EXHIBIT R-2, RDT&E Budget Item Justification					DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY / BA-4					R-1 ITEM NOMENCLATURE PE 0603207N Air/Ocean Tactical Applications			
COST ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Total PE Cost	**39.300**	**67.531**	**116.082**					
2341 METOC Data Acquisition	14.155	19.765	22.028					
2342 METOC Data Assimilation and Modeling	13.323	18.590	19.424					
2343 Tactical METOC Applications	4.383	6.368	16.164					
2344 Precise Timing and Astrometry	1.035	20.215	2.258					
3207 Fleet Synthetic Training		0.997	1.008					
3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)			55.200					
9999 Congressional Increases	6.404	1.596						

(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 to project 2343, Tactical METOC Applications, beginning in FY10 are the result of technical corrections to the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program's funding profile in order to more appropriately reflect the software only nature of the effort. The net result of these zero sum technical changes are reductions to the NITES-Next OP,N (BLI 4226 Meteorological Equipment) profile & subsequent dollar for dollar increases to the program's RDT&E,N profile.

Funding increases to project 2342, METOC Data Acquisition, in FY10 reflects the beginning of the System Development and Demonstration (SDD) phase of the Littoral Battlespace Sensing - Autonomous Undersea Vehicle (LBS-AUV) portion of the Littoral Battlespace Sensors - Unmanned Undersea Vehicle (LBS-UUV) program, and are the result of technical changes to the program's funding profile. The net result of these zero sum technical changes, are reductions to the LBS-UUV OP,N (BLI 4226 Meteorological Equipment) profile & subsequent dollar for dollar increases to the program's RDT&E,N profile.

Funding increases to project 2342, METOC Data Assimilation and Modeling, in FY10 are in support of the Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities effort, and reflects the need for additional data assimilation algorithms and applications resulting from the launch of the NPOESS Preparatory Project (NPP) satellite.

Funding increase to project 3229 is for the Office of Naval Research's (ONR) Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) satellite program in FY10, FY09 efforts budgeted in project 2344, Precise Timing and Astrometry, $19M.

EXHIBIT R-2, RDT&E Budget Item Justification	DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY / BA 4	R-1 ITEM NOMENCLATURE PE 0603207N Air/Ocean Tactical Applications

(U) B. PROGRAM CHANGE SUMMARY:

(U) Funding:		FY 2008	FY 2009	FY 2010	FY 2011
FY09 President's Submit		43.406	66.133	46.725	
FY10 President's Submit		39.300	67.531	116.082	
Total Adjustments		(4.106)	1.398	69.357	
Summary of Adjustments					
Miscellaneous Adjustments			(0.199)	(0.819)	
Program Adjustments		4.106		70.176	
Congressional Increase			1.600		
	Subtotal	4.106	1.401	69.357	

(U) Schedule:

Schedules for the Littoral Battlespace Sensors - Unmanned Undersea Vehicle (LBS-UUV) and Naval Integrated Tactical Environmental System Next Generation (NITES-Next) programs have been updated to reflect technical corrections to the program's funding profiles and resulting increased developmental efforts beginning in FY10.

(U) Technical:

Not applicable

EXHIBIT R-2a, RDT&E Project Justification							DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2341 METOC Data Acquisition			
COST ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Project Cost	**14.155**	**19.765**	**22.028**					
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.) identified as 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; 7) develop an expanded database for predictive METOC models in areas of interest; and 8) support the 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.

Funding in FY10 reflects the beginning of the System Development and Demonstration (SDD) phase of the Littoral Battlespace Sensing - Autonomous Undersea Vehicle (LBS-AUV) portion of the Littoral Battlespace Sensors - Unmanned Undersea Vehicle (LBS-UUV) program, and are the result of technical changes to the program's funding profile. The net result, of these zero sum technical changes, are reductions to the LBS-UUV OP,N (BLI 4226 Meteorological Equipment) profile & subsequent dollar for dollar increases to the program's RDT&E,N profile.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
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

(U) B. Accomplishments/Planned Program

Littoral Battlespace Sensing, Unmanned Undersea Vehicles (LBS-UUV)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	4.331	4.841	7.361	
RDT&E Articles Quantity				

FY08 - Began development of glider prototypes and the planned tracking and telemetry components of the unmanned systems in preparation of Milestone C (FY10). Sensor integration and validation/ verification tests were initiated. Continued development glider prototypes, including the development and testing of integrated sensors. Completed related studies (communications, databasing, data flow, etc.) and system engineering plans. Continued development of a common Tracking and Telemetry and vehicle mission planning system. Demonstrated and test components. Developed requirements, specifications, and standards for the glider, Tracking and Telemetry, and Mission Planning systems in preparation for Milestone C and for use in related Joint Capabilities Integration & Development System (JCIDS) documentation.

FY09 - Continue development of end-to-end LBSF&I Increment 1.0 glider sensor and support systems. Begin testing and demonstration of end to end glider systems in preparation for MS C and LRIP in FY10. Define Increment 2.0 requirements and definition of Spiral 2 improved Unmanned Undersea Vehicles and associated support systems (launch and recovery, mission planning, test equipment, etc.). Conduct Spiral 2 studies (Analyses of Alternatives, Engineering Studies, etc.). Begin preparations for the System Development and Demonstration (SDD) phase of the Autonomous Undersea Vehicle (AUV) component of this program.

FY10 - Complete the System Development and Demonstration (SDD) phase of the Littoral Battlespace Sensing - Glider (LBS-G) system (Milestone C is scheduled for Q2FY10). Complete at-sea and ashore Development Testing and Evaluation (DT&E) of the complete end-to-end glider system including command and control, mission planning, launch and recovery, mission profile characteristics and other Key Performance Parameters (KPPs) and Key System Parameters (KSAs). Continue developing the LBS-G Spiral 2.0 definition and associated engineering studies and analyses of alternatives. Begin the SDD phase of the Littoral Battlespace Sensing - Autonomous Undersea Vehicle (LBS-AUV) phase. Funding increase reflects the beginning of the System Development and Demonstration (SDD) phase of the Littoral Battlespace Sensing - Autonomous Undersea Vehicle (LBS-AUV) portion of the Littoral Battlespace Sensors - Unmanned Undersea Vehicle (LBS-UUV) program.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition	

(U) B. Accomplishments/Planned Program

USMC Meteorological Mobile Facility (Replacement) Next Generation (METMF(R) NEXGEN)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	2.491	0.000	0.000	
RDT&E Articles Quantity				

FY08 - Conducted operational testing of METMF(R) NEXGEN (formerly METMF(R) NG) prototypes and prepared for delivery.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
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

(U) B. Accomplishments/Planned Program

Meteorlogical and Oceanographic (METOC) Furture Mission Capabilities (FMC)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	6.435	7.537	9.338	
RDT&E Articles Quantity				

FY08 - METOC Future Capabilities continued development and test of the military Aircraft Communications Addressing and Reporting System (ACARS) and exploited Intelligence Surveillance & Reconnaissance (ISR) sensors for manned & unmanned platforms for environmental information. Continued use of Naval Special Warfare (NSW), Mine Warfare tactical sensors for Through-the-Sensor (TTS) applications for environmental assessment and characterization. Developed, demonstrated & tested TTS concept for undersea warfare systems. Continued development of the SPS-48E and SPS-48G Radar Obsolescence and Availability (ROAR) Hazardous Weather Detection and Display Capability (HWDDC). Tested and demonstrated the HWDDC system. Began work with SPS-48G developer to integrate algorithms into ROAR. Continued development of the SPY-1 TEP prototype. Completed related studies (communications, databasing, data flow, etc.) and system engineering plans. Completed development of the HWDDC requirements, specifications, and standards for the HWDDC system in preparation for procurement and for use in related JCIDS documentation. Began development of TEP requirements, specifications, standards and system engineering plans for the TEP system. 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. Developed quality control, fusion and product uncertainty tools and techniques to transform data into information to support product development for mission planners and TDA use. Developed techniques and tools to guide adaptive sampling to optimize use of measurement assets. Developed advanced Geospatial Information and Services (GI&S) databases and data processing tools and techniques to support boundary conditions for numerical forecast models. Developed advanced data fusion tools and interface modules to ocean and atmospheric data assimilation systems.

FY09 - Continue advanced component and prototype efforts associated with acquiring environmental data. Continue development of advanced data measurement and survey techniques to improve survey planning and execution. Continue development of improved data quality control technologies and the automation of data acquisition processes. Continue to develop advanced technologies and techniques to improve Geospatial Information and Services (GI&S) capabilities within Navy METOC production centers and throughout the fleet user base. Implement through-the-sensor (TTS) technologies to use tactical detection systems to characterize undersea and atmospheric environment in the battlespace integrate with analysis and C4I distribution systems. Development of the SPY-1 TEP prototype and integration of HWDDC into the SPS-48G ROAR. Developed TEP requirements, specifications, standards and system engineering plans for integration of the TEP algorithms into the Aegis SPY-1 Open Architecture upgrade program. Work with the SPS-48G program office and prime contractor to integrate HWDDC algorithms into the ROAR system.

FY10 - Continue advanced component and prototype efforts associated with acquiring environmental data. Continue development of advanced data measurement and survey techniques to improve survey planning and execution. Continue development of improved data quality control technologies and the automation of data acquisition processes. Continue to develop advanced technologies and techniques to improve Geospatial Information and Services (GI&S) capabilities within Navy METOC production centers and throughout the fleet user base. Implement through-the-sensor (TTS) technologies to use tactical detection systems to characterize undersea and atmospheric environment in the battlespace integrate with analysis, C4I distribution, and tactical decision systems. Developed TEP requirements, specifications, standards and system engineering plans for integration of the TEP algorithms into the Aegis SPY-1 Open Architecture upgrade program.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
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	

(U) B. Accomplishments/Planned Program

Naval Integrated Tactical Environmental System Next Generation (NITES-Next)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	2.223	0.094	
RDT&E Articles Quantity				

FY09 - Support METOC data transport, storage, delivery, design and development efforts in a Net-centric environment for pre-Milestone C Naval Integrated Tactical Environmental Subsystem Next Generation (NITES-Next) activities.

FY10 - Continued support for METOC data transport, storage, delivery, design and development efforts from FY09 in preparation for Milestone C Naval Integrated Tactical Environmental Subsystem Next Generation (NITES-Next) activities.

Tactical Environmental Support System/Naval Integrated Tactical Environmental Subsystem (TESS/NITES)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.342	0.231	0.000	
RDT&E Articles Quantity				

FY08 - Finalized Naval Integrated Tactical Environmental Subsystem (NITES) Data (formerly known as Tactical Environmental Data (TED) Services) integration efforts and prepared for COMOPTEVFOR operational evaluation (OPEVAL) with Command and Control Systems.

FY09 - Tactical Environmental Support System/Naval Integrated Tactical Environmental Subsystem (TESS/NITES) software development and testing for technology upgrades, refreshes, migrations, and system engineering efforts.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition	

(U) B. Accomplishments/Planned Program

Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.556	0.433	5.235	
RDT&E Articles Quantity				

FY08 - Completed 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. Commenced 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.) Continued development of ambient noise assimilation capability aboard submarines. Began development of advanced geo-acoustic merging algorithms to support inversions. Conducted submarine fathometer (BQN-17) Automated Sediment Classification System (ASCS) validation. Developed, demonstrated & tested Through-the-Sensor (TTS) concept for undersea warfare systems. 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. Developed 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. Developed advanced processing tools to work with insitu data sources to populate environmental database and support forward deployed oceanographic personnel. Continued 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.

FY09 - Geo-acoustic data inversion (through-the-sensor) efforts rolled into the Ocean Bottom Characterization Initiative (OBCI). Expand ambient noise through-the-sensor collection and 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)). Develop techniques and algorithms to collect atmospheric refractivity data in support of Anti-Submarine Warfare (ASW) operations. Continue to develop, test and demonstrate advanced Geographic Information Systems (GIS) in support of world-wide Ant Submarine Warfare (ASW) operations. Develop mission planning tools in support of littoral combat operations. Develop capability to quickly calculate transmission loss (TL) values in tactical timeframes. Continue data analysis and processing development for environmental characterization for mission planning & tactical decision aid use. Continue development, test/document and quality control fusion and product uncertainty tools and techniques to transform data into information to support product development for mission planners and tactical decision aid (TDA) use. Continue development, test and validation of techniques and tools to guide adaptive sampling to optimize use of measurement assets. Develop both acoustic and non-acoustic ASW reconstruction and analysis algorithms and techniques to aid in environmental analysis of Naval exercises. Develop and validate ASW product effectiveness metrics algorithms. Develop and validate methods for a theater-wide ambient noise planning tool using all available data sources. Develop next-generation shipping noise quantification, data fusion and forecast algorithms. Design the automated model metrics system. 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 Anti-Submarine Warfare missions. Continue development, verify and validate performance and document adaptive geoacoustic survey work for transition to unmanned vehicles 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.

FY10 - Continue FY09 efforts. Continue to develop, test and demonstrate advanced mission planning tools and Geographic Information Systems (GIS) in support of world-wide Undersea Warfare (USW) operations. Continue to develop capability to calculate transmission loss (TL) values in tactical timeframes to include uncertainty quantification of those values. Develop and validate both acoustic and non-acoustic USW product effectiveness algorithms to aid in environmental analysis of Naval exercises. Develop and validate methods for a theater-wide ambient noise planning and forecasting capability. Ocean Bottom Characterization Initiative (OBCI): Develop and demonstrate advanced in-situ sensor systems to support littoral environmental awareness in support of USW missions. Use operational Navy platforms for in-situ oceanographic and acoustic measurements. Develop Next Generation bottom loss and backscatter databases and database structures. Develop improved techniques to support geoacoustic and oceanographic survey operations. Develop algorithms for inclusion of bioacoustic effects in acoustic surveys. FY09 OBCI efforts were accomplished under the Ocean Bottom Characterization Initiative (OBCI) project.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition	

(U) B. Accomplishments/Planned Program

Ocean Bottom Characterization Initiative (OBCI)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	4.500	0.000	
RDT&E Articles Quantity				

FY09 - Develop capability to rapidly map coastal and deep-water seabed geoacoustic properties through characterization of seabed variability. Design offboard geo-acoustic survey platform and sensor prototypes for deployment aboard T-AGS class ships and other Naval Oceanographic Office (NAVOCEANO) assets. Continue development, validation and verification of the Delivered Geophysical Acoustic Inversion Toolkit (GAIT) Version 3 bottom loss algorithms for AntiSubmarine Warfare Tactical Decision Aids (ASW TDAs) and NAVOCEANO assets to include active inversion methods. Continue development of a passive seabed classification system. Verify & validate performance of Through The Sensor (TTS) applications for inclusion in Navy Standard databases. Continue development of advanced geo-acoustic merging algorithms to support inversions. Pursue adaptive sampling techniques for NAVOCEANO geoacoustic survey assets. Characterize backscatter (i.e. reverberation) data for inclusion in NAVOCEANO databases. Adapt ocean glider and autonomous underwater vehicle (AUV) sensors and behavior algorithms to support NAVOCEANO survey operations. Perform gravity/seismic data set correlation to improve geoacoustic databases. Extend bandwidth of existing bottom loss databases and algorithms to include all active and passive tactical acoustic frequencies. Define frequency extrapolation limits of existing reverberation data sets. Continue to develop prototype replacement acoustic source for NAVOCEANO survey operations. Begin development of active acoustic clutter characterization algorithms into Fleet Synthetic Training (FST) systems. Adapt the Generalized Acoustic Bottom Interaction Model (GABIM) to act as the first-order solution for a comprehensive, integrated system to generate an acoustic bottom loss and backscatter database in regions of strategic Navy interest. Provide technical and program management oversight for the Ocean Bottom Characterization Initiative (OBCI). Continue investigation of Low Frequency Active (LFA) source to characterize the seabed.

FY10 - Efforts rolled into the Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW) program.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2341 METOC Data Acquisition

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Line Item No. & Name	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
OPN 4226 METEOROLOGICAL EQUIPMENT	16.625	24.669	21.458					

RELATED RDT&E: PE 0604218N, Air/Ocean Equipment Engineering

(U) D. ACQUISITION STRATEGY:

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 (PEO C4I).

(U) E. MAJOR PERFORMERS:

Not applicable

(U) F. METRICS:

Earned Value Management (EVM) is used for metrics reporting and risk management.

Exhibit R-3 Cost Analysis (page 1)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4		PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications						PROJECT NUMBER AND NAME 2341 METOC Data Acquisition				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Product Development												
	WX	NRL	41.875	5.620	N/A	6.487	N/A					
	WX	SSC	15.949	2.964	N/A	3.068	N/A					
	WX	MISC	7.329	0.790	N/A	0.892	N/A					
	CP	MISC	24.419	6.796	N/A	11.373	N/A					
	CPIF	Teledyne Brown Eng, AL	3.166	3.391	N/A							
Subtotal Product Development			92.738	19.561	N/A	21.820	N/A					
Remarks:												
Support Costs												
	CP	MISC	2.260	0.204	N/A	0.208	N/A					
Subtotal Support Costs			2.260	0.204	N/A	0.208	N/A					
Remarks:												

Exhibit R-3 Cost Analysis (page 1)

Exhibit R-3 Cost Analysis (page 2)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4		PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications						PROJECT NUMBER AND NAME 2341 METOC Data Acquisition				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation												
	WX	OPTEVFOR	0.160		N/A		N/A					
	MP	JITC	0.040		N/A		N/A					
Subtotal Test & Evaluation			0.200	0.000	N/A	0.000	N/A					
Remarks:												
Management Services												
Subtotal Management Services			0.000	0.000	N/A	0.000	N/A					
Remarks:												
Total Cost			95.198	19.765	N/A	22.028	N/A					

Exhibit R-3 Cost Analysis (page 2)

EXHIBIT R4, Schedule Profile

DATE: May 2009

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 - Program: Littoral Battlespace Sensing, Unmanned Undersea Vehicles (LBS-UUV)

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
LBSF&I UUV	Studies	AUV MS B			Spiral 1 AUV Sys Dev & Dem																											
			Glider MS B		Glider Sys Dev & Dem						Glider MS C		Glider IOC																			

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2341 METOC Data Acquisition - Program: Littoral Battlespace Sensing, Unmanned Undersea Vehicles (LBS-UUV)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
LBS-UUV								
Gliders								
Milestone B (MS B)	2Q							
System Development & Demonstration (SDD)	3Q - 4Q	1Q - 4Q	1Q - 2Q					
Milestone C (MS C)			2Q					
Initial Operating Capability (IOC)			4Q					
AUV								
Milestone B (MS B)	2Q							
System Development & Demonstration (SDD)	3Q - 4Q	1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile																																
																															DATE: May 2009	
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 - Program: METMF(R) NEXGEN																
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Acquisition Milestones	System Development & Demonstration																															
Contract Award or Events	Prototype 1																															
	Prototype 2																															
Testing		Temp/ISP																														
		KTR																														
			GQT																													
			TRR																													
Development			SVR																													
Documentation				CPD																												
			IA																													

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						**DATE:** May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	**PROGRAM ELEMENT** PE 0603207N Air/Ocean Tactical Applications				**PROJECT NUMBER AND NAME** 2341 METOC Data Acquisition - Program: METMF (R) NEXGEN			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Acquisition Milestones								
System Development & Demonstration	1Q - 4Q							
Contract Award or Events								
Prototype 1	1Q - 4Q							
Prototype 2	1Q - 4Q							
Testing								
TEMP / ISP	2Q - 4Q							
KTR	2Q - 4Q							
GQT	4Q							
TRR	4Q							
Development								
SVR	4Q							
Documentation								
CPD	3Q - 4Q							
IA	3Q							

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile																																
																															DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4					PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications												PROJECT NUMBER AND NAME 2341 METOC Data Acquisition - Program: Meteorlogical and Oceanographic (METOC) Future Mission Capabilities (FMC)															
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Database/Survey Development	→																															
Through-The-Sensor (TTS) Technologies	← TEP Development/Demonstration											→																				
	HWDDC →					← SPS-48G ROAR Integration																												

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	**PROGRAM ELEMENT** PE 0603207N Air/Ocean Tactical Applications				**PROJECT NUMBER AND NAME** 2341 METOC Data Acquisition - Program: Meteorological and Oceanographic (METOC) Future Mission Capabilities			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Database/Survey Development	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Through-The-Sensor (TTS) Technologies								
HWDDC								
Development & Demonstration	1Q - 4Q	1Q						
SPS-48G ROAR Integration		2Q - 4Q	1Q - 4Q					
TEP								
Development & Demonstration	1Q - 4Q	1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

CLASSIFICATION:

EXHIBIT R4, Schedule Profile

DATE: May 2009

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 - Program: Tactical Environmental Support System/Naval Integrated Tactical Environmental Subsystem (TESS/NITES)

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Update Database Software for Transition to New Technology	▲		▲																													
Tactical Decision Aid (TDA) and Data Software Test and Integration		▲			▲																											
NITES TDA/Data Integration Efforts for Command and Control System Platforms	▲				▲			▲																								

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY	PROGRAM ELEMENT				PROJECT NUMBER AND NAME			
RDT&E, N / BA-4	PE 0603207N Air/Ocean Tactical Applications				2341 METOC Data Acquisition - Program: Tactical Environmental Support System/Naval Integrated Tactical Environmental Subsystem (TESS/NITES)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Update Database Software for Transition to New Technology	1Q - 3Q							
Tactical Decision Aid (TDA) and Data Software Test and Integration	2Q - 4Q	1Q						
NITES TDA/Data Integration Efforts for Command and Control System Platforms	1Q - 4Q	1Q - 4Q						

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile																															DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4									PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications														PROJECT NUMBER AND NAME 2341 METOC Data Acquisition - Program: Naval Integrated Tactical Environmental Subsystem (NITES) Next											
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Engineering Studies/Prototypes of Data Transport for Engineering & Development					Arch/Design Study/Eng																											
Design Development and Test of Data Storage in Netcentric Environment with NITES-Next													Net-centric METOC Data Support of DT&E																			

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY	PROGRAM ELEMENT				PROJECT NUMBER AND NAME			
RDT&E, N / BA-4	PE 0603207N Air/Ocean Tactical Applications				2341 METOC Data Acquisition - Program: Naval Integrated Tactical Environmental Subsystem (NITES) Next			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Engineering Studies/Prototypes of Data Transport for Engineering & Development		1Q - 4Q						
Design Development and Test of Data Storage in Netcentric Environment with NITES-Next		1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile | **DATE:** May 2009

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 - Program: Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW)

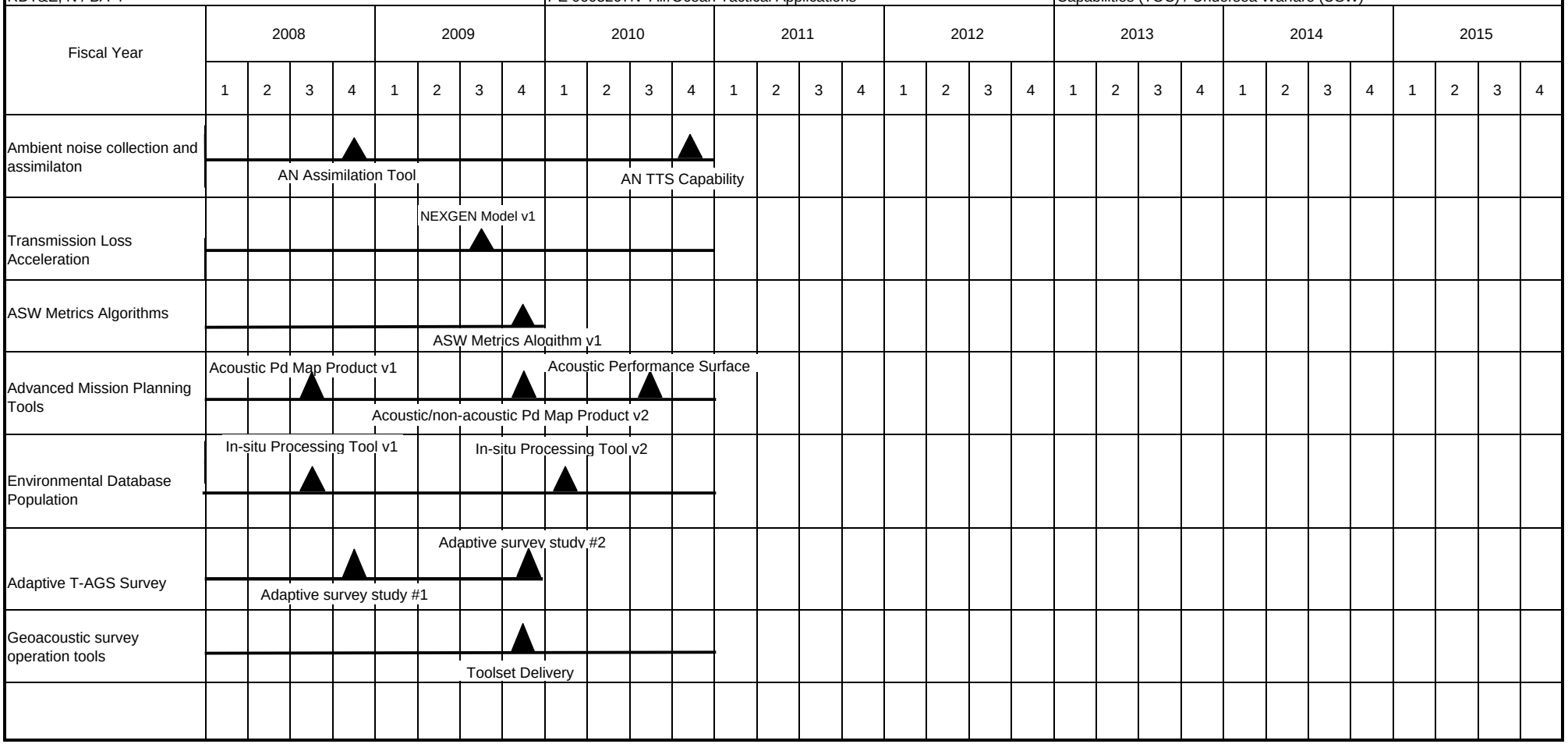

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2341 METOC Data Acquisition - Program: Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Ambient noise collection and assimilaton	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Transmission Loss Acceleration	1Q - 4Q	1Q - 4Q	1Q - 4Q					
ASW Metrics Algorithms	1Q - 4Q	1Q - 4Q						
Advanced Mission Planning Tools	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Environmental Database Population	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Adaptive T-AGS Survey	1Q - 4Q	1Q - 4Q						
Geoacoustic survey operation tools	1Q - 4Q	1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile | **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY
RDT&E, N / BA-4

PROGRAM ELEMENT NUMBER AND NAME
PE 0603207N Air/Ocean Tactical Applications

PROJECT NUMBER AND NAME
2341 METOC Data Acquisition - Program: Ocean Bottom Characterization Initiative (OBCI)

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Offboard Geoacoustic Survey System (OBCI)								AUV/Glider Behavior Mods ▲ T-AGS Glider Swarm Demo ▲																								
GAIT Version 3 Bottom Loss Algorithms (OBCI)							SOO OAML Delivery ▲ AN Inversion OAML Delivery ▲																									
Backscatter Database Development (OBCI)								Offboard Sensor Design ▲																								
Adaptive Sampling Geoacoustic Survey (OBCI)								DEM/VAL ▲																								

Note: Efforts rolled into the Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW) program.

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2341 METOC Data Acquisition - Program: Ocean Bottom Characterization Initiative (OBCI)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Offboard Geoacoustic Survey System (OBCI)								
AUV Glider Behavior Mods		4Q						
T-AGS Glider Swarm Demo		4Q						
GAIT Version 3 Bottom Loss Algorithms (OBCI)								
SOO OAML Delivery		3Q						
AN Inversion OAML Delivery		3Q						
Backscatter Database Development (OBCI)								
Offboard Sensor Design		4Q						
Adaptive Sampling Geoacoustic Survey (OBCI)								
DEM/VAL		4Q						

EXHIBIT R-2a, RDT&E Project Justification						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	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 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Project Cost	**13.323**	**18.590**	**19.424**					
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 (NAVO), 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 NPOESS data including the NPOESS Preparatory Project (NPP). 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 sensor data. 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 at both FNMOC and NAVO. 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 FY10 are in support of the Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities effort and reflect the need for additional data assimilation algorithms and applications resulting from the launch of the NPOESS Preparatory Project (NPP) satellite.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	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

Littoral Battlespace Sensing, Unmanned Undersea Vehicle (LBS-UUV)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	1.700	1.000	
RDT&E Articles Quantity				

FY09 - Continue, from FY07, the development of advanced data assimilation and fusion algorithms for glider and Autonomous Undersea Vehicles (AUVs) data including, temperature, depth, salinity, optics, hydrographic, bathymetric and other water column and ocean bottom properties. Demonstrate a basic capability to assimilate, database, and relay data and derived products from ocean gliders and AUVs, including optics, bathymetry, temperature, depth, salinity, and currents. Demonstrate prototype mission planning and adaptive sampling capability. Begin defining LBSF&I Unmanned Undersea Vehicle (UUV) Spiral 2.0 Fusion and Integration requirements and capabilities. Conduct Spiral 2 capability studies and analyses as required.

FY10 - Demonstrate a basic capability to assimilate, database, and relay data and derived products from ocean gliders, including optics (glider analysis, satellite coupling, NCOM integration, etc.), temperature, depth, salinity, and currents. Demonstrate prototype mission planning and adaptive sampling capability as part of the Littoral Battlespace Sensing - Gliders (LBS-G) System Development and Demonstration (SDD) phase. Continue development of advanced bathymetric data assimilation techniques such as Inertial Navigation Drift, automated fusion, micronavigation, and feature based navigation. Continue to define the LBS - Unmanned Undersea Vehicle (LBS-UUV) Spiral 2.0 Fusion requirements and capabilities. Integrate advanced quality control algorithms into the LBS-G system as required as part of the System Development and Demonstration (SDD) phase of the procurement. Complete at-sea and ashore Development Testing and Evaluation (DT&E) of the complete end-to-end glider system including command and control, mission planning, mission profile characteristics and other Key Performance Parameters (KPPs) and Key System Parameters (KSAs). Begin integration of advanced quality control algorithms into the LBS-AUV program as part of its SDD phase.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
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

(U) B. Accomplishments/Planned Program

Meteorlogical and Oceanographic (METOC) Future Mission Capabilities (FMC)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	10.529	9.968	9.132	
RDT&E Articles Quantity				

FY08 - Developed ASW Tactical Decision Aids (TDA) asset allocation and mission planning tools to optimize deployment of environmental data collection assets. Explored presentation of mission planning and acoustic reconstruction data in a Geographic Information System (GIS). Developed algorithms to create area acoustic assessments and analogous exercise area tools. Developed advanced data assimilation, coupled mesoscale forecast systems. Tested performance of 4D-Var (Degrees of Variation) for NAVDAS integration. Extended capabilities of assimilation systems to use additional satellite, remote sensed and insitu data types. Developed 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. Developed advanced global atmospheric prediction/forecast models. Developed high resolution (small scale) atmospheric models to nowcast & forecast environmental conditions in the littoral and riverine regions. Continued development of advanced aerosol small scale and large scale prediction models. Continued development of the Hazardous Weather Detection and Display Capability (HWDDC), the Tactical Environmental Processor (TEP) and associated advanced algorithms (e.g. Nowcast) that assimilate and fuse variou data types such as radial wind velocity, reflectivity, rain rate, etc. generated from the HWDDC system as well as data types such as electromagnetic refractivity generated from the SPY-1 TEP. Demonstrated the HWDDC system and associated fusion algorithms. Developed automated quality control algorithms for these data types. Began development of an end-to-end methodology to collect, fuse, and integrate these data into Navy and DoD networks and command and control nodes. Developed advanced data assimilation, coupled mesoscale forecast systems. Tested performance of 3D-Var for NCODA integration. Extended capabilities of assimilation systems to use additional satellite, remote sensed and insitu data types. Continued development of architecture for fully coupled ocean and atmospheric system. Continued to develop advanced ocean prediction/forecast models. Developed high resolution (small scale) atmospheric models to forecast environmental conditions in the littoral and riverine regions. Developed advanced global atmospheric prediction/forecast models. Developed high resolution (small scale) atmospheric models to nowcast & forecast environmental conditions in the littoral and riverine regions. Began development of data assimilation capability using EUMETSAT (European satellite) and NASA satellite data. Developed TDA uncertainty algorithms.

FY09 - Continue advanced component development and prototype efforts associated with advanced data assimilation into environmental prediction systems. Continue development of advanced oceanographic ar atmospheric prediction systems and architectures to provide improved forecasts and estimates of product accuracies. Continue development of improved data fusion techniques, data quality control technologies and accelerate the automation prediction processes. Develop data assimilation and fusion techniques and technologies for tactical radars, remote sensing and undersea sensor systems. Develop atmospheric fusion algorithms and demonstrate TEP/HWDDC reachback fusion capability. Development of network integration capability and continue to develop systems engineering plans, requirements, standards, studies, and other documentation supporting integration of these products into the SPY-1 Open Architecture and SPS-48G radars. Development of advanced data assimilation and data quality control algorithms for glider and Autonomous Undersea Vehicles (AUVs) data including, temperature, depth, salinity, optics, hydrographic, bathymetric and other water column and ocean bottom properties.

FY10 - Continue advanced component development and prototype efforts associated with advanced data assimilation into environmental prediction systems, to include development of tactical decision aids and asset allocation tools. Continue development of advanced oceanographic and atmospheric prediction systems and architectures to provide improved forecasts and estimates of product accuracies. Continue development of improved data fusion techniques, data quality control technologies and accelerate the automation prediction processes. Develop data assimilation and fusion techniques and technologies for tactical radars, remote sensing and undersea sensor systems. Develop atmospheric fusion algorithms and demonstrate TEP reachback fusion capability. Development of network integration capability and continue to develop systems engineering plans, requirements, standards, studies, and other documentation supporting integration of these products. Development of advanced data assimilation and data quality control algorithms for glider and Autonomous Undersea Vehicles (AUVs) data including, temperature, depth, salinity, optics, hydrographic, bathymetric and other water column and ocean bottom properties.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
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	

(U) B. Accomplishments/Planned Program

Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	3.612	5.851	
RDT&E Articles Quantity				

FY09 - Continue development of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) data assimilation algorithms and applications previously funded under PE 0305160N, Navy METOC Support (Space), Project 0524 using simulations and on-orbit heritage sensors. The NPOESS program constellation of satellites include the NPOESS Preparatory Project (NPP) satellite, the NPOESS satellites (C-1, C-2 and replacements) and the European METOP (European METeorological OPerational satellite program) .

FY10 - Continue development of techniques for the assimilation of data from current and future civil, military and international earth observing systems. Develop Naval applications using this data for Naval Meteorological and Oceanography (METOC) Production Centers. Funding increase reflects the need for additional data assimilation algorithms and applications resulting from the launch of the NPOESS Preparatory Project (NPP) satellite.

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EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	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

Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	2.794	3.310	3.441	
RDT&E Articles Quantity				

FY08 - Began development of an ASW mission planning tool for operational use at the ASW Reachback Cell (RBC) resident at the NAVOCEANO. Developed ASW Tactical Decision Aids (TDA) asset allocation and mission planning tools to optimize deployment of environmental data collection assets. Explored presentation of mission planning and acoustic reconstruction data in a Geographic Information System (GIS) Developed algorithms to create area acoustic assessments and analogous exercise area tools. Continued development of RAM. Increase computational speed of the model on ASW TDA processors. Created an OAML Model Testbed by archiving existing passive transmission loss active reverberation datasets. Made modification to the Comprehensive Acoustic System Simulation (CASS) Gaussian Ray Bundle (GRAB) to improve model performance. Began upgrade of NAUTILUS (a commercial product) propagation model to compute low frequency reverberation. Continued annual upgrades to the STAPLE system. Conducted Reverberation Modeling Workshop. Continued development of the SESSS algorithm. Continued to develop the Geophysical-Acoustic Bottom Interaction Model (GABIM) and GABIM-derived database. Began development of algorithms that recommend active sonar waveforms based on the state of the environment. Developed an algorithm that validates and improves the quality of modeled low frequency active planning. Continued development of the regional Ambient Noise Database (ANDB). Incorporated archived directional ambient noise time series observational data into the ANDB. Updated historical shipping databases with non-traditional vessel density data. Commenced development of a short-term ambient noise forecasting capability using previously collected ambient noise data from tactical sensors. Incorporated Adaptive Beam Forming (ABF) techniques into existing noise models. Developed methods to aid in the collection, archiving/databasing ambient noise data for later inclusion in historical databases supporting ASW TDAs. Developed TDA uncertainty algorithms.

FY09 - Continue development of ASW mission planning, analysis and reconstruction tools, including Geographic Information Systems (GIS), for operational use at the ASW Reachback Cell (RBC.) Reconstruction and Analysis (R&A) tool set will be expanded to support all ASW communities, integrate mission planning functions and contain both acoustic/non-acoustic reconstruction data in a GIS environment. Continue to develop ASW tactical decision aid (TDA) asset allocation and mission planning tools to optimize deployment of both environmental data collection assets and tactical acoustic and non-acoustic sensors. Develop ASW-related performance surface products for use at the NAVOCEANO ASW Reachback Cell and in mission planning systems to include Probability of Detection (Pd) maps. Assess uncertainty values associated with acoustic performance prediction products. Identify, develop and test environmentally-oriented, mathematically-based decision support tools for application in support of ASW operations and exercises. Begin development of models, databases and algorithms to quantify non-acoustic/acoustic uncertainty. Continue development of algorithms to create area acoustic assessments and analogous exercise area tools. Develop descriptive dynamic oceanography features assessment tool for ocean model accuracy/reliability determination. Establish a standardized environment for model and observation data. Continue spiral development of the RAM and Parabolic Equation acoustic models. Integrate upgrade NAUTILUS propagation model into fleet systems. Continue annual upgrades to the Scalable Tactical Acoustic Propagation Loss Engine (STAPLE) system. Continue development of SESSS. Develop a self-consistent semi-empirical surface loss model. Develop quantification algorithms for volume scattering. 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. Continue to make modification to the Comprehensive Acoustic System Simulation (CASS) Gaussian Ray Bundle (GRAB) to improve model performance in support of mission planning systems, tactical decision aids, fleet synthetic training systems and modeling and simulation tools. Upgrade the ASPM model to support IEER mission predictions. Use reverberation workshop results to develop new Navy Standard active reverberation model. Continue development of algorithms that recommend active sonar waveforms based on the state of the environment and algorithms that validate and improve the quality of modeled low frequency active planning. Develop electro-magnetic propagation and radiance models and refractive databases to support emerging non-acoustic ASW sensors. Develop models that quantify effects of near- surface turbulence and N-gradients on target detection. Develop Fish Scattering Strength (FSS) algorithm. Adapt existing acoustic models for better active localization. Improve realism in clutter modeling. 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. Develop ambient noise databases for emerging airborne and submarine-based ASW systems. Develop prototype P-3 AXBT data collection system. Develop improved bathythermograph (BT) data processing system for Master Oceanographic Observation Data Set (MOODS). Develop rapid mission reconstruction, analysis & feedback system. Provide project technical and program management oversight.

FY10 - Continue FY09 efforts. Continue to develop decision tool asset allocation and mission planning modules to optimize deployment of both environmental data collection assets and tactical Undersea Warfare (USW) acoustic and non-acoustic sensors. Continue to refine and validate USW-related performance assessment and decision products for use at the NAVOCEANO Antisubmarine Warfare (ASW) Reachback Cell (RBC) and in USW decision tools. Continue spiral development of active and passive acoustic propagation loss models for use in fleet mission planning systems supporting mono- and multistatic Antisubmarine Warfare operations. Continue technology upgrades to transmission loss acceleration algorithms. Develop algorithms that characterize acoustic reverberation and clutter as well as boundary and volume loss/scatter functions as observed by active and passive tactical sonar systems. Develop decision tool algorithms that optimize operational sonar system performance. Continue to develop directional and omnidirectional regional ambient noise characterization tools. Conduct technical demonstration of in-situ ocean parameter collection systems. Populate/upgrade oceanographic and acoustic databases in COCOM areas of interest. Transition algorithms that capture and communicate variability and uncertainty, robustness and sensitivity as input to Fleet USW decision tools and underlying models and data bases. Develop oceanographic operations analysis tools Develop real-time and post-event ASW performance assessment tools. Provide project technical and program management oversight.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Line Item No. & Name	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
OPN 4226 METEOROLOGICAL EQUIPMENT	16.625	24.669	21.458					

RELATED RDT&E: PE 0604218N, Air/Ocean Equipment Engineering

(U) D. ACQUISITION STRATEGY:

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 (PEO C4I).

(U) E. MAJOR PERFORMERS:

Not applicable

(U) F. METRICS:

Earned Value Management (EVM) is used for metrics reporting and risk management.

Exhibit R-3 Cost Analysis (page 1)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4			PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications					PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Product Development												
	WX	NRL	80.058	11.036	N/A	11.563	N/A					
	WX	SSCs	0.806	0.680	N/A	0.786	N/A					
	WX	MISC	3.547	1.020	N/A	1.179	N/A					
	CP	MISC	11.471	5.854	N/A	5.896	N/A					
	N/A	MISC	12.775									
	Grant	Univ. S. Miss.	2.413									
Subtotal Product Development			111.070	18.590	N/A	19.424	N/A					
Remarks:												
Support Costs												
	CP	SSA/CSC	0.295		N/A		N/A					
Subtotal Support Costs			0.295	0.000	N/A	0.000	N/A					
Remarks:												

Exhibit R-3 Cost Analysis (page 1)

Exhibit R-3 Cost Analysis (page 2)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4		PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications						PROJECT NUMBER AND NAME 2342 METOC Data Assimilation and Modeling				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation												
Subtotal Test & Evaluation			0.000	0.000		0.000						
Remarks:												
Management Services												
Subtotal Management Services			0.000	0.000		0.000						
Remarks:												
Total Cost			111.365	18.590	N/A	19.424	N/A					

Exhibit R-3 Cost Analysis (page 2)

EXHIBIT R4, Schedule Profile

DATE: May 2009

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 - Program: Littoral Battlespace Sensing, Unmanned Undersea Vehicle (LBS-UUV)

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
LBSF&I UUV	Studies	AUV MS B			Spiral 1 AUV Sys Dev & Dem																											
			Glider MS B		Glider Sys Dev & Dem					Glider MS C		Glider IOC																				

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2342 METOC Data Assimilation - Program: Littoral Battlespace Sensing, Unmanned Undersea Vehicle (LBS-UUV)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
LBS-UUV								
Gliders								
Milestone B (MS B)	2Q							
System Development & Demonstration (SDD)	3Q - 4Q	1Q - 4Q	1Q - 2Q					
Milestone C (MS C)			2Q					
Initial Operating Capability (IOC)			4Q					
AUV								
Milestone B (MS B)	2Q							
System Development & Demonstration (SDD)	3Q - 4Q	1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile																																
																															DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4					**PROGRAM ELEMENT NUMBER AND NAME** PE 0603207N Air/Ocean Tactical Applications												**PROJECT NUMBER AND NAME** 2342 METOC Data Assimilation and Modeling - Program: Meteorlogical and Oceanographic (METOC) Future Mission Capabilities (FMC)															
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Ocean Forecast Models Global	→	→	→	→	→	→	→	→	→	→	→	→																				
Ocean Forecast Models Regional	→	→	→	→	→	→	→	→	→	→	→	→																				
Ocean Forecast Models Littoral	→	→	→	→	→	→	→	→	→	→	→	→																				
Ocean Assimilation	→	→	→	→	→	→	→	→	→	→	→	→																				
Atmospheric Forcast Model Global	→	→	→	→	→	→	→	→	→	→	→	→																				
Atmospheric Mesoscale Forecast	→	→	→	→	→	→	→	→	→	→	→	→																				
Atmospheric Assimilation	→	→	→	→	→	→	→	→	→	→	→	→																				

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
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 - Program: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Ocean Forecast Models Global	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Ocean Forecast Models Regional	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Ocean Forecast Models Littoral	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Ocean Assimilation	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Atmospheric Forecast Model Global	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Atmospheric Mesoscale Forecast	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Atmospheric Assimilation	1Q - 4Q	1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile																																**DATE:** May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4					**PROGRAM ELEMENT NUMBER AND NAME** PE 0603207N Air/Ocean Tactical Applications												**PROJECT NUMBER AND NAME** 2342 METOC Data Assimilation and Modeling - Program: Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities																			
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
NPOESS Preparatory Project (NPP) / National Polar-orbiting Operational Environmental Satellite System (NPOESS)					Data Assimilation Algorithm Development →							NPP Launch																						

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail								**DATE:** May 2009
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 - Program: Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
NPOESS Preparatory Project (NPP) / National Polar-orbiting Operational Environmental Satellite System (NPOESS)								
Data Assimilation Algorithm Development		1Q - 4Q	1Q - 4Q					
NPP Launch			3Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile | **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY
RDT&E, N / BA-4

PROGRAM ELEMENT NUMBER AND NAME
PE 0603207N Air/Ocean Tactical Applications

PROJECT NUMBER AND NAME
2342 METOC Data Assimilation and Modeling - Program: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)

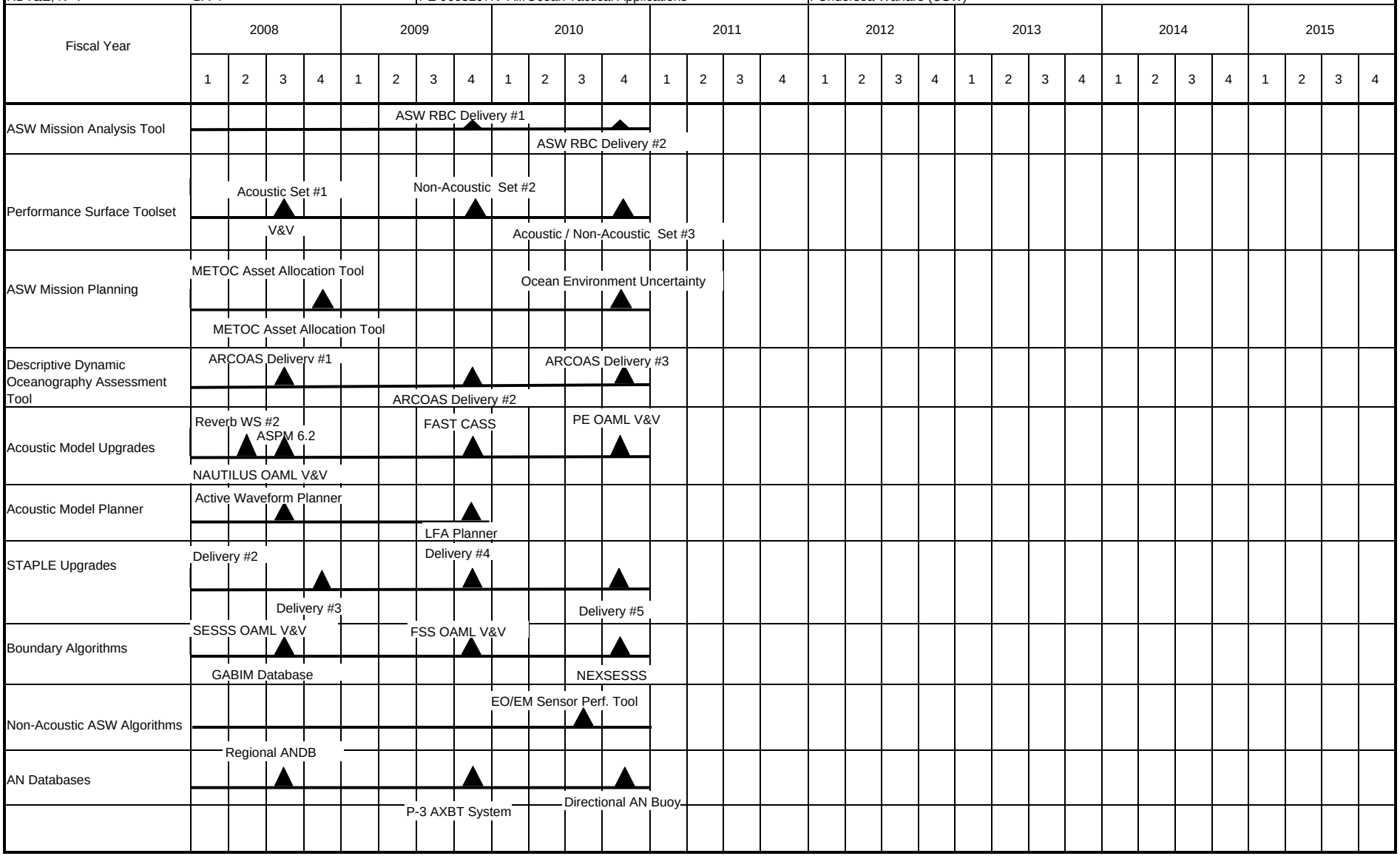


EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						**DATE:** May 2009		
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 - Program: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
ASW Mission Analysis Tool	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Performance Surface Toolset	1Q - 4Q	1Q - 4Q	1Q - 4Q					
ASW Mission Planning	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Descriptive Dynamic Oceanography Assessment Tool	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Acoustic Model Upgrades	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Acoustic Model Planner	1Q - 4Q	1Q - 4Q						
STAPLE Upgrades	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Boundary Algorithms	1Q - 4Q	1Q - 4Q	1Q - 4Q					
Non-Acoustic ASW Algorithms	1Q - 4Q	1Q - 4Q	1Q - 4Q					
AN Databases	1Q - 4Q	1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R-2a, RDT&E Project Justification						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2343 Tactical METOC Applications			
COST ($ in Millions)	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015
Project Cost	**4.383**	**6.368**	**16.164**					
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.

Funding increases, beginning in FY10, are the result of technical corrections to the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program's funding profile in order to more appropriately reflect the software only nature of the effort. The net result of these zero sum technical changes are reductions to the NITES-Next OP,N (BLI 4226 Meteorological Equipment) profile & subsequent dollar for dollar increases to the program's RDT&E,N profile.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2343 Tactical METOC Applications	

(U) B. Accomplishments/Planned Program

Naval Integrated Tactical Environmental System Next Generation (NITES-Next)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	4.383	6.368	15.888	
RDT&E Articles Quantity				

FY08 - Continued 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-Next (formerly NITES NG), including integration of updates to sensor data and backgrounds consistent with Joint Operations and development of upgrades to next generation Electromagnetic and Electro-optical (EM/EO) and Advanced Refractive Environmental Prediction System (AREPS) performance prediction systems to include incorporation of new Navy and Joint Sensor Suites. Developed the Mine Warfare and Environmental Data Applications Library (MEDAL) to include the incorporation of the new environmental databases and model updates . Supported transition in fleet for integration of new EM/EO Target Acquisition Weapons Software (TAWS), and advanced visualization techniques for Global Command and Control Systems integration prior to NITES-Next transition in FY08 to include integration of new EM/EO, TAWS, and advanced visualization techniques.

FY09 - Milestone C preparation activities and associated development of system architecture, system engineering, software development, test and integration activities for NITES-Next, including development of upgrades to next generation EM/EO and AREPS performance prediction systems. Extensive Developmental Test and Evaluation (DT&E) efforts in preparation for Initial Operational Test and Evaluation and Milestone C involving lab, fleet and site testing and early COMOPTEVFOR involvement. Develop MEDAL to include the incorporation of the new environmental databases and model updates.

FY10- Continue development of system architecture, system engineering, software development, test and integration activities for NITES-Next, including integration with to next generation EM/EO and performance prediction systems in support of Milestone C activities. Continue Developmental Test and Evaluation (DT&E) efforts in preparation for Initial Operational Test and Evaluation and Milestone C involving lab, fleet and site testing and early COMOPTEVFOR involvement. Complete the Critical Design Review (CDR) initiates extensive software development across the multiple Computer Software Configuration Items (CSCI).

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
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	

(U) B. Accomplishments/Planned Program

Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	0.000	0.276	
RDT&E Articles Quantity				

FY08 - Efforts reported under the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program.

FY09 - Efforts reported under the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program.

FY10 - Continue capability upgrades and validation of Next Generation electro-magnetic and electro-optic (EM/EO) performance prediction systems and decision tools. Develop Through-the-Sensor (TTS) technologies to characterize atmospheric boundary layer parameters for ASW applications.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
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

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Line Item No. & Name

Not applicable.

RELATED RDT&E: PE 0604218N (Air/Ocean Equipment Engineering).

(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-Next) under JCIDS by Program Executive Officer for Command, Control, Communications, Computers, and Intelligence (PEO C4I).

(U) E. MAJOR PERFORMERS:

N/A

Exhibit R-3 Cost Analysis (page 1)												DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4			PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications					PROJECT NUMBER AND NAME 2343 Tactical METOC Applications				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Product Development	WX	NRL	2.988	0.250	N/A	0.655	N/A					
	WX	SSCs	5.056	0.630	N/A	1.637	N/A					
	WX	MISC	3.302	0.758	N/A	1.965	N/A					
	CP	MISC	53.808	4.730	N/A	11.907	N/A					
	N/A	MISC	6.370									
Subtotal Product Development			71.524	6.368	N/A	16.164	N/A					
Remarks:												
Support Costs	CP	IPD	0.595		N/A		N/A					
Subtotal Support Costs			0.595	0.000	N/A	0.000	N/A					
Remarks:												

Exhibit R-3 Cost Analysis (page 1)

Exhibit R-3 Cost Analysis (page 2)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4			PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications					PROJECT NUMBER AND NAME 2343 Tactical METOC Applications				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation												
Subtotal Test & Evaluation			0.000	0.000		0.000						
Remarks:												
Management Services												
Subtotal Management Services			0.000	0.000		0.000						
Remarks:												
Total Cost			72.119	6.368	N/A	16.164	N/A					

Exhibit R-3 Cost Analysis (page 2)

EXHIBIT R4, Schedule Profile			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 2343 Tactical METOC Applications - Program: Naval Integrated Tactical Environmental System Next Generation (NITES-Next)	

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Acquisition, Preparation & Major Milestones	Architecture & Prep for PDR, events toward MSC					PDR		CDR																								
Development Test and Refresh/Spirals									DT&E B(1)																							
TDA/Mission Planning Updates & Integration w/ NITES-Next	MEDAL Update TAWS EM Server				MEDAL Update TAWS/AREPS Platform Vulnerability				TAWS/AREPS																							

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						**DATE:** May 2009		
APPROPRIATION/BUDGET ACTIVITY	**PROGRAM ELEMENT**				**PROJECT NUMBER AND NAME**			
RDT&E, N / BA-4	PE 0603207N Air/Ocean Tactical Applications				2343 Tactical METOC Applications - Program: Naval Integrated Tactical Environmental System Next Generation (NITES-Next)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Acquisition, Preparation & Major Milestones								
Preliminary Design Review (PDR)		2Q - 3Q						
Critical Design Review (CDR)		4Q						
Development Test and Refresh/Spirals								
DT&E B(1)		4Q	1Q - 4Q					
TDA Mission Planning Updates & Integration with NITES-Next								
MEDAL Update	1Q - 4Q	1Q - 4Q						
TAWS EM Server	1Q - 4Q							
TAWS / AREPS		1Q - 4Q	1Q - 4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R4, Schedule Profile																																DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4									PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications														PROJECT NUMBER AND NAME 2343 Tactical METOC Applications - Program: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)													
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Next Generation Electro-Magnetic and Electro-Optic (EM/EO) Performance Prediction Systems									EM/EO Capability Upgrade																							

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						**DATE:** May 2009		
APPROPRIATION/BUDGET ACTIVITY	**PROGRAM ELEMENT**				**PROJECT NUMBER AND NAME**			
RDT&E, N / BA-4	PE 0603207N Air/Ocean Tactical Applications				2343 Tactical METOC Applications - Program: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Next Generation Electro-Magnetic and Electro-Optic (EM/EO) Performance Prediction Systems			**1Q - 4Q**					
Capability Upgrades			4Q					

Exhibit R-4a, Schedule Detail

EXHIBIT R-2a, RDT&E Project Justification						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry			
COST ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Project Cost	**1.035**	**20.215**	**2.258**					
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.

Joint Milli-Arcsecond Pathfinder Survey (J-MAPS). Joint strike operations require extremely accurate Positioning, Navigation, and Timing (PNT) systems in order to both: locate hostile threats with space-borne Intelligence Surveillance and Reconnaissance (ISR) systems, and then to deliver ordnance on precisely selected targets. The U.S. Navy, via the U.S. Naval Observatory (USNO), provides a key component of PNT – the Celestial Reference Frame. This reference frame is defined in star catalogs that are used in conjunction with star trackers to determine orientation of space-based sensors to minimize Target Location Error (TLE) and the resultant weapon system Circular Error Probable (CEP). The accuracy of star positions (hence obtainable CEP and TLE) is degrading with time due to the movement of stars since the last highly accurate space-based measurements of star positions (order of 1 milli-arcsecond) were made in 1991 (Hipparcos star catalog). The accuracy of the catalog is approaching the minimum necessary to support current requirements, and will not meet future needs for high accuracy sensors and weapon systems. Therefore, USNO, in concert with other activities and agencies in the Space and ISR communities, has developed the J-MAPS initiative. The J-MAPS initiative will satisfy the emerging requirements for a new high accuracy star catalog through a space-based astrometry mission that will also “pathfind” new star tracker technology as a risk reduction for future ISR systems. Producing star catalogs with sufficient accuracy to meet these requirements can only be done from space platforms (satellites) due to atmospheric interference on ground-based systems and the physical limitations of high atmospheric aircraft.

Beginning in FY10 the resources for the J-MAPS program are budgeted in project 3229.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
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

(U) B. Accomplishments/Planned Program

Precise Timing & Astrometry	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	1.035	1.215	2.258	
RDT&E Articles Quantity				

FY08 - Completed development of algorithm for ensemble clock system. 24/7 demonstration of two fountain ensemble clock. Mod M-code GPS receiver to meet final specifications.

FY09 - Operational Readiness Review (ORR) for Rubidium (Rb) Fountain at USNO. Installation and testing for three Rb fountain systems. Continue fabrication of four Rb Fountain Systems . Demo GPS Military (M) Code tracking for Timing Receivers.

FY10 - Complete fabrication of four Rb Fountain systems; complete installation and testing of Alternate Master Clock (AMC) Fountain systems. Complete contract preparation and award for unique capabilities GPS M Code Timing Receiver.

Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	19.000	0.000	
RDT&E Articles Quantity				

FY09 - Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) will be used to complete Phase A (conceptual design) and Phase B (preliminary design) of the overall spacecraft and mission. In addition, long lead item developments will begin immediately after the System Requirements Review (SRR). Developments will include focal plane assemblies, readout and processing electronics, and optical components. By the end of FY09, as a result of this funding, a preliminary design for the spacecraft will be delivered.
Note: Beginning in FY10 the resources for the J-MAPS program are budgeted in project 3229.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
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

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Line Item No. & Name

Not applicable.

(U) D. ACQUISITION STRATEGY:

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 infrare 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 (PEO C4I).

(U) E. MAJOR PERFORMERS:

N/A

Exhibit R-3 Cost Analysis (page 1)												DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4			PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications					PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Product Development	WX	Naval Observatory	12.932	1.215	N/A	2.258	N/A					
	N/A	MISC	0.438		N/A		N/A					
	TBD	TBD		19.000								
Subtotal Product Development			13.370	20.215	N/A	2.258	N/A					
Remarks:												
Support Costs												
Subtotal Support Costs			0.000	0.000		0.000						
Remarks:												

Exhibit R-3 Cost Analysis (page 1)

Exhibit R-3 Cost Analysis (page 2)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4		PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications						PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation												
Subtotal Test & Evaluation			0.000	0.000		0.000						
Remarks:												
Management Services												
Subtotal Management Services			0.000	0.000		0.000						
Remarks:												
Total Cost			13.370	20.215	N/A	2.258	N/A					

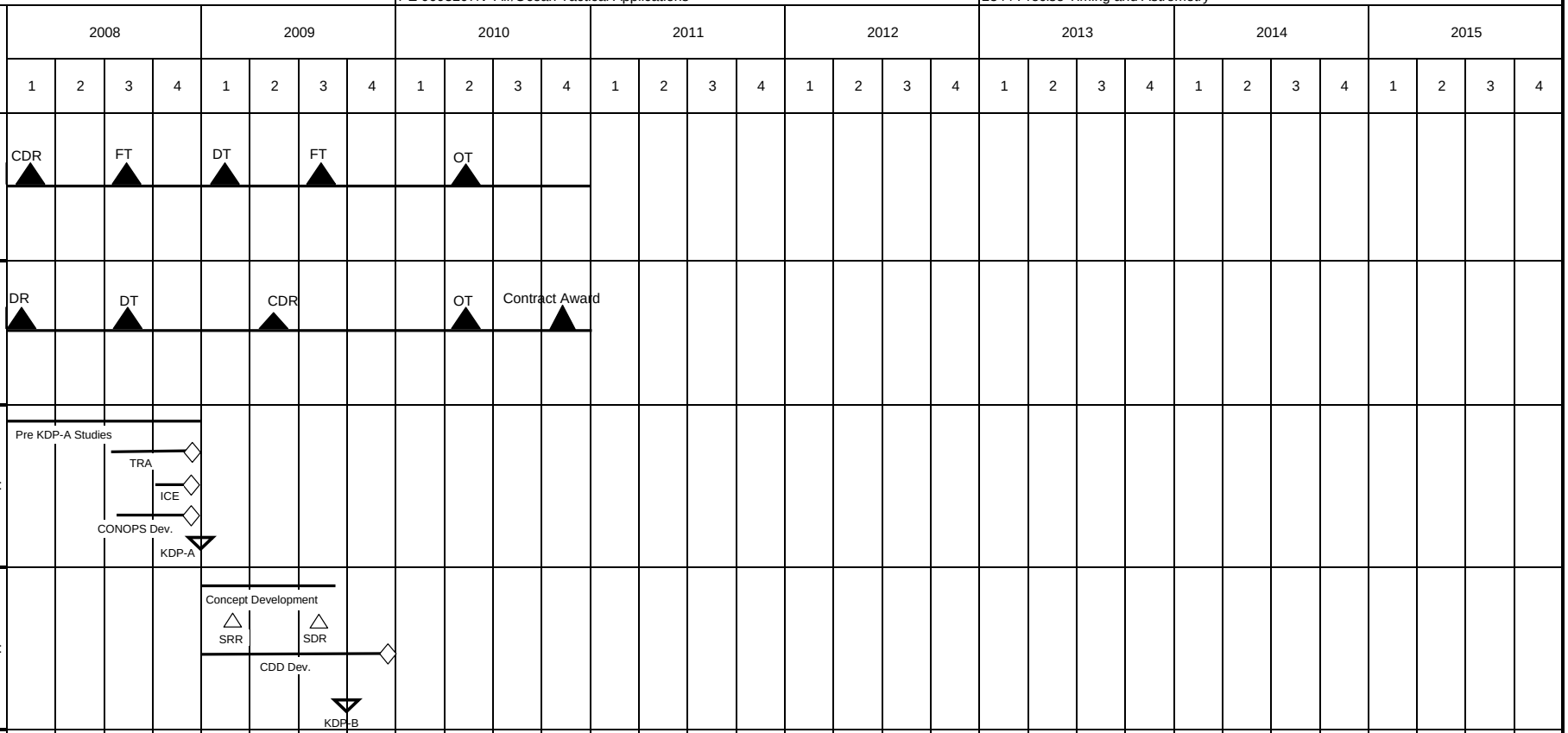
Exhibit R-3 Cost Analysis (page 2)

EXHIBIT R4, Schedule Profile | **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY
RDT&E, N / BA-4

PROGRAM ELEMENT NUMBER AND NAME
PE 0603207N Air/Ocean Tactical Applications

PROJECT NUMBER AND NAME
2344 Precise Timing and Astrometry



FY08 Efforts of the Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) program funded by the "Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program" Congressional Increase.

PDR = Preliminary Design Review, DR = Design Review, DT = Development Test, CDR = Critical Design Review, OT = Operational Test, FT = Functional Test, IOC = Initial Operating Capability, FOC = Full Operational Capability, SRR = System Requirements Review

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 2344 Precise Timing and Astrometry			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Rubidium Beam (Rb) Master Clock	1Q - 4Q	1Q - 4Q	1Q - 4Q					
CDR	1Q							
FT	3Q	3Q						
DT	1Q							
OT			2Q					
GPS M-Code Receiver								
DR	1Q							
DT	3Q							
CDR		2Q						
OT			2Q					
Contract Award			4Q					
Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)								
Pre-Phase A Development								
Pre - Key Decision Pont A Studies	1Q - 4Q							
Technical Readiness Assessment (TRA)	3Q - 4Q							
CONOPS Development	3Q - 4Q							
Independent Cost Estimate (ICE)	4Q							
Key Decision Point A	4Q							
Phase A Development								
Concept Development		1Q - 3Q						
System Requirements Review (SRR)		1Q						
System Design Review (SDR)		3Q						
Capability Development Document (CDD) Development		1Q - 4Q						
Key Decision Point B		3Q - 4Q						

FY08 Efforts of the Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) program funded by the "Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program" Congressional Increase.

Exhibit R-4a, Schedule Detail

EXHIBIT R-2a, RDT&E Project Justification						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 3207 Fleet Synthetic Training			
COST ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Project Cost	**0.000**	**0.997**	**1.008**					
RDT&E Articles Qty								

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

Fleet Synthetic Training (FST) is a CNO initiative that is intended to provide naval forces with an enhanced in-port training capability. Integrating embedded shipboard training devices, aircraft and submarine simulators into an interoperable network with Joint, Coalition and Interagency partners is expected to provide more effective training for our deploying naval forces.

A key factor in achieving this new way of training our naval forces is to ensure that the required training is based on realistic characterizations of the physical environment. This project is intended to develop and deliver software that characterizes the ocean and atmospheric environments; adjusts to meet Fleet-required training scenarios; allows synthetic training to be conducted in areas of planned and contingency operations; and, provides sufficient detail to simulate the real-world conditions of the physical environment in those areas of interest.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY	**PROGRAM ELEMENT NUMBER AND NAME**	**PROJECT NUMBER AND NAME**	
RDT&E, N / BA-4	PE 0603207N Air/Ocean Tactical Applications	3207 Fleet Synthetic Training	

(U) B. Accomplishments/Planned Program

Fleet Synthetic Training (FST)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	0.997	1.008	
RDT&E Articles Quantity				

FY09 - Begin to develop software that provides a common ocean and atmospheric environment to the federation of systems within the Fleet Synthetic Training compliant High Level Architecture. Start to enhance underwater acoustic propagation model and database software that is required to stimulate active sonar displays aboard ships. Start to develop software that is required to connect the sensor performance surface to the federation of Fleet Synthetic trainers. Initiate software development of land mass effects (e.g., island effects) on ocean and atmospheric environments.

FY10 - Begin to field software that provides a common ocean and atmospheric environment to the federation of systems within the Fleet Synthetic Training compliant High Level Architecture. Start to implement software that is required to connect the sensor performance surface to the federation of Fleet Synthetic trainers. Continue software development of land mass effects (e.g., island effects) on ocean and atmospheric environments. Begin testing enhanced underwater acoustic propagation model and database software that is required to stimulate active sonar displays aboard ships. Begin to assess the effectiveness of these upgrades in addressing the question of how much fidelity is required within the models in order for the Fleet to be able to realize training in-port that's equivalent in effectiveness to training at-sea.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 3207 Fleet Synthetic Training

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Line Item No. & Name

Not Applicable

RELATED RDT&E:

(U) D. ACQUISITION STRATEGY:

(U) E. MAJOR PERFORMERS:

Not applicable

(U) F. METRICS:

EXHIBIT R-2a, RDT&E Project Justification

Exhibit R-3 Cost Analysis (page 1)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4		PROGRAM ELEMENT 0603207N Air/Ocean Tactical Applications						PROJECT NUMBER AND NAME 3207 Fleet Synthetic Training				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Product Development	WX	Naval Oceanographic Office -		0.600	N/A	0.610	N/A					
		Stennis Space Center, MS										
	CP	Applied Research Laboratory -		0.397	N/A	0.398	N/A					
		University of Texas										
Subtotal Product Development			0.000	0.997	N/A	1.008	N/A					
Remarks:												
Support Costs												
Subtotal Support Costs			0.000	0.000		0.000						
Remarks:												

Exhibit R-3 Cost Analysis (page 1)

Exhibit R-3 Cost Analysis (page 2)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4		PROGRAM ELEMENT 0603207N Air/Ocean Tactical Applications						PROJECT NUMBER AND NAME 3207 Fleet Synthetic Training				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation					N/A		N/A					
Subtotal Test & Evaluation			0.000	0.000		0.000						
Remarks:												
Management Services												
Subtotal Management Services			0.000	0.000		0.000						
Remarks:												
Total Cost			0.000	0.997	N/A	1.008	N/A					

Exhibit R-3 Cost Analysis (page 2)

EXHIBIT R4, Schedule Profile																																
																															DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4									PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications												PROJECT NUMBER AND NAME 3207 Fleet Synthetic Training											
Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	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
Software/Product Development for Realistic Sybthetic Environment					▲				▲																							
Acoustic Model & Database Enhancements for SQS-53c Active Sonar Displays						▲				▲																						
Software/Product Development to Connect the Sensor Performance Surface to the Federation of Trainers					▲				▲																							

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 3207 Fleet Synthetic Training			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Software/Product development for Realistic Synthetic Environment		1Q	1Q					
Acoustic Model & Database Enhancements for SQS-53c Active Sonar		2Q	2Q					
Displays								
Software/Product development to connect the Sensor Performance		1Q	1Q					
Surface to the Federation of trainers								

Exhibit R-4a, Schedule Detail

EXHIBIT R-2a, RDT&E Project Justification						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications				PROJECT NUMBER AND NAME 3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)			
COST ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Project Cost	**0.000**	**0.000**	**55.200**					
RDT&E Articles Qty								

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

Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) satellite program. Joint strike operations require extremely accurate Positioning, Navigation, and Timing (PNT) systems in order to both: locate hostile threats with space-borne Intelligence Surveillance and Reconnaissance (ISR) systems, and then to deliver ordnance on precisely selected targets. The U.S. Navy, via the U.S. Naval Observatory (USNO), provides a key component of PNT – the Celestial Reference Frame. This reference frame is defined in star catalogs that are used in conjunction with star trackers to determine orientation of space-based sensors to minimize Target Location Error (TLE) and the resultant weapon system Circular Error Probable (CEP). The accuracy of star positions (hence obtainable CEP and TLE) is degrading with time due to the movement of stars since the last highly accurate space-based measurements of star positions (order of 1 milli-arcsecond) were made in 1991 (Hipparcos star catalog). The accuracy of the catalog is approaching the minimum necessary to support current requirements, and will not meet future needs for high accuracy sensors and weapon systems. Therefore, USNO, in concert with other activities and agencies in the Space and ISR communities, has developed the J-MAPS initiative. The J-MAPS initiative will satisfy the emerging requirements for a new high accuracy star catalog through a space-based astrometry mission that will also “pathfind” new star tracker technology as a risk reduction for future ISR systems. Producing star catalogs with sufficient accuracy to meet these requirements can only be done from space platforms (satellites) due to atmospheric interference on ground-based systems and the physical limitations of high atmospheric aircraft.

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)	

(U) B. Accomplishments/Planned Program

Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.000	0.000	55.200	
RDT&E Articles Quantity				

FY08 - Efforts funded by the "Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program" Congressional Increase.

FY09 - Efforts funded in project 2344 (Precise Timing and Astrometry) for concept development.

FY10 - Efforts budgeted in project 3229 (Joint Milli-Arcsecond Pathfinder Survey) is for Phase B preliminary design and Phase C complete design.

EXHIBIT R-2a, RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY	**PROGRAM ELEMENT NUMBER AND NAME**	**PROJECT NUMBER AND NAME**
RDT&E, N / BA-4	PE 0603207N Air/Ocean Tactical Applications	3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Line Item No. & Name

FY08 - Efforts funded by the "Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program" Congressional Increase.

FY09 - Efforts funded in project 2344 (Precise Timing and Astrometry) for concept development.

(U) D. ACQUISITION STRATEGY:

The JMAPS program will not be developed as an Evolutionary Acquisition (EA). JMAPS will be acquired as an S&T government activity through NRL and USNO. ONR will utilize the contract mechanism at NRL and USNO to support the development of the program. JMAPS will be executed as a class B/C program in accordance with Military handbook DOD-HDBK-343 (USAF) of 01 February 1986, *Design Construction and Testing Requirements for One of a Kind Space Equipment*. Additionally, JMAPS will adhere to the Key Decision Point and gates established for acquisition programs. Complete traceability will be limited to only the key requirements and technology below TRL 6 at ATP will be acceptable by providing risk mitigation strategies and maintain alternate implementations.

(U) E. MAJOR PERFORMERS:

The major performers for JMAPS is NRL for the spacecraft and instrument and USNO for the performance expertise and catalogue generation. Funding will be provided to these organizations through work request and direct cite funding documents. The Air Force Research Laboratory supports the development of the spacecraft bus. Funding to AFRL will be through a MIPR. Additionally management support to the program office is provided by an ONR support contract.

Exhibit R-3 Cost Analysis (page 1)												DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4			PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications					PROJECT NUMBER AND NAME 3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Product Development			0.000	0.000	N/A							
Preliminary Design Review (PDR) & Critical Design Review (CDR)	FM	Naval Research Laboratory (NRL), Washington DC				49.400	Oct-09					
Subtotal Product Development			0.000	0.000	N/A	49.400	N/A					
Remarks:												
Support Costs												
Requirements and Performance analysis	FM	USNO, Washington DC				5.200	Oct-09					
Subtotal Support Costs			0.000	0.000		5.200						
Remarks:												

Exhibit R-3 Cost Analysis (page 1)

Exhibit R-3 Cost Analysis (page 2)									DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4			PROGRAM ELEMENT PE 0603207N Air/Ocean Tactical Applications					PROJECT NUMBER AND NAME 3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 09 Cost	FY 09 Award Date	FY 10 Cost	FY 10 Award Date	FY 11 Cost	FY 11 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation												
Subtotal Test & Evaluation			0.000	0.000		0.000						
Remarks:												
Management Services												
Program office support	Contract	ONR- Arlington, VA				0.600	Oct-09					
Subtotal Management Services			0.000	0.000		0.600						
Remarks:												
Total Cost			0.000	0.000	N/A	55.200	N/A					

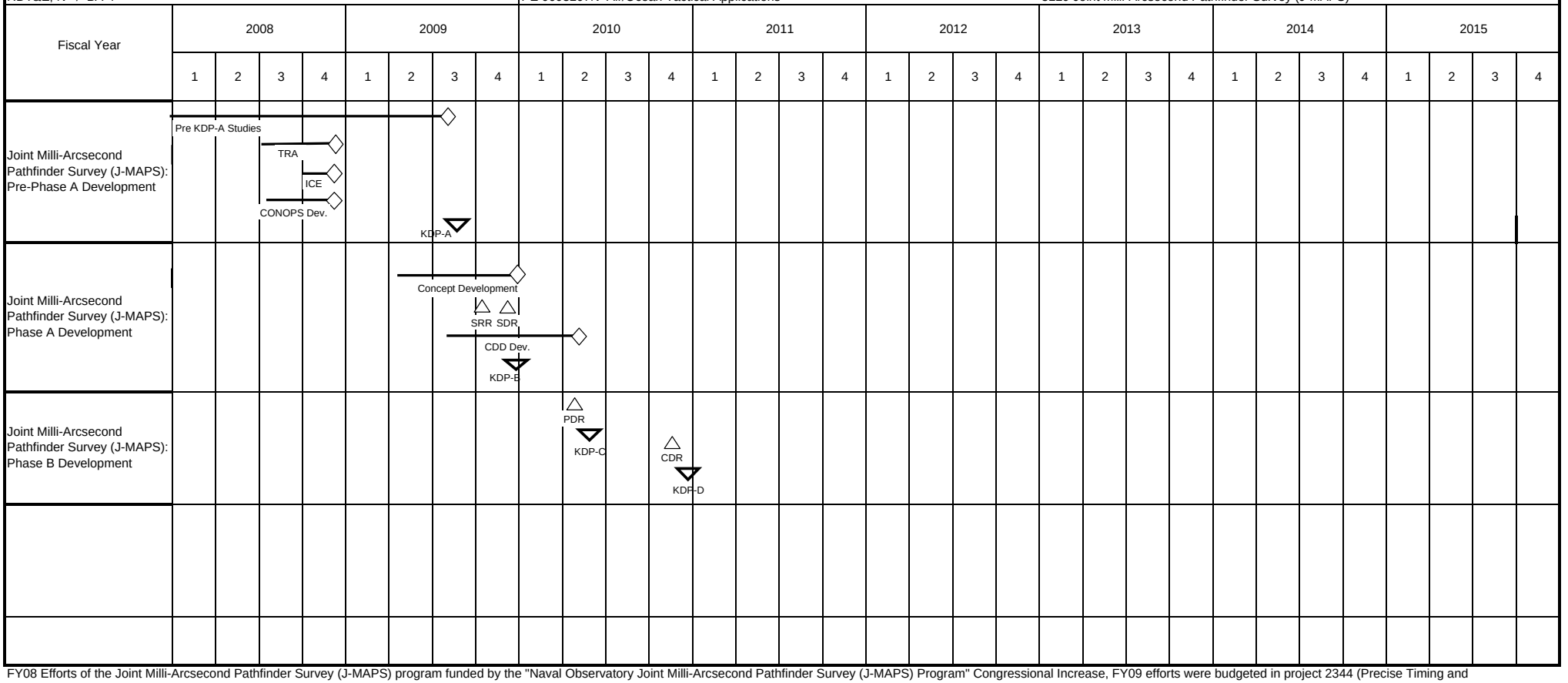
Exhibit R-3 Cost Analysis (page 2)

EXHIBIT R4, Schedule Profile | **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY
RDT&E, N / BA-4

PROGRAM ELEMENT NUMBER AND NAME
PE 0603207N Air/Ocean Tactical Applications

PROJECT NUMBER AND NAME
3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)



FY08 Efforts of the Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) program funded by the "Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program" Congressional Increase, FY09 efforts were budgeted in project 2344 (Precise Timing and

PDR = Preliminary Design Review, DR = Design Review, DT = Development Test, CDR = Critical Design Review, OT = Operational Test, FT = Functional Test, IOC = Initial Operating Capability, FOC = Full Operational Capability, SRR = System Requirements Review

EXHIBIT R4, Schedule Profile

Exhibit R-4a, Schedule Detail						DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	**PROGRAM ELEMENT** PE 0603207N Air/Ocean Tactical Applications				**PROJECT NUMBER AND NAME** 3229 Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)			
Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Joint Milli-Arcsecond Pathfinder Survey (J-MAPS)								
Pre-Phase A Development								
Pre - Key Decision Pont A Studies	1Q - 4Q							
Technical Readiness Assessment (TRA)	3Q - 4Q							
CONOPS Development	3Q - 4Q							
Independent Cost Estimate (ICE)	4Q							
Key Decision Point A		3Q						
Phase A Development								
Concept Development		2Q - 4Q						
System Requirements Review (SRR)		4Q						
System Design Review (SDR)		4Q						
Capability Development Document (CDD) Development		3Q - 4Q	1Q - 2Q					
Key Decision Point B		4Q						
Phase B Development								
Preliminary Design Review			2Q					
Key Decision Point C			2Q					
Phase C Development								
Critical Design Review			4Q					
Key Decision Point D			4Q					

FY08 Efforts of the Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) program funded by the "Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program" Congressional Increase, FY09 efforts were budgeted in project 2344 (Precise Timing and Astrometry).

Exhibit R-4a, Schedule Detail

EXHIBIT R-2a, RDT&E Project Justification			DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-4	PROGRAM ELEMENT NUMBER AND NAME PE 0603207N Air/Ocean Tactical Applications	PROJECT NUMBER AND NAME 9999 Congressional Increases	

(U) B. Accomplishments/Planned Program

9891 Gateway Concept	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	1.546	0.000	0.000	
RDT&E Articles Quantity				

FY08 - Continued the development of a new design for underwater cable connections.

9999 Semi-Submersible UUV	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	0.967	1.596	0.000	
RDT&E Articles Quantity				

FY08 - Began design and development efforts for a Semi-Submersible Unmanned Underwater Vehicle (UUV)

FY09 - Continue the design and development efforts for a Semi-Submersible Unmanned Underwater Vehicle (UUV)

9999 Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program	FY 08	FY 09	FY 10	FY 11
Accomplishments/Effort/Subtotal Cost	3.891	0.000	0.000	
RDT&E Articles Quantity				

FY08 - Began system engineering and technology development efforts, to include the development of the focal plane array, for the Naval Observatory Joint Milli-Arcsecond Pathfinder Survey (J-MAPS) Program.