL				sensor Upgrades				DEM/VAL				GIG Integration				DEM/VAL							
	AQS20/SPS48E				Littoral sensor interface development				platform Integration								DEM/VAL															
Sensors/Obs Sys (In-Situ)																																



**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification						DATE: <b>February 2007</b>		
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>		PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications			PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling			
COST (\$ in Millions)	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Project Cost	<b>9.054</b>	<b>10.753</b>	<b>14.511</b>	<b>17.075</b>	<b>21.648</b>	<b>17.386</b>	<b>14.462</b>	<b>13.078</b>
RDT&E Articles Qty								

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The meteorological and oceanographic (METOC) Data Assimilation Project is a multi-faceted project that provides future mission capabilities for warfighters to characterize the physical environment within their battlespace. This project includes: 1) development, demonstration and validation of atmospheric and oceanographic data assimilation techniques, forecast models, database management systems, and associated software for use in both mainframe and tactical scale computers. Included are numerical oceanographic and atmospheric models for the Large Scale Computers at the Navy Fleet Numerical Meteorology and Oceanography Center (FNMOC), Monterey, CA and the Naval Oceanographic Office, Stennis Space Center, MS. These models, combined with a global communications network for data acquisition and distribution, form a prediction system which provides METOC data and products necessary to support naval operations worldwide in virtually every mission area; 2) other models, which focus on ocean thermal structure and circulation, and surf and tide prediction; 3) techniques to process and manage satellite remotely-sensed environmental data at Oceanography Centers ashore and on ships equipped with the AN/SMQ-11 satellite receiver/recorder; 4) National Polar-orbiting Operational Environmental Satellite System (NPOESS) readiness and risk reduction preparations to develop hardware and software that will allow ground stations to receive, ingest and exploit the NPOESS Preparatory Project (NPP) data. These techniques allow for the integration and tactical application of significant oceanographic and atmospheric data derived from satellite-borne sensors. Included are techniques and algorithms for the processing of sensor measurements, conversion of raw signal data to geophysical information, analysis schemes encompassing Artificial Intelligence and Expert Systems, and other satellite data applications and field validation of end products; and, 5) a family of acoustic system performance models beginning with active system models and databases in the low-, mid-, and high-frequency regimes and culminating with high fidelity simulation products. As weapons and sensors become more sophisticated and complex, the marine environment has an increasingly significant impact on system performance. Operational limitations induced by the ocean and atmosphere must be understood, and the resulting constraints on mission effectiveness and system employment minimized. Hence, the operating forces require more accurate worldwide forecasts of METOC conditions with increased temporal and spatial resolution. An additional challenge is posed by the emergence of new satellite sensors, which are continually adding new sources of disparate data types. In order to fully exploit this dynamic and massive volume of data, modern Data Base Management Systems (DBMS) are required, and must be tailored for individual computer configurations. Improved representation of smaller-scale phenomena, particularly in the littoral, is also an important consideration. Intelligence Preparation of the Environment (IPE) Sensor R&D to meet CNO and Commander, Fleet Forces Command (CFFC) requirements for remote autonomous, clandestine, littoral battlespace sensing in near shore areas in support of Sea Shield & Sea Basing.

Funding increases in FY08 and beyond support the development of advanced data fusion algorithms and network integration as part of the Littoral Battlespace Sensing, Fusion and Integration (LBSF&I) Program. These efforts are highlighted in the Assimilation and Prediction Models (Atmosphere) and Assimilation and Prediction Models (Ocean) descriptions.

CLASSIFICATION:

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling

**(U) B. Accomplishments/Planned Program**

Modeling and Simulation (M&S)/Tactical Design Aids (TDA) and Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.405	1.985	1.091	1.022
RDT&E Articles Quantity				

FY06 - Delivered Version 1.0 of Carrier Strike Group (CSG) / Expeditionary Strike Group (ESG) Environmental Simulator to Naval Oceanography Office (NAVOCEANO). Conducted demonstration and validation. Began development of Version 2.0.

FY07 - Deliver Joint Modeling and Simulations (M&S) support capabilities to Naval Oceanography Command (NAVOCEANO). Continue development of Version 2.0 of the CSG/ESG Environmental Simulator. Begin development of automated quality control algorithms, sensor command and control interfaces, and communications interfaces in support of Littoral Battlespace Sensing, Fusion and Integration (LBSF&I). Participate in selected Naval Exercises and deliver post exercise strawman and final reports (from Fleet Exercises). New applications and data are delivered from the program and require verification and validation on an annual basis. Deliver annual report (from Fleet Applications and Data Verification and Validation). Continue development of automated Anti-Submarine Warfare (ASW) reconstruction and data collection efforts.

FY08 - Begin development of an ASW mission planning tool for operational use at the ASW Reachback Cell (RBC) resident at the NAVOCEANO. Develop ASW Tactical Decision Aids (TDA) asset allocation and mission planning tools to optimize deployment of environmental data collection assets. Explore presentation of mission planning and acoustic reconstruction data in a Geographic Information System (GIS) Develop a algorithms to create area acoustic assessments and analogous exercise area tools.

FY09 - Continue development of ASW mission planning, analysis and reconstruction tools (including GIS) for operational use at the ASW RBC. Tool set will be expanded to support all ASW communities, Integrate mission planning and acoustic reconstruction data in a GIS. Continue to develop ASW TDA asset allocation and mission planning tools to optimize deployment of both environmental data collection assets and tactical acoustic and non-acoustic sensors.

Fleet Exercises/TDA and Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.505			
RDT&E Articles Quantity				

FY06 - Participated in selected Naval Exercises and delivered post exercise strawman and final reports. Continued development of Automated ASW Reconstruction efforts.

FY07 - Efforts incorporated into the TDA and Mission Planning investment line.

High-Resolution Forecast Models/Assimilation and Prediction Models (Atmosphere)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.881			
RDT&E Articles Quantity				

FY06 - Delivered Version 3 of Coupled Atmospheric Mesoscale Prediction Systems (COAMPS). Re-code Coupled Atmospheric Mesoscale Prediction Systems (COAMPS) to conform to Weather Research and Forecasting (WRF) compatibility requirements. Began integration of COAMPS Dust algorithms. Continued research directed towards improved Tropical Cyclone forecasts.

FY07 - Efforts incorporated into the "Assimilation and Prediction Models (Atmosphere)" product line.

## CLASSIFICATION:

EXHIBIT R-2a, RDT&E Project Justification			DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY	PROGRAM ELEMENT NUMBER AND NAME	PROJECT NUMBER AND NAME	
<b>RDT&amp;E, N / BA-4</b>	PE 0603207N Air/Ocean Tactical Applications	2342 METOC Data Assimilation and Modeling	

**(U) B. Accomplishments/Planned Program**

	FY 06	FY 07	FY 08	FY 09
Coupled Data Assimilation/ Assimilation and Prediction Models (Atmosphere)				
Accomplishments/Effort/Subtotal Cost	0.505	1.984	3.995	4.044
RDT&E Articles Quantity				

FY06 - Began operational test of Naval Research Lab (NRL) Atmospheric Variation Data System (NAVDAS) Version 3. Re-code NAVDAS to conform to Weather Research and Forecasting (WRF) compatibility requirements. Developed of next generation coupled assimilation techniques incorporating direct satellite derived radiance data.

FY07 - Complete NAVDAS Version 3 Operational Test (OPTTEST) and deliver to FNMOC. Investigate and incorporate Automated Techniques into the next generation data assimilation system. Re-code NAVDAS to conform to Weather Research and Forecasting (WRF) compatibility requirements (from Coupled Data Assimilation). Continue implementing WRF compatibility requirements. Explore incorporation of high-resolution Aerosol analyses and forecasts (from High-Resolution Models). Begin development of Coupled Ocean/Atmosphere Meso-Scale Prediction System (COAMPS) V4. Continue investigations into improved Tropical Cyclone forecasting techniques. Begin Development of Hi-Res (~27km) Global Model. Complete COAMPS Dust algorithm integration. Begin COAMPS operating system Nowcast integration. Develop advanced data fusion algorithms for weather radars in support of the LBSF&I program.

FY08 - LBSF&I: Continue development of advanced algorithms (e.g. Nowcast) that assimilate and fuse various data types such as radial wind velocity, reflectivity, rain rate, etc. generated from the Hazardous Weather Detection and Display Capability (HWDDC) system as well as data types such as electromagnetic refractivity generated from the SPY-1 Tactical Environmental Processor (TEP). Demonstrate the HWDDC fusion algorithms. Develop automated quality control algorithms for these data types. Begin development of an end-to-end methodology to collect, fuse, and integrate these data into Navy and DoD networks and command and control nodes. Develop related systems engineering plans, requirements, standards, studies, and other documentation supporting LBSF&I Joint Capabilities Integration & Development System (JCIDS) and related acquisition documentation development.

METOC Future: Develop advanced data assimilation, coupled mesoscale forecast systems. Test performance of 4D-Var (Degrees of Variation) for NAVDAS integration. Extend capabilities of assimilation systems to use additional satellite, remote sensed and insitu data types. Develop architecture for fully coupled ocean and atmospheric system. Continue to develop advanced atmospheric prediction/forecast models. Develop high resolution (small scale) atmospheric models to forecast environmental conditions in the littoral and riverine regions. Develop advanced global atmospheric prediction/forecast models. Develop high resolution (small scale) atmospheric models to nowcast & forecast environmental conditions in the littoral and riverine regions. Development advance aerosol small scale and large scale prediction models.

FY09 - LBSF&I: Continue TEP fusion algorithm development. Demonstrate TEP fusion capability. Continue development of network integration capability. Continue to develop related systems engineering plans, requirements, standards, studies, and other documentation supporting LBSF&I JCIDS development. Develop advance aerosol small scale and large scale prediction models.

METOC Future: Continue development and verify performance of advanced data assimilation, coupled mesoscale forecast systems. Test performance of 4D-Var for NAVDAS integration. Extend capabilities of assimilation systems to use additional satellite, remote sensed and insitu data types. Continue to develop and test fully coupled atmospheric-ocean system. Continue to develop advanced global atmospheric prediction/forecast models. Develop high resolution (small scale) atmospheric models to nowcast & forecast environmental conditions in the littoral and riverine regions. Continue development and test performance of advance aerosol small scale and large scale prediction models.

CLASSIFICATION:

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>		
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling		
<b>(U) B. Accomplishments/Planned Program</b>				
Basin Scale Ocean Models/ Accomplishments/Effort/Subtotal Cost	FY 06 0.855	FY 07 2.614	FY 08 6.135	FY 09 6.114
RDT&E Articles Quantity				
<p>FY06 - Completed the transition of Adriatic Sea model. Transitioned rapid relocatability capability. Performed incremental development of coupled air/ocean models for selected geographical locations in response to emergent requirements. Completed development of Naval Coupled Ocean Data Assimilation (NCODA) Multi-Variate Optimal Interpolation (MVOI). Continued development of Naval Coastal Ocean Model (NCOM) relocateable grid, dynamic Modular Ocean Data Assimilation System (MODAS), and Hybrid Coordinate Ocean Model (HYCOM). Began development of NCODA Vertical Covariance.</p> <p>FY07 - Incremental development of coupled air/ocean models for selected geographical locations in response to emergent requirements. Complete development of MODAS dynamic. Begin development of MODAS Next Generation (NEXGEN). Continue development of HYCOM. Complete development of NCOM relocateable. Begin development of NCOM Region A. Complete development of NCODA Vertical Covariance. Begin development of NCODA Horizontal Covariance. Continue development of advanced ADvanced CIRCulation model (ADCIRC) and coastal wave and surf algorithms. Develop advanced data fusion algorithms in support of the LBSF&amp;I program.</p> <p>FY08 - LBSF&amp;I: Continue development of advanced algorithms that assimilate and fuse various glider and Autonomous Undersea Vehicle (AUV) sensor data types such as conductivity, temperature, depth, optical properties, hydrographic, and bathymetric data. Develop automated data quality control algorithms supporting these data types. Begin development of an end-to-end methodology to collect, transmit, fuse, and integrate these data into Navy and DoD networks and Command and Control nodes. Develop related systems engineering plans, requirements, standards, studies, and other documentation supporting LBSF&amp;I JCIDS and related acquisition documentation development.</p> <p>METOC Future: Develop advanced data assimilation, coupled mesoscale forecast systems. Test performance of 3D-Var for NCODA integration. Extend capabilities of assimilation systems to use additional satellite, remote sensed and insitu data types. Development of architecture for fully coupled ocean and atmospheric system. Continue to develop advanced ocean prediction/forecast models. Develop high resolution (small scale) atmospheric models to forecast environmental conditions in the littoral and riverine regions. Develop advanced global atmospheric prediction/forecast models. Develop high resolution (small scale) atmospheric models to nowcast &amp; forecast environmental conditions in the littoral and riverine regions.</p> <p>FY09 - LBSF&amp;I: Continue development of advanced data assimilation and fusion algorithms. Demonstrate TEP fusion algorithm. Demonstrate TEP fusion capability. Continue development of network integration capability and related systems engineering plans, requirements, standards, studies, and other JCIDS required documentation. Test and demonstrate advanced glider data fusion capability.</p> <p>METOC Future: Continue development and verify performance of advanced data assimilation, coupled mesoscale forecast systems. Test performance of 3D-Var for NCODA integration. Extend capabilities of assimilation systems to use additional satellite, remote sensed and insitu data types. Continue to develop and test fully coupled atmospheric-ocean system. Continue to develop advanced global Numerical Ocean Circulation prediction/forecast models. Develop high resolution (small scale) oceanographic models to nowcast &amp; forecast environmental conditions in the littoral and riverine regions.</p>				
Data Assimilation/ Assimilation and Prediction Models (Space) Accomplishments/Effort/Subtotal Cost	FY 06 1.255	FY 07 1.309	FY 08 1.495	FY 09 3.829
RDT&E Articles Quantity				
<p>FY06 - Continued to transition applications using next generation WindSat (U.S. Satellite), Meteosat Second Generation (MSG), the Special Sensor Microwave Imager and Sounder (SSMIS), and MTSAT (Japanese replacement satellite). Began development of the next generation of Satellite Workstations.</p> <p>FY07 - Continue to transition applications using next generation WindSat, MSG, the SSMIS, and MTSAT. Incorporation of Automated Expert System techniques (from Data Assimilation). Continue improvements to the Satellite Workstation.</p> <p>FY08 - Development of NPP/NPOESS data assimilation algorithms. Begin development of data assimilation capability using EUMETSAT (European satellite) and NASA satellite data.</p> <p>FT09 - Continue development of NPP/NPOESS data assimilation algorithms including development test and evaluation. Continue development of data assimilation capability using data from EUMETSAT satellites and from NASA's Earth Observing System satellites and begin hosting and operational testing at both Naval METOC Production Centers.</p>				

## CLASSIFICATION:

EXHIBIT R-2a, RDT&E Project Justification			DATE: <b>February 2007</b>	
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling		
<b>(U) B. Accomplishments/Planned Program</b>				
Automated Objective Processing/ Assimilation and Prediction Models (Oceans)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.755			
RDT&E Articles Quantity				
FY06 - Delivered prototype global Naval Coastal Ocean Model (NCOM) prediction system upgrades to the Naval Oceanography Command for testing. FY07 - Efforts incorporated into the "Assimilation and Prediction Models (Oceans)" investment line.				
Tide/Surf Data Visualization/ Assimilation and Prediction Models (Oceans)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.505			
RDT&E Articles Quantity				
FY06 - Finalized approved documentation and delivered Version 1 to Ocean Atmosphere Master Library (OAML). Began development of advanced ADCIRC and coastal wave and surf algorithms. FY07 - Efforts incorporated into the "Assimilation and Prediction Models (Oceans)" investment line.				
NEXGEN Acoustic Models/ Assimilation and Prediction Models (Acoustics)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.200	1.862	1.095	1.244
RDT&E Articles Quantity				
FY06 - Incorporated variable range-step option in Range Acoustic Model (RAM) 4.0, consolidated disparate bottom databases into one consolidated database Geoacoustic Database Variable Resolution (GDB-V). Integrated latest acoustic models into the Geo Acoustic Inversion Toolkit (GAIT). Continued development of Semi-Empirical Surface Scattering Strength (SESSS) Version 3.0 (4-10 kHz gap). Continued annual upgrades to the Scalable Tactical Acoustic Propagation Loss Engine (STAPLE) system. FY07 - Demonstrate and validate RAM 4.0 3D(3 Degrees of Freedom) and deliver OAML. Begin development of RAM 5.0 4D (4 Degrees of Freedom). Complete bottom database consolidation. Continue development of Standard Operating Activities (SOA) GAIT. Begin development of active algorithms for the GAIT. Incorporate Automated Expert Systems model selection algorithms into the next generation RAM (from NEXGEN Acoustic Models). Complete integration of initial uncertainty algorithms into Fleet TDAs. Continue development of next generation mid-frequency bottom loss/bottom scatter models and databases for shallow water environments. Begin development of a fully automated version of GAIT (from Shallow Water Acoustics). Continue annual upgrades to the STAPLE system. Complete SESSS 3.0 (4-10 kHz gap). FY08 - Continue development of RAM. Increase computational speed of the model on ASW TDA processors. Create an OAML Model Testbed by archiving existing passive transmission loss active reverberation datasets. Make modification to the Comprehensive Acoustic System Simulation (CASS) Gaussian Ray Bundle (GRAB) to improve model performance. Begin upgrade of NAUTILUS (a commercial product) propagation model to compute low frequency reverberation. Continue annual upgrades to the STAPLE system. Conduct Reverberation Modeling Workshop. Continue development of the SESSS algorithm. Continue to develop the Geophysical-Acoustic Bottom Interaction Model (GABIM) and GABIM-derived database. Begin development of algorithms that recommend active sonar waveforms based on the state of the environment. Develop an algorithm that validates and improves the quality of modeled low frequency active planning. FY09 - Continue development of RAM. Continue upgrade of NAUTILUS propagation model. Continue annual upgrades to the STAPLE system. Continue development of SESSS. Develop a self-consistent semi-empirical surface loss model. Continue development of the GABIM Version 2.0 and GABIM-derived database. Continue development of algorithms that recommend active sonar waveforms based on the state of the environment.				

EXHIBIT R-2a, RDT&E Project Justification			DATE: <b>February 2007</b>	
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling		
<b>(U) B. Accomplishments/Planned Program</b>				
Shallow Water Acoustics/ Assimilation and Prediction Models (Acoustics)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.755			
RDT&E Articles Quantity				
<p>FY06 - Began development of a Ship of Opportunity version of Geophysical Acoustic Inversion Toolkit (GAIT). Integration of uncertainty predictions into Fleet Tactical Decision Aids (TDA).                      FY07 - Efforts incorporated into the "Assimilation and Prediction Models (Acoustics)" investment line.</p>				
Fleet Applications and Data Verification & Validation/ TDA and Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.405			
RDT&E Articles Quantity				
<p>FY06 - Delivered Annual Report.                      FY07 - Efforts incorporated into the TDA and Mission Planning investment line.</p>				
Littoral Battlespace Sensor Data Assimilation/ Sensors and Observing Systems (Unmanned Vehicles)	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.028	0.999		
RDT&E Articles Quantity				
<p>FY06 - Developed and delivered initial engineering documentation. Developed in-depth data assimilation methods to support various evolving littoral sensors such as the NEXGEN Upper Air Sensor, Seaglider, and Helicopter and/or Unmanned Aerial Vehicle (UAV) specific sensors. Developed new sensors and/or reconfigure existing littoral sensors to support littoral Undersea Warfare (USW), Mine Warfare (MIW), Special Operations (SPECOPS) and other Naval Operations. Developed Next Generation Upper Air Sensor prototype. Conducted glider Alternatives Analysis, data compression and transmission investigations, system hardening, common control interface development, and automated trim and balance capability development                      FY07 - Develop in-depth next generation data assimilation methods to support various evolving littoral sensors such as the Next Generation Upper Air Sensor, Underwater Unmanned Vehicle (UUV) gliders, and Helicopter and/or UAV specific sensors. Demonstrate prototype sensors and deliver post-demonstration report (from Littoral Battlespace Sensor Data Assimilation). Continue development of UV data compression, system hardening, common control interface, and an automated balance and trim capability. Begin integration of a UUV acoustic sensor capability. Conduct demonstration of new capabilities in support of LBSF&amp;I program.</p>				

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling

**(U) B. Accomplishments/Planned Program**

Ambient Noise Data/TDA/Mission Planning	FY 06	FY 07	FY08	FY09
Accomplishments/Effort/Subtotal Cost			0.700	0.822
RDT&E Articles Quantity				

FY08 - Development of the regional Ambient Noise Database (ANDB). Incorporate archived directional ambient noise time series observational data into the ANDB. Update historical shipping databases with non-traditional vessel density data. Commence development of a short-term ambient noise forecasting capability using previously collected ambient noise data from tactical sensors. Incorporate Adaptive Beam Forming (ABF) techniques into existing noise models. Develop methods to aid in the collection, archiving/databasing ambient noise data for later inclusion in historical databases supporting ASW TDAs. Develop TDA uncertainty algorithms.

FY 09 - Continue development of the regional ANDB. Continue development of a short-term ambient noise forecasting capability using previously collected ambient noise data from tactical sensors. Continue to develop methods and techniques to aid in the collection, archiving/databasing and dissemination of both omni-directional and directional ambient noise data. Engineering design for NEXGEN ambient noise model, data assimilation and forecasting tool. Continue to develop TDA uncertainty algorithms.

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling
<p><b>(U) C. OTHER PROGRAM FUNDING SUMMARY:</b></p> <p><u>Line Item No. &amp; Name</u></p> <p>Not applicable</p> <p><b>(U) D. ACQUISITION STRATEGY:</b></p> <p>Acquisition, management and contracting strategies to support the METOC Data Assimilation Project which is a multi-faceted program which includes: 1) development, demonstration and validation of atmospheric and oceanographic data assimilation techniques, forecast models, database management systems, and associated software for use in both mainframe and tactical scale computers; 2) other models, which focus on ocean thermal structure and circulation, and surf and tide prediction; 3) techniques to process and manage satellite remotely-sensed environmental data at Oceanography Centers ashore and on ships equipped with the AN/SMQ-11 satellite receiver/recorder; and, 4) a family of acoustic system performance models beginning with active system models and databases in the low-, mid-, and high-frequency regimes and culminating with high fidelity simulation products, all with management oversight by Program Executive Officer for Command, Control, Communications, Computers, and Intelligence and Space (PEO C4I &amp; Space).</p> <p><b>(U) E. MAJOR PERFORMERS:</b></p> <p>Not applicable</p> <p><b>(U) F. METRICS:</b></p> <p>Earned Value Management (EVM) is used for metrics reporting and risk management.</p>		

CLASSIFICATION:

Exhibit R-3 Cost Analysis (page 1)										DATE: February 2007		
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT				PROJECT NUMBER AND NAME					
RDT&E, N / BA-4			PE 0603207N Air/Ocean Tactical Applications				2342 METOC Data Assimilation and Modeling					
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 07 Cost	FY 07 Award Date	FY 08 Cost	FY 08 Award Date	FY 09 Cost	FY 09 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Software Development	WX	NRL	64.032	8.556	N/A	10.171	N/A	11.970	N/A	CONT	CONT	
	WX	NAWC-WD, Pax	1.981	0.285	N/A	0.250	N/A	0.750	N/A	CONT	CONT	
	PD	APL	1.628	0.397	N/A	0.347	N/A	0.750	N/A	CONT	CONT	
	Grant	Univ. S. Miss.	2.413		N/A		N/A		N/A	CONT	CONT	
	CP	Neptune	1.722	0.445	N/A	0.760	N/A		N/A	CONT	CONT	
	CP	New Age	1.421	0.445	N/A	1.225	N/A	1.225	N/A	CONT	CONT	
	N/A	MISC	12.775	0.623	N/A		N/A	0.580	N/A	CONT	CONT	
	CP	Seaport-e (SAIC/Metron)	1.025		N/A	1.758		1.800				
Subtotal Software Development			86.997	10.753		14.511		17.075		CONT	CONT	
Remarks:												
Systems Engineering	CP	SSA/CSC	0.295							CONT	CONT	
Subtotal Support			0.295							CONT	CONT	
Remarks:												
Total Cost			87.292	10.753		14.511		17.075		CONT	CONT	

EXHIBIT R4, Schedule Profile																				DATE: <b>February 2007</b>																
APPROPRIATION/BUDGET ACTIVITY					PROGRAM ELEMENT NUMBER AND NAME								PROJECT NUMBER AND NAME																							
RDT&E, N / BA-4					PE 0603207N Air/Ocean Tactical Applications								2342 METOC Data Assimilation and Modeling																							
Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013							
	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	4	1	2	3	4
Coupled Data Assimilation/ Assim/Pred Models (Atm)	NAVDAS V3.0																																			
	WRF																																			
Hi-Res Forecast Models/ Assim/Pred Models (Atm)	COAMPS V3.0																																			
	Radar Assim																																			
Assim/Pred Models (Atm)	WRF				NAVDAS V3				Hi-Res Global (~27km)				COAMPS NOWCAST/NAVDAS				NEXGEN HI-Res Re-locatable																			
					Hi-Res Aerosols				Radar Assim High model top (~67km)				Multi constituents (aero)																							
									LBSF&I Ocean Data Fusion and Integration																											
Basin Scale Ocean Models/ Assim./Pred Models (Ocn)	NCOM Relocatable																																			
	Dynamic MODAS																																			
	HYCOM																																			
Automated Obj Processing/ Assim/Pred Models (Ocn)	NCOM Upgrades																																			
Tide/Surf/Data Visualization/ Assim/Pred Models (Ocn)	ADCIRC																																			
	Costal Wave/Surf																																			
Assim/Pred Models (Ocn)					MODAS Dyn				MODAS 3.0				MODAS NEXGEN																							
					NCOM Relocate				Region A				NCODA V2.0				HYCOM Regional				NCODA V3.0				HYCOM Region A											
					NCODA V1.0																															
									LBSF&I Ocean Data Fusion and Integration																											
NEXGEN Acoustic Models/ Assim/Pred Models (Ac)	RAM 4.0																																			
	SESS 3.0																																			
Shallow Water Acoustics/ Assim/Pred Models (Ac)	SOA GAIT																																			
	Uncertainty																																			
Assim/Pred Models (Ac)					RAM 4.0 3D				RAM V5.0 4D				NEXGEN RAM																							
					SESS V3.0				SOA/Active GAIT				SOA GAIT				Active GAIT				NEXGEN Inversions															
					STAPLE Upgrades				STAPLE TTIS																											





**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification							DATE: <b>February 2007</b>		
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>		PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications			PROJECT NUMBER AND NAME 2343 Tactical METOC Applications				
COST (\$ in Millions)		FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
Project Cost		<b>7.381</b>	<b>8.652</b>	<b>7.678</b>	<b>6.373</b>	<b>6.805</b>	<b>6.229</b>	<b>6.387</b>	<b>6.549</b>
RDT&E Articles Qty									

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The Tactical Meteorological and oceanographic (METOC) Applications Project provides future operational effects decision aid capabilities for Navy and Marine Corps warfighters in the context of Joint Operations. This project identifies and transitions state-of-the-art decision support software technologies from the government's and commercial Industry's technology base and then demonstrates and validates these capabilities before fielding. These future software decision support tools are intended to provide platform, sensor, communications, and weapon systems performance assessments for warfighters in terms of their littoral and deep-strike battlespace environments. These assessments allow mission planners and warfighters, from the unit to theater level, to optimize their sensor employment on airborne, surface, and subsurface platforms in support of all Naval Composite Warfare mission areas including Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare (AAW), Strike Warfare (STW), and Naval Special Warfare (NSW). Performance assessments leading to improvements in operational and tactical control are conducted through a two-tiered approach: 1) METOC Decision Aids (MDAs) and, 2) Operational Effects Decision Aids (OEDAs). MDAs consist of a series of analysis tools which characterize the physical environment conditions of the battlespace based on the best set of physical environment data available at the time (i.e., some combination of historical and/or real-time (or near real-time) in-situ, and numerically modeled forecast data). OEDAs then use the MDA information by fusing it with relevant, often-classified sensor and target data to predict how own-force weapons and sensor systems will perform against hostile targets. Performance results are displayed in tabular and graphic formats for use by mission planners and combat/weapon system operators to develop localization plans, USW/AAW/ASUW screens, STW profiles, AMW ingress and egress points, and for other warfare considerations. MDAs and OEDAs typically use data derived from sensors developed in Project 2341 (METOC Data Acquisition) and assimilated by software produced by Project 2342 (METOC Data Assimilation and Modeling). MDAs and OEDAs also use data obtained through direct interfaces to Navy combat systems. A current emphasis area of the project is capabilities required to characterize and/or predict sensor and weapons system performance in the highly complex littoral environments in support of regional conflict scenarios. It addresses multi-warfare areas, particularly shallow water ASW, NSW, and missile and air defense/strike capabilities.

This budget reflects changes in investment line description beginning in FY07. This change supports acquisition and development investment lines that support the vision, operations concept, and capability requirements. Changes consolidate and better define RDT&E efforts as well as better reflect the new Commander Naval Meteorological and Oceanographic Command (CNMOC) reorganization.

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2343 Tactical METOC Applications

**(U) B. Accomplishments/Planned Program**

Electromagnetic and Electro-optical (EM/EO) Decision Aids/ TDA/Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.740	8.652	7.678	6.373
RDT&E Articles Quantity				

FY06 - Completed development of Target Acquisition Weather Software (TAWS) Version 3.0 to include new sensor data and backgrounds consistent with Joint Operations. Continued development of TAWS 4.0 (web-enabled). Developed upgrades to next generation Electromagnetic and Electro-optical (EM/EO) performance prediction systems to include incorporation of new Navy and Joint Sensor Suites. Began porting Advanced Refractive Effects Prediction System (AREPS) code to JAVA. Began development of the Naval Integrated Tactical Environmental System Next Generation (NITES NG).

FY07 - Complete development of TAWS 4.0. Begin development of TAWS 4.4 Enterprise Portal. Complete development of AREPS JAVA port. Begin development of an advanced EM Model Server. Conduct annual update of Mine Warfare Environmental Data Applications Library (MEDAL) acoustic databases and models. Continue development of NITES NG.

FY08 - Development of System architecture, system engineering, Preliminary Design Review (PDR), Critical Design Review (CDR), initial software development and Pre-Milestone C acquisition activities for NITES NG, including integration of updates to sensor data and backgrounds consistent with Joint Operations and development of upgrades to next generation EM/EO and AREPS performance prediction systems to include incorporation of new Navy and Joint Sensor Suites. Develop MEDAL to include the incorporation of the new environmental databases and model updates. Support transition in fleet for integration of new EM/EO TAWS, and advanced visualization techniques for Global Command and Control System - Maritime and Joint (GCCS-M and GCCS-J) integration prior to NITES NG transition in FY08 to include integration of new EM/EO, TAWS, and advanced visualization techniques for GCCS-M and GCCS-J integration.

FY09 - Milestone C activities and associated development of system architecture, system engineering, software development, test and integration activities for NITES NG including development of upgrades to next generation EM/EO and AREPS performance prediction systems to include incorporation of new Naval and Joint Sensor Suites. Develop MEDAL to include the incorporation of the new environmental databases and model updates.

Mine Littoral Warfare Tactical Decision Aids (TDA)/ TDA/Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.567			
RDT&E Articles Quantity				

FY06 - Performed development to incorporate additional mine littoral warfare decision aids in applicable performance prediction systems. Developed MEDAL Build 11 to include the incorporation of the new Geoacoustic Database - Variable Resolution (GDB-V) as well as the incorporation of the new Battlespace Profiling System (BPS).

FY07 - Efforts rolled into the "TDA/Mission Planning" investment line.

Tactical Decision Aids (TDA) COTS Visualization/ TDA/Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.672			
RDT&E Articles Quantity				

FY06 - Developed Network integration via Commercial Joint Mapping Tool Kit (CJMTK) and integration of evolving Geospatial Information Services (GIS) based technology.

FY07 - Efforts rolled into the "TDA/Mission Planning" investment line.

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2343 Tactical METOC Applications

**(U) B. Accomplishments/Planned Program**

Platform Vulnerability/TDA/Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.266			
RDT&E Articles Quantity				

FY06 - Developed TDA Version 4 to include integration of new EM/EO, TAWS, and advanced visualization techniques such as 4D Visualization.  
 FY07 - Efforts rolled into the "TDA/Mission Planning" investment line.

Sensor Interface Capabilities/TDA/Mission Planning	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	1.136			
RDT&E Articles Quantity				

FY06 - Performed evolutionary development of Build 3.5. Evaluated functionality during at-sea tests and deliver technical reports. Completed Integrated Ocean Observing System (IOOS) effort.  
 FY07 - Efforts rolled into the "TDA/Mission Planning" investment line.

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification	DATE: <b>February 2007</b>
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APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2343 Tactical METOC Applications
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**(U) C. OTHER PROGRAM FUNDING SUMMARY:**

Line Item No. & Name

Not applicable

RELATED RDT&E: PE 0604218N (Air/Ocean Equipment Engineering). TESS/NITES will incorporate METOC data applications.

**(U) D. ACQUISITION STRATEGY:**

Acquisition, management and contracting strategies are to support the Tactical METOC Applications project to continue the development of state-of-the-art software capabilities that provide sensor, communication, and weapon system performance assessments across the full spectrum of open ocean and littoral operating environments, meteorology and oceanography , all with management oversight incorporating these into Naval Integrated Tactical Environmental System Next Generation (NITES NG) under JCIDS by Program Executive Officer for Command, Control, Communications, Computers, and Intelligence and Space (PEOC4I & Space).

**(U) E. MAJOR PERFORMERS:**

N/A

CLASSIFICATION:

Exhibit R-3 Cost Analysis (page 1)										DATE: February 2007		
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT				PROJECT NUMBER AND NAME					
RDT&E, N / BA-4			PE 0603207N Air/Ocean Tactical Applications				2343 Tactical METOC Applications					
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 07 Cost	FY 07 Award Date	FY 08 Cost	FY 08 Award Date	FY 09 Cost	FY 09 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Software Development	WX	NUWC	1.400	0.830	N/A					CONT	CONT	
	WX	SSC SD	3.459	0.525	N/A	0.535	N/A	0.546	N/A	CONT	CONT	
	WX	NRL	2.343	0.525	N/A	0.360	N/A	0.430	N/A	CONT	CONT	
	CP/DP	NAVSEA	38.152	0.400	N/A	0.350	N/A	0.350	N/A	CONT	CONT	
	CP	LOCKHEED	1.053									
	N/A	MISC	6.370	0.675	N/A	0.688	N/A	0.702	N/A	CONT	CONT	
	CP	SeaPort e		1.167	N/A	1.126	N/A	1.067	N/A	CONT	CONT	
	CPAF	Anteon	3.600	2.000	N/A							
	CP	NITES NG Contract		2.530	Q3	4.619	N/A	3.278	N/A	CONT	CONT	
Subtotal Product Development			56.377	8.652		7.678		6.373			79.080	
Remarks:												
	CP	IPD	0.595							CONT	CONT	
Subtotal Support			0.595							CONT	CONT	
Remarks:												
Total Cost			56.972	8.652		7.678		6.373		CONT	CONT	

CLASSIFICATION:

EXHIBIT R4, Schedule Profile																								February 2007								
APPROPRIATION/BUDGET ACTIVITY								PROGRAM ELEMENT NUMBER AND NAME								PROJECT NUMBER AND NAME																
RDT&E, N / BA-4								PE 0603207N Air/Ocean Tactical Applications								2343 Tactical METOC Applications																
Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	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	4
EM/EO Decision Aids/ TDA/Mission Planning	▲ TAWS 3.0 ▲																															
	▲ JAVA AREPS ▲																															
Mine Warfare TDAs/ TDA/Mission Planning	▲ MEDAL Update ▲																															
TDA COTS Visualization/ TDA/Mission Planning	▲ NITES NG ▲																															
Platform Vulnerability/ TDA/Mission Planning	▲ NITES II Upgrade ▲																															
Sensor Interface Capabilities/ TDA/Mission Planning	▲ IOOS ▲																															
TDA/Mission Planning					NITES NG MEDAL Update				NITES NG MEDAL Update				NITES NG TAW\$/AREPS				NITES NG LBSI&F				NITES NG DCGS-N											
					TAW\$/AREPS				TAW\$/AREPS																							
					EM Server				Platform Vulnerability																							



**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification							DATE: <b>February 2007</b>		
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>		PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications			PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry				
COST (\$ in Millions)		FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Project Cost		<b>1.285</b>	<b>1.590</b>	<b>1.216</b>	<b>1.270</b>	<b>1.321</b>	<b>1.319</b>	<b>1.344</b>	<b>1.370</b>
RDT&E Articles Qty									

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The major thrust of the Precise Timing and Astrometry Project (PTA) is to provide future capabilities that directly support the mission of the U.S. Naval Observatory (USNO). These future mission capabilities are intended to:

1) address DoD requirements for needed increases in positioning accuracies of modern weapons systems by the determination of star positions (including objects at other than optical wavelengths) and the stellar inertial reference system (to which all navigation, guidance, and positioning systems are ultimately referred); 2) develop techniques for the prediction of the Earth's instantaneous orientation with respect to the stellar inertial reference system; 3) oversee the determination and dissemination of precise time information using the Navy/DoD Master Clock System and precise time distribution networks; and, 4) develop advanced electronic light detectors and interferometry in the optical and infrared wavelength regions for very precise determination of the positions of both faint and bright stars, satellite tracking, and space debris studies. DoD Instruction 5000.2 assigns to the Navy the responsibility for coordinating Precise Time and Time Interval (PTTI) requirements and for maintaining a PTTI reference standard (astronomical and atomic) for use by all DoD Services, Federal agencies, and related scientific laboratories. The Navy is also responsible for providing astronomical data for navigation, positioning, and guidance, including space. Some operational and many emerging requirements surpass current support capabilities. In response to these DoD requirements, this project transitions Research (6.1) and Exploratory Development (6.2) efforts, as well as developments in the civilian sector, into the operational capabilities of the USNO.

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry

**(U) B. Accomplishments/Planned Program**

Time Transfer/ Precise Timing, Astrometry, & Reference Frames	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.392	1.590	1.216	1.270
RDT&E Articles Quantity				

FY06 - Developed next generation Global Positioning System (GPS) Independent Time Transfer. Completed design of preliminary Prototype M Code Timing Rx.  
 FY07 - Begin development of the algorithm for the atomic fountain timescale. Begin a 24/7 demonstration of the Ensemble Fountain Clock Systems. Complete and demonstrate the Prototype M Code GPS receiver. Begin development of the USNO Robotic Astrometric Telescope (URAT) Focal Plane Array (FPA). Conduct a pre-operational demonstration of the Charge Coupled Device (CCD) array for the USNO Robotic Astrometric Telescope.  
 FY08 - Complete development of algorithm for ensemble clock system. 24/7 demonstration of fountain ensemble clock. Mod M-code GPS receiver to meet final specifications. Demo URAT focal plane.  
 FY09 - Initiate ensemble demo at Alternate Maser Clock (AMC) facility. Demo final M-Code receiver. Design astrometric space mission.

Earth Orientation/Astrometry/ Precise Timing, Astrometry, & Reference Frames	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.430			
RDT&E Articles Quantity				

FY06 - Completed Orion Array Prototype Detector. Performed incremental development of next generation earth orientation techniques (Astrometric Telescope). Began development of radiation mitigation techniques for space operations.  
 FY07 - Efforts rolled into the "Precise Timing, Astrometry & Reference Frames" Investment line.

Master Clock/ Precise Timing, Astrometry, & Reference Frames	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.463			
RDT&E Articles Quantity				

FY06 - Performed initial testing and completed initial Technical Reports. Demonstrated 24/7 operational capability of Rubidium Fountain Clock. Began development of Ensemble Fountain Clock Systems.  
 FY07 - Efforts rolled into the "Precise Timing, Astrometry & Reference Frames" Investment line.

**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification		DATE: <b>February 2007</b>
APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry
<p><b>(U) C. OTHER PROGRAM FUNDING SUMMARY:</b></p> <p><u>Line Item No. &amp; Name</u></p> <p>Not applicable.</p>		
<p><b>(U) D. ACQUISITION STRATEGY:</b></p> <p>Acquisition, management and contracting strategies are to support the Precise Timing and Astrometry Project in direct support of the U.S. Naval Observatory (USNO) in: 1) addressing DoD requirements for needed increases in positioning accuracies of modern weapons systems by the determination of star positions and the stellar inertial reference system; 2) developing techniques for the prediction of the Earth's instantaneous orientation with respect to the stellar inertial reference system; 3) overseeing the determination and dissemination of precise time information using the Navy/DoD Master Clock System and precise time distribution networks; and, 4) developing advanced electronic light detectors and interferometry in the optical and infrared wavelength regions for very precise determination of the positions of both faint and bright stars, satellite tracking, and space debris studies, all with management oversight by Program Executive Officer for Command, Control, Communications, Computers, and Intelligence and Space (PEOC4I &amp; Space).</p>		
<p><b>(U) E. MAJOR PERFORMERS:</b></p> <p>N/A</p>		



CLASSIFICATION:

EXHIBIT R4, Schedule Profile																				DATE: <b>February 2007</b>												
APPROPRIATION/BUDGET ACTIVITY										PROGRAM ELEMENT NUMBER AND NAME										PROJECT NUMBER AND NAME												
RDT&E, N / BA-4										PE 0603207N Air/Ocean Tactical Applications										2344 Precise Timing and Astrometry												
Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	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	4
Time Transfer/ Precise Timing, Astrometry, & Reference Frames	M Code Timing Rx																															
Earth Orientation/ Precise Timing, Astrometry, & Reference Frames	Radiation Mitigation Demo																															
Master Clock/ Precise Timing, Astrometry, & Reference Frames	Rubidium Demo																															
Precise Timing, Astrometry, & Reference Frames																																



**CLASSIFICATION:**

EXHIBIT R-2a, RDT&E Project Justification	DATE: <b>February 2007</b>
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APPROPRIATION/BUDGET ACTIVITY <b>RDT&amp;E, N / BA-4</b>	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 9999 Congressional Increases
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**(U) B. Accomplishments/Planned Program**

9890 3D-CMAPS	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	2.394	0.000	0.000	0.000
RDT&E Articles Quantity				

FY06: The 3D-CMAPS Congressional Add provided the Navy an opportunity to evaluate a newly developed commercial sonar technology. This new sonar technology has the potential to be the next-generation for hydrographic surveying and seafloor bottom imaging sonar in support of Mine Warfare.

9891 Gateway System	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.958	0.000	0.000	0.000
RDT&E Articles Quantity				

9892 Littoral Acoustic Demonstration Center	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.958	0.000	0.000	0.000
RDT&E Articles Quantity				

9891 Gateway Concept	FY 06	FY 07	FY 08	FY 09
Accomplishments/Effort/Subtotal Cost	0.000	0.996	0.000	0.000
RDT&E Articles Quantity				

FY07: Develop a new design for underwater cable connections.