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Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications							
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
Total Program Element	443.418	31.357	39.246	40.429	-	40.429	40.974	40.682	43.901	44.610	Continuing	Continuing
2341: METOC Data Acquisition	149.620	5.793	6.336	2.518	-	2.518	4.387	4.430	5.084	5.230	Continuing	Continuing
2342.: METOC Data Assimilation and Mod	174.428	12.899	15.235	12.582	-	12.582	16.362	18.905	19.451	20.615	Continuing	Continuing
2343: Tactical METOC Applications	117.491	9.049	8.908	9.124	-	9.124	14.384	14.149	15.220	15.503	Continuing	Continuing
2344.: Precise Time and Astrometry	0.000	2.936	5.914	8.954	-	8.954	2.340	1.179	2.106	1.222	Continuing	Continuing
2363: Remote Sensing Capability Development	0.000	-	-	4.988	-	4.988	2.500	1.000	1.000	0.980	Continuing	Continuing
3207: Fleet Synthetic Training	1.879	0.680	2.853	2.263	-	2.263	1.001	1.019	1.040	1.060	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

The Air Ocean Tactical Applications (AOTA) Program Element is aligned with the Navy's maritime strategy to enhance the future mission capabilities of the Navy-Marine Corps Meteorological and Oceanographic (METOC) Team supporting naval warfighters worldwide. New state-of-the art government and commercial technologies are identified, transitioned, demonstrated and then integrated into Combat Systems and programs of record to provide capabilities that provide real-time and near-real-time 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 and predicting 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. Model data, products and services can be used by forward-deployed personnel or in a reach-back mode to optimize sensor placement and force allocation decisions. Global Geospatial Information and Services efforts within this program address the bathymetric 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 and specific unit-level combat systems. This program element develops technological upgrades for the U.S. Naval Observatory's Master Clock system to meet requirements of Department of Defense 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.

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Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy I BA 4: Advanced Component Development & Prototypes (ACD&P)		R-1 Program Element (Number/Name) PE 0603207N I Air/Ocean Tactical Applications			
Major emphasis areas include the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) and the METOC Future Mission Capabilities, the METOC Space-Based Sensing Capabilities, the Precise Timing and Astrometry, the Fleet Synthetic Training, the Tactical Oceanographic Capabilities for Under Sea Warfare, the Earth System Prediction Capability projects, and the Remote Sensing Capability Development.					
B. Program Change Summary (\$ in Millions)	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total
Previous President's Budget	34.085	42.246	46.862	-	46.862
Current President's Budget	31.357	39.246	40.429	-	40.429
Total Adjustments	-2.728	-3.000	-6.433	-	-6.433
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-3.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.463	-			
• Program Adjustments	-	-	6.400	-	6.400
• Rate/Misc Adjustments	-0.001	-	-12.833	-	-12.833
• Congressional General Reductions Adjustments	-2.264	-	-	-	-
Change Summary Explanation					
Technical: Added funding to Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program development and Future Mission Capabilities (FMC) efforts in FY15.					
Beginning in FY15 the Remote Sensing Capability Development program will collect target data for development of automated algorithms.					
Schedule: The schedule for the Remote Sensing Capability Development program is added to reflect the programs development efforts beginning in FY15.					

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2341 / METOC Data Acquisition			
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
2341: METOC Data Acquisition	149.620	5.793	6.336	2.518	-	2.518	4.387	4.430	5.084	5.230	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		
# The FY 2015 OCO Request will be submitted at a later date.												
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) identified as the most promising candidates are transitioned from the government's and commercial industry's technology base. These new sensor technologies are demonstrated, validated and integrated into operational programs for warfighters. These new sensor capabilities provide timely and accurate METOC data and products to operational and tactical commanders. METOC data requirements have likewise evolved as the emphasis on naval warfare has evolved from blue water operations to the littoral and deep strike battlespace. The littoral and deep strike regions typically have dynamic and complex oceanographic and atmospheric conditions. The need to accurately characterize these conditions is more crucial than ever in planning and executing warfare operations and effectively allocating force weapon and sensor systems. 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. Operational sensors are deployed great distances from the target area of interest. The challenge is to collect and disseminate METOC data in variable and dynamic littoral environmental conditions or in denied, remote or inaccessible areas over extended periods of time. This project: 1) provides the means to rapidly and automatically acquire a broad array of METOC data using both off-board and on-board sensors; 2) provides an on-scene assessment capability for the tactical commander; 3) provides the tactical commander with real-time METOC data and products for operational use; 4) demonstrates and validates the use of tactical workstations and desktop computers for processing and display of METOC data and products; 5) demonstrates and validates techniques which employ data compression, connectivity and interface technologies to obtain, store, process, distribute and display these METOC data and products; 6) develops new charting and bathymetric survey techniques necessary to reduce the existing shortfall in coastal hydrographic survey requirements; 7) develops an expanded database for predictive METOC models in areas of interest; and 8) supports the development of radar weather using through-the-sensor techniques. Major emphasis areas include the METOC Future Mission Capabilities (FMC) and the Tactical Oceanographic Capabilities project. FY 2015 request provides for continued advanced development of software and hardware component and prototype efforts associated with acquiring environmental data, and METOC data dissemination, storage, delivery, design, development efforts, and develop METOC network integration capability.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2013	FY 2014	FY 2015	
Title: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)									5.481	5.984	2.219	
Articles:									-	-	-	
FY 2013 Accomplishments:												

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014	FY 2015
Continued advanced component and prototype development efforts associated with acquiring environmental data and develop advanced techniques for data measurement and survey techniques that capture measurement uncertainties in order to provide warfare commanders with an accurate assessment of uncertainty in sensor performance prediction products and services. Continued development of improved data quality control technologies and the automation of data acquisition processes and develop advanced technologies and techniques to improve Geospatial Information and Services (GI&S) capabilities within Navy Meteorological and Oceanographic (METOC) product production centers and throughout the fleet user base. Continued to develop technologies that use tactical detection systems where applicable to characterize undersea and atmospheric environment in the battlespace. Began Through-the-Sensor (TTS) development and demonstration. Developed METOC network integration capability and continue to develop systems engineering plans, requirements, standards, studies, and other documentation supporting integration of these products.				
FY 2014 Plans: Continue advanced component and prototype development efforts associated with acquiring environmental data and develop advanced techniques for data measurement and survey techniques that capture measurement uncertainties in order to provide warfare commanders with an accurate assessment of uncertainty in sensor performance prediction products and services. Continue to develop technologies that use tactical detection systems where applicable to characterize undersea and atmospheric environment in the battlespace. Develop and demonstrate in-situ sampling techniques to support adaptive and advance measurement technologies. Develop techniques to improve delivery of GI&S within Navy METOC product production centers and throughout the fleet user base. Continue TTS development and demonstration. Continue to develop METOC systems engineering plans, requirements, standards, studies, and other documentation supporting integration of these products.				
FY 2015 Plans: Continue advanced component and prototype development efforts associated with acquiring environmental data and develop advanced techniques for data measurement and survey techniques that capture measurement uncertainties in order to provide warfare commanders with an accurate assessment of uncertainty in sensor performance prediction products and services. Continue to develop technologies that use tactical detection systems where applicable to characterize undersea and atmospheric environment in the battlespace. Develop and demonstrate in-situ sampling techniques to support adaptive and advance measurement technologies. Continue the development of techniques to improve delivery of GI&S within Navy METOC product production centers and throughout the fleet user base. Continue TTS development and demonstrate functionality. Develop tools and techniques to support forecaster's processing, analysis and performance assessment processes.				
Title: Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW)		0.312	0.352	0.299
Articles:		-	-	-
FY 2013 Accomplishments:				

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Appropriation/Budget Activity 1319 / 4				R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2341 / METOC Data Acquisition				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)										FY 2013	FY 2014	FY 2015
Continued to transition models, algorithms and databases that either calculate accurate acoustic Transmission Loss (TL) or characterize environmental parameters that affect TL and develop TL calculation implementations. Continued to develop capabilities to calculate acoustic TL values in tactical timeframes to include uncertainty quantification of those values. FY 2014 Plans: Continue to transition models, algorithms and databases that calculate accurate acoustic TL and characterize environmental parameters that affect TL. Develop TL calculation implementations to be used in the Navy's Anti-Submarine Warfare (ASW) Tactical Decision Aids (TDAs) and sonar trainers. Continue to develop capabilities to rapidly calculate acoustic TL values within tactical timeframes to include environmental uncertainty quantification of those values. FY 2015 Plans: Continue to transition models, algorithms and databases used to calculate accurate acoustic TL and characterize environmental parameters that affect TL into U.S. Navy ASW TDAs. Continue to develop capabilities to rapidly calculate acoustic TL values within tactical timeframes to include environmental uncertainty quantification of those values for both active and passive sonar systems.												
Accomplishments/Planned Programs Subtotals										5.793	6.336	2.518
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost	
• RDTEN/0604218N/2345: FLEET METOC EQUIPMENT	2.380	2.611	1.224	-	1.224	1.332	0.848	1.310	1.950	Continuing	Continuing	
• RDTEN/0603207N/2342: METOC DATA ASSIMILATION AND MOD	10.242	10.250	4.937	-	4.937	8.154	8.352	8.709	9.669	Continuing	Continuing	
• RDTEN/0604218N/2346: METOC SENSOR ENGINEERING	1.278	1.415	0.940	-	0.940	1.194	1.206	1.228	1.260	Continuing	Continuing	
Remarks												
D. Acquisition Strategy												
Acquisition, management and contracting strategies are to support the Meteorological and Oceanographic (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 Navy.												

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E. Performance Metrics

Goal: Develop techniques and tools to acquire Meteorological and Oceanographic (METOC) data in order to improve the accuracy of global and regional scale meteorological and oceanographic forecast models. Advanced sensor component, data collection, and meteorological, oceanographic and hydrographic survey technique development tasks are directed by Resource Sponsor, with input from external Systems Commands and/or Type Commanders, in response to validated capability gaps or operational fleet requirements. Wherever applicable, and based on favorable Science & Technology (S&T) assessments, tasks shall leverage or transition existing Small Business Innovative Research and/or RDT&E Budget Activity 6.2 - 6.3 S&T work.

Metric -- Tasks will address no less than 75% of applicable capability gaps and requirements.

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Exhibit R-4, RDT&E Schedule Profile: PB 2015 Navy																							Date: March 2014					
Appropriation/Budget Activity 1319 / 4												R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications												Project (Number/Name) 2341 / METOC Data Acquisition				
METOC Future Mission Capabilities (FMC)	FY 2013				FY 2014				FY 2015				FY 2016				FY 2017				FY 2018				FY 2019			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Geospatial Information and Services (GI&S) System Development / Demonstration																												
Through-the-Sensor (TTS) Development / Demonstration																												
Ocean-Atmos Acquisition & Processing Development / Demonstration																												
In-situ Data Sampling & GI&S Delivery Technologies																												
Assess Reach-back and On Scene Data Fusion																												
2015OSD - 0603207N - 2341																												

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Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2342. / METOC Data Assimilation and Mod			
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
2342.: METOC Data Assimilation and Mod	174.428	12.899	15.235	12.582	-	12.582	16.362	18.905	19.451	20.615	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		

The FY 2015 OCO Request will be submitted at a later date.

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 software associated with atmospheric and oceanographic data assimilation forecast models and database management systems 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 software models, which focus on ocean thermal structure and circulation, and surf and tide prediction; 3) software 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) future METOC and environmental satellite data readiness and risk reduction preparations to develop hardware and software that will allow ground stations to receive, ingest and exploit satellite data including payload sensor data from the National Polar Orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP), the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) Polar Systems' Meteorological Operational satellites A & B (METOP-A & B), Joint Polar Satellite System (JPSS), and Defense Meteorological Satellite Program (DMSP). This software allows for the integration and tactical application of significant oceanographic and atmospheric data derived from satellite-borne sensors. Satellite and unmanned sensor data, combined with manned platform data are foundational to a robust numerical weather and oceanographic modeling capability that predicts battlespace conditions impacting fleet and adversary weapon and sensor performance. Included are software 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 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 Sensor R&D to meet Chief of Naval Operations and Commander, Fleet Forces Command requirements for remote autonomous, clandestine, littoral battlespace sensing in near shore areas in support of Sea Shield & Sea Basing.

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications	Project (Number/Name) 2342. / METOC Data Assimilation and Mod		
Major emphasis areas include the METOC Future Mission Capabilities (FMC), the METOC Space-Based Sensing Capabilities, and the Tactical Oceanographic Capabilities / Under Sea Warfare projects (TOC/USW).				
FY 2015 request provides for continued advanced software 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 software), the continued development of advanced oceanographic and atmospheric prediction systems software and architectures to provide improved forecasts and estimates of product accuracies, continued development of improved data fusion techniques, data quality control technologies and accelerate the automation prediction processes, and the development of data assimilation and fusion software technologies for tactical radars, remote sensing and undersea sensor systems. Begin research and development of data processing and data assimilation algorithms for the Geostationary Operational Environmental Satellite (GOES-R) launch. Develop Meteorological and Oceanographic (METOC) Decision Support & Predation Tools to improve Electromagnetic and Electro-optical (EM/EO) system performance. The Earth System Prediction Capability (ESPC) program provides a more accurate global ocean and atmospheric forecast system with longer skillful forecast times through integrating and coupling atmosphere, ocean, ice, land and near-space forecast models into a seamless prediction system that reduces errors in the current modeling suite. Additionally it will develop a national common modeling architecture to improve cross-agency collaboration, and a greatly more efficient computational architecture to allow for real-time operational prediction.				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014	FY 2015
Title: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)		4.404	4.199	2.521
Articles:		-	-	-
FY 2013 Accomplishments: Continued development of advanced oceanographic and atmospheric prediction systems and architectures to provide improved forecasts and estimates of product accuracies. Continued development of improved data fusion techniques, data quality control technologies and accelerate the automation of prediction processes using data from tactical sensors, remote sensing and undersea sensor systems. Continued to develop Meteorological and Oceanographic (METOC) and Geospatial Information and Services (GI&S) fusion algorithms and demonstrate reach-back capability.				
FY 2014 Plans: 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 and assimilation techniques, data quality control technologies and accelerate the automation of prediction processes using data from tactical sensors, remote sensing and undersea sensor systems. Continue to develop METOC and GI&S fusion algorithms and demonstrate reach-back capability.				
FY 2015 Plans: Continue development of advanced METOC prediction systems and architectures to provide improved forecasts and estimates of product accuracies. Continue development of improved data fusion and assimilation techniques, data quality control technologies and accelerate the automation of prediction processes using data from tactical sensors, remote sensing and undersea sensor				

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014	FY 2015
systems. Continue to develop METOC and GI&S fusion algorithms and demonstrate capabilities. Develop METOC Decision Support & Predation Tools to improve Electromagnetic and Electro-optical (EM/EO) systems performance.				
Title: Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities		3.012	2.170	0.642
Articles:		-	-	-
FY 2013 Accomplishments: Continued research and development of data processing and data assimilation algorithms utilizing National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP), Meteorological Operational satellite program (MetOp), and Defense Meteorological Satellite Program (DMSP) satellite data. Began assimilation of Meteorological satellite data from other Federal non-DOD, commercial, and foreign earth observing satellite systems. Prepared to ingest data from Joint Polar Satellite System (JPSS) program satellites.				
FY 2014 Plans: Continue research and development of data processing and data assimilation algorithms utilizing National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP), Meteorological Operational satellite program (MetOp), and DMSP satellite data. Continue assimilation of Meteorological satellite data from other Federal non-DOD, commercial, and foreign earth observing satellite systems. Continue preparation to ingest data from JPSS program satellites. Begin research and development of data processing and data assimilation algorithms for the Geostationary Operational Environmental Satellite (GOES) program.				
FY 2015 Plans: Continue preparation to ingest data from earth observing satellite systems, specifically JASON. Begin research and development of data processing and data assimilation algorithms for the GOES-R launch.				
Title: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)		2.826	3.881	1.774
Articles:		-	-	-
FY 2013 Accomplishments: Continued decision tool development that assists Undersea Warfare (USW) warfighters to optimally deploy assets equipped with acoustic sensors and to take advantage of prevailing environmental conditions. Continued to refine and validate USW-related performance surface and decision products for use afloat and at reachback cells to determine appropriate tactical Courses of Action (COAs) in Anti-Submarine Warfare (ASW). Continued population/upgrade of oceanographic, acoustic and geoacoustic databases in Combatant Commanders' (COCOM) areas of interest. Transitioned algorithms that capture and communicate variability and uncertainty contained in the output of underlying model and data base components of ASW Tactical Decision Aids (TDAs). Expanded capabilities and increased access speed of acoustic surface scattering and loss modules. Continued development of Reachback Cell (RBC) ocean model assessment toolkit. Continued development of methodologies that				

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014
characterize and forecast bioacoustic volume attenuation and scatter functions as observed by the Navy's active hull-mounted sonar systems. Continued to develop and transition the environmental components of Mine Warfare (MIW) TDAs in use by the U.S. Navy's MIW Forces and Naval Oceanography enterprise (NOe) personnel supporting them. FY 2014 Plans: Continue to develop the underlying acoustic and environmental software components of Navy decision tools that assist USW warfighters to optimally deploy assets equipped with acoustic sensors and to take advantage of prevailing environmental conditions. Verify, validate and transition this software technology through the Oceanographic and Atmospheric Master Library (OAML). Continue to refine and validate USW-related performance surface and decision support software applications for use afloat and at ASW RBCs to determine appropriate tactical COAs in ASW. Continue population/upgrade of oceanographic, acoustic and geoacoustic databases in COCOM areas of interest. Begin developing Maritime Patrol Aircraft and submarine-based Through-the-Sensor (TTS) technologies to collect and transmit environmental data for use by Naval Oceanographic Office (NAVOCEANO) to predict Anti-Submarine Warfare (ASW) sensor performance. Transition software algorithms that capture and communicate variability and uncertainty contained in the output of underlying model and data base components of ASW Tactical Decision Aids (TDAs). Expand capabilities and increase access speed of acoustic surface scattering and loss modules. Continue development of software-based methodologies that characterize and forecast bioacoustic volume attenuation and scatter functions as observed by the Navy's active hull-mounted sonar systems. Continue to develop and transition the environmental software components of MIW TDAs in use by the U.S. Navy's Mine Warfare (MIW) Forces and NOe personnel supporting them. Provide technical support to the NAVOCEANO in updating geoacoustic bottom loss & scatter data bases for sonar performance predictions. Begin to design, develop, demonstrate and transition a geospatially-enabled global ocean observing system database through the Ocean Observing System Security Group (OOSG) designed to characterize national and international ocean observatories locations, sensor grid capabilities and mitigations to address potential U.S. submarine security vulnerabilities. Conduct proof-of-concept at-sea demonstrations of emerging Unmanned Undersea Vehicle (UUV) and Unmanned Surface Vehicle (USV) technologies designed to collect environmental data. FY 2015 Plans: Continue to develop the underlying acoustic and environmental software components of Navy decision tools that assist Undersea Warfare (USW) warfighters to optimally deploy assets equipped with acoustic sensors and to take advantage of prevailing environmental conditions. Verify, validate and transition this software technology through the Atmospheric Master Library (OAML). Continue population/upgrade of oceanographic, acoustic and geoacoustic databases in Combatant Commanders' (COCOM) areas of interest. Continue developing Maritime Patrol Aircraft and submarine-based TTS technologies to collect and transmit environmental data for use by NAVOCEANO to predict ASW sensor performance. Transition software algorithms that capture and communicate variability and uncertainty contained in the output of underlying model and data base components of ASW TDAs. Continue to develop and transition the environmental software components of MIW TDAs in use by the U.S. Navy's MIW Forces and Naval NOe personnel supporting them. Provide technical support to the NAVOCEANO in updating geoacoustic bottom loss			

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014
& scatter data bases for sonar performance predictions. Conduct proof-of-concept at-sea demonstrations of emerging UUV and USV technologies designed to collect environmental data.			
Title: Earth System Prediction Capability (ESPC)		2.657	4.985
Articles:		-	-
FY 2013 Accomplishments: Initiated a common model architecture and standards, as well as developed demonstration plans and conducted science workshops and early benchmark testing to meet long range program goal of advanced skillful forecast (relative to averaged climatology) from current operational capability of 7-10 days, to 30 days and longer. Provided the Navy component to match a National research and development (R&D) initiative across the major U.S. National Operational Prediction Centers at Navy, National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA), and Department of Energy (DOE).			
FY 2014 Plans: -Continue all efforts from FY2013. -Continue to develop a National common environmental computing architecture to improve cross-Agency collaboration, and a greatly more efficient computational architecture to allow for real-time operational prediction. -Continue common environmental model architecture and standards, and prediction demonstration plans and science workshops, and initiate benchmark testing. -Continue efforts towards advanced skillful environmental forecasts and decision guidance (relative to averaged climatology) to improve from the operational capability, currently 7-10 days, to 30 days and longer. -Continue the Navy component to the National R&D initiative for Environmental Prediction across the major U.S. National Operational Prediction Centers at Navy, NOAA, NASA, and DOE.			
FY 2015 Plans: Continue all efforts from FY2014, less those noted as complete. Complete a National common environmental computing architecture to improve cross-Agency collaboration. Continue to develop a greatly more efficient computational architecture to allow for real-time operational prediction. Complete common environmental model architecture and standards and prediction demonstration plans. Continue science workshops and benchmark testing. Continue efforts towards advanced skillful environmental forecasts and decision guidance (relative to averaged climatology) to improve from the operational capability, currently 7-10 days, to 30 days and longer. Continue the Navy component to the National R&D initiative for Environmental Prediction across the major U.S. National Operational Prediction Centers at Navy, NOAA, NASA, and DOE.			

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319 / 4				R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2342. / METOC Data Assimilation and Mod				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)										FY 2013	FY 2014	FY 2015
Initiate improved scalability and computational performance of a fully coupled global atmosphere / wave / ocean / land / ice prediction system providing daily predictions out to 10 days and weekly predictions out to 30 days. Initiate improved DoD decision support for 30-180 Day lead times.												
Accomplishments/Planned Programs Subtotals										12.899	15.235	12.582
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost	
• OPN/4226: METEOROLOGICAL EQUIPMENT	17.790	19.118	12.575	-	12.575	14.947	15.834	16.512	16.549	Continuing	Continuing	
• RDTEN/0604218N/2345: FLEET METOC EQUIPMENT	2.380	2.611	1.244	-	1.244	1.332	0.848	1.310	1.950	Continuing	Continuing	
• RDTEN/0603207N/2341: METOC DATA ACQUISITION	5.793	6.336	2.518	-	2.518	4.387	4.430	5.084	5.230	Continuing	Continuing	
• RDTEN/0604218N/2346: METOC SENSOR ENGINEERING	1.278	1.415	0.940	-	0.940	1.194	1.206	1.228	1.260	Continuing	Continuing	
• RDTEN/0305160N/0524: NAVY METOC SUPPORT (SPACE)	0.738	0.742	0.359	-	0.359	0.645	0.641	0.661	0.680	Continuing	Continuing	
Remarks												
D. Acquisition Strategy												
Acquisition, management and contracting strategies to support the Meteorological & Oceanography (METOC) Data Assimilation Project which is a multi-faceted program which includes: 1) development, demonstration and validation of software associate with atmospheric and oceanographic data assimilation forecast models and database management systems for use in both mainframe and tactical scale computers; 2) other software models, which focus on ocean thermal structure and circulation, and surf and tide prediction; 3) software 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.												
Acquisition, management and contracting strategies to support the Earth System Prediction Capability Project, a multi-faceted program which includes: 1) development, demonstration and validation of atmospheric, sea ice and oceanographic data assimilation techniques, forecast models, database management systems, and associated software for use in teraflop to petaflop scale computers; 2) other models, which focus on decision products and quantifying thresholds, forecast uncertainty, and risk for Navy and DoD resource and mission planning using non-Navy models as input; 3) techniques to improve computational and data dissemination efficiency for environmental information dominance.												

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>	Project (Number/Name) 2342. / <i>METOC Data Assimilation and Mod</i>

E. Performance Metrics

Goal: Develop techniques and tools to assimilate Meteorological and Oceanographic (METOC) data in order to improve the accuracy of global and regional scale meteorological and oceanographic forecast models. Data assimilation is expanded to include new in-situ and remotely-sensed data types, based on operational need. Tasks are directed toward advanced software enabling assimilation of disparate sources on non-synoptic time scales. Acoustic, atmospheric, and oceanographic model development, prototyping and transition is focused on improved model physics, increased resolution, and computational efficiency.

Metric: Tasks will address no less than 75% of applicable capability gaps and requirements.

Goal (ESPC): Develop a more accurate global ocean, atmosphere, wave and sea ice forecast system with longer skillful forecast times from weeks to seasons through integrating and coupling atmosphere, ocean, ice, land and near-space forecast models into a seamless prediction system that reduces errors in the current modeling suite. Additionally develop a common modeling architecture to improve cross-Agency collaboration, and a greatly more efficient computational architecture to allow for real-time operational prediction.

Metrics: Long term trends show a globally averaged gain of skill of 1 day per decade of RDT&E investment, i.e. today's 5-day forecast is as accurate as the 3-day forecast available in the early 1990's. This program will implement new technological approaches to improve 7-14 day predictions to the level of current 5-7 day forecasts and will seek to provide quantifiable skill above long term seasonal averages for 14-90 day lead times for mission planning.

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Exhibit R-4, RDT&E Schedule Profile: PB 2015 Navy																							Date: March 2014					
Appropriation/Budget Activity 1319 / 4												R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications												Project (Number/Name) 2342. / METOC Data Assimilation and Mod				
METOC Future Mission Capabilities (FMC)	FY 2013				FY 2014				FY 2015				FY 2016				FY 2017				FY 2018				FY 2019			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
METOC FMC																												
Data Assimilation Into Coupled Prediction Systems																												
Develop Oceanographic and Atmospheric Forecast Models																												
Oceanographic and Atmospheric Forecast Model Data Assimilation																												
Decision Support & Performance Prediction Tools																												

2015OSD - 0603207N - 2342.L39

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Exhibit R-4, RDT&E Schedule Profile: PB 2015 Navy

Date: March 2014

Appropriation/Budget Activity

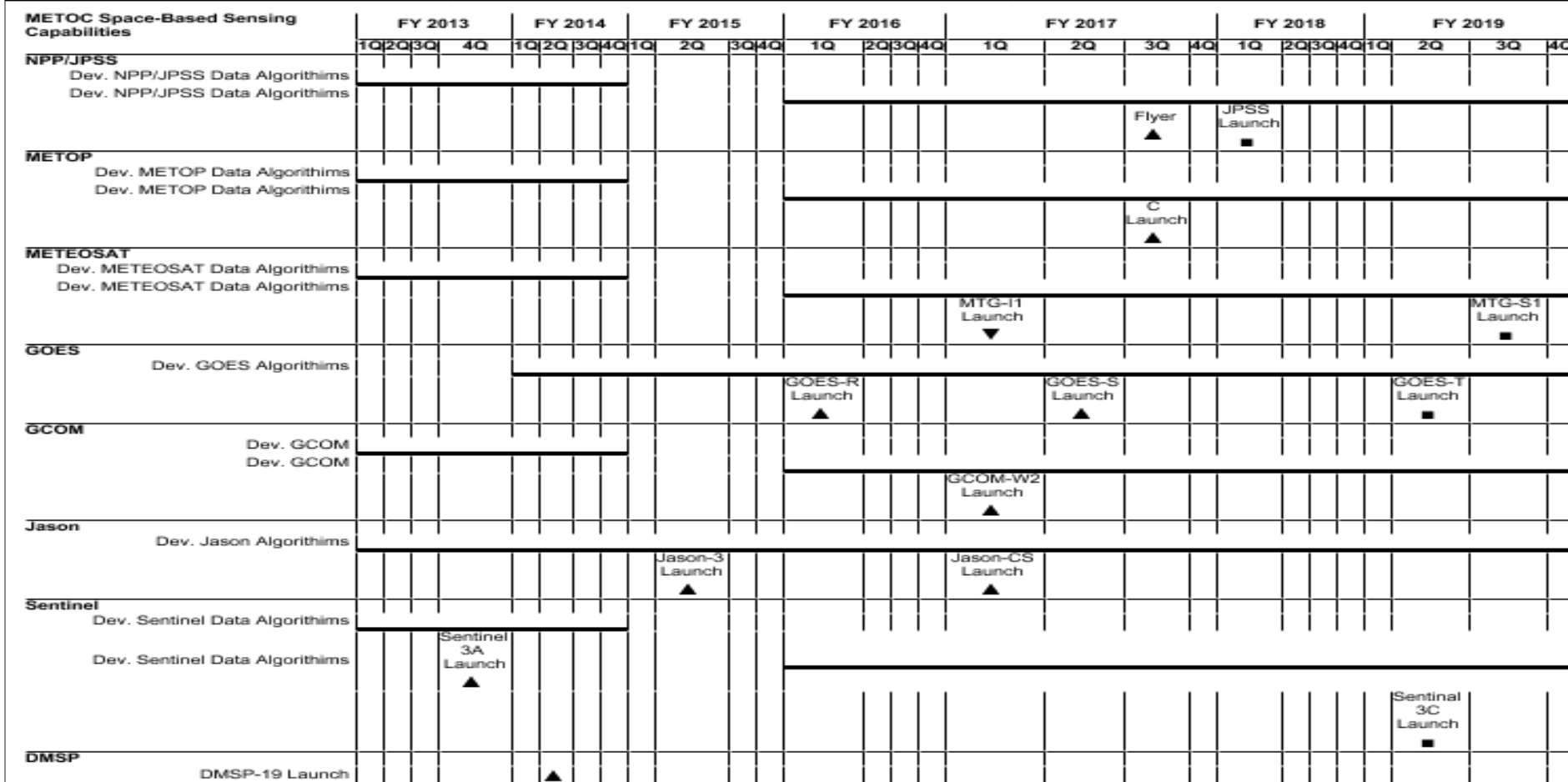
1319 / 4

R-1 Program Element (Number/Name)

PE 0603207N / *Air/Ocean Tactical Applications*

Project (Number/Name)

2342. / *METOC Data Assimilation and Mod*



2015OSD - 0603207N - 2342.L39

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PE 0603207N: *Air/Ocean Tactical Applications*
Navy

R-1 Line #25

R-1 Program Element (Number/Name)	Program Element Description	Program Element Status	Program Element Comments

PE 0603207N / Air/Ocean Tactical Applications

2342. *I METOC Data Assimilation and Mod*2015OSD - 0603207N - 2342.L39

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PE 0603207N: *Air/Ocean Tactical Applications*
Navy

R-1 Line #25

Project (Number/Name)	Start Date	End Date	Duration (Days)	Progress (%)	Status	Owner	Team	Budget (€)	Actual Cost (€)	Variance (€)	Risk Level	Notes
101	2023-01-01	2023-03-31	90	100	Completed	John Doe	Team Alpha	50000	48000	2000	Low	Project completed ahead of schedule.
102	2023-02-01	2023-05-31	120	75	In Progress	Jane Smith	Team Beta	75000	70000	5000	Medium	Minor delays in procurement.
103	2023-03-01	2023-06-30	120	20	On Hold	Mike Johnson	Team Gamma	60000	0	60000	High	Waiting for client approval.
104	2023-04-01	2023-07-31	120	0	Not Started	Sarah Lee	Team Delta	80000	0	80000	Medium	Initial planning phase.
105	2023-05-01	2023-08-31	120	0	Not Started	David Kim	Team Epsilon	90000	0	90000	Low	Resource allocation in progress.

PE 0603207N / Air/Ocean Tactical Applications

2342. *I METOC Data Assimilation and Mod*

Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW) - (Cont.)	FY 2013				FY 2014				FY 2015				FY 2016				FY 2017				FY 2018				FY 2019			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Bioacoustic Volume Attenuation and Scatter Efforts																												

2015 OSD - 0603207N - 2342 L39

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2343 / Tactical METOC Applications			
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
2343: Tactical METOC Applications	117.491	9.049	8.908	9.124	-	9.124	14.384	14.149	15.220	15.503	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		
# The FY 2015 OCO Request will be submitted at a later date.												
A. Mission Description and Budget Item Justification												
The Tactical Meteorology and Oceanography (METOC) Applications Project provides future operational effects decision aid capabilities for Navy and Marine Corps warfighters in the context of Joint Operations in a net-centric environment. 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 software decision support tools 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 Unit to Theater level, to optimize their sensor employment on airborne, surface, and subsurface platforms in support of Naval Composite Warfare mission areas including Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare, 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 weapons and sensor systems will perform. Performance results are displayed in tabular and graphic formats integrated into net-centric visualization tools 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.												
The major emphasis of this project is the software development within the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program of record.												
FY 2015 request provides for the achievement of NITES-Next Initial Operational Capability (IOC), the continuation of Fleet Capability Release (FCR)-2 software development efforts including extensive system architecture, and testing efforts and initiation of FCR-3.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2013	FY 2014	FY 2015	
Title: Naval Integrated Tactical Environmental System Next Generation (NITES-Next)									9.049	8.908	9.124	

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014	
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>	Project (Number/Name) 2343 / <i>Tactical METOC Applications</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014
Articles: FY 2013 Accomplishments: Continued developing Fleet Capability Release-1 (FCR-1) software. Obtained Limited Fielding Decision (LFD) entrance criteria for FCR-1 from Milestone Decision Authority (MDA). Coordinated with Naval Command Operational Test and Evaluation Force (COMOPTEVFOR) for test events. Conducted FCR-1 System Integration Test #1 (SIT). Completed documentation (including Requirements Definition Package (RDP), Cost Analysis Requirements Description (CARD) and Acquisition Program Baseline (APB)) for NITES-Next FCR-2 Build Decision. Completed required documentation in support of the LFD for FCR-1. Developed the Technology Readiness Assessment (TRA) Addendum 1 for FCR-1 and FCR-2. Obtained FCR-2 Build Decision. Generated FCR-2 contract package. FY 2014 Plans: Conduct SIT #2, System Qualification Test (SQT), Developmental Test and Evaluation (DT&E), and User Assessment (UA) for FCR-1. Obtain interim authority to test (IATT) for live network testing. Obtain authority to operate (ATO) for FCR-1. Obtain LFD from MDA, and conduct limited fielding of FCR-1 software to a maximum of six ships. Begin sustainment of FCR-1 software. Complete Navy Training System Plan (NTSP) and Independent Logistics Assessment (ILA) for FCR-1. Plan the FCR-2 test activities. Award task order and start development, integration, and testing of FCR-2. Conduct the System Engineering Technical Review (SETR) Build Technical Review (BTR) in support of FCR-2. Begin documentation and preparation (including RDP, TRA Addendum 2, CARD and APB) for FCR-3. Begin planning for contract actions in support of FCR-3. FY 2015 Plans: Conduct Initial Operational Test and Evaluation (IOT&E) in support of FCR-1 Fielding Decision (FD). Conduct FCR-1 FD with the MDA and achieve Initial Operational Capability (IOC). Continue developing, integrating, and testing FCR-2 software. Continue documentation and preparation for FCR-3 (including RDP, TRA Addendum 2, CARD and APB). Continue planning contract in support of FCR-3. Plan for SIT and SQT for FCR-2.		-	-
Accomplishments/Planned Programs Subtotals		9.049	8.908
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
Acquisition, management and contracting strategies are to support the Tactical Meteorology & Oceanography (METOC) Applications project to continue the development of state-of-the-art software capabilities that provide sensor, communication, and weapon system performance assessments across open ocean and littoral			

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>	Project (Number/Name) 2343 / <i>Tactical METOC Applications</i>

operating environments, all with management oversight incorporating these into the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program under Joint Capabilities Integration and Development System (JCIDS) by the Department of the Navy (DoN).

E. Performance Metrics

Goal: Develop METOC future Operational Effects Decision Aid (OEDA) capabilities for Navy and Marine Corps war fighters in order to facilitate the characterization and prediction of the battlespace.

Metric: Improve the accuracy of METOC tactical decision aids and applications in order to address no less than 75% of applicable capability gaps and requirements.

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Exhibit R-4, RDT&E Schedule Profile: PB 2015 Navy

Date: March 2014

Appropriation/Budget Activity

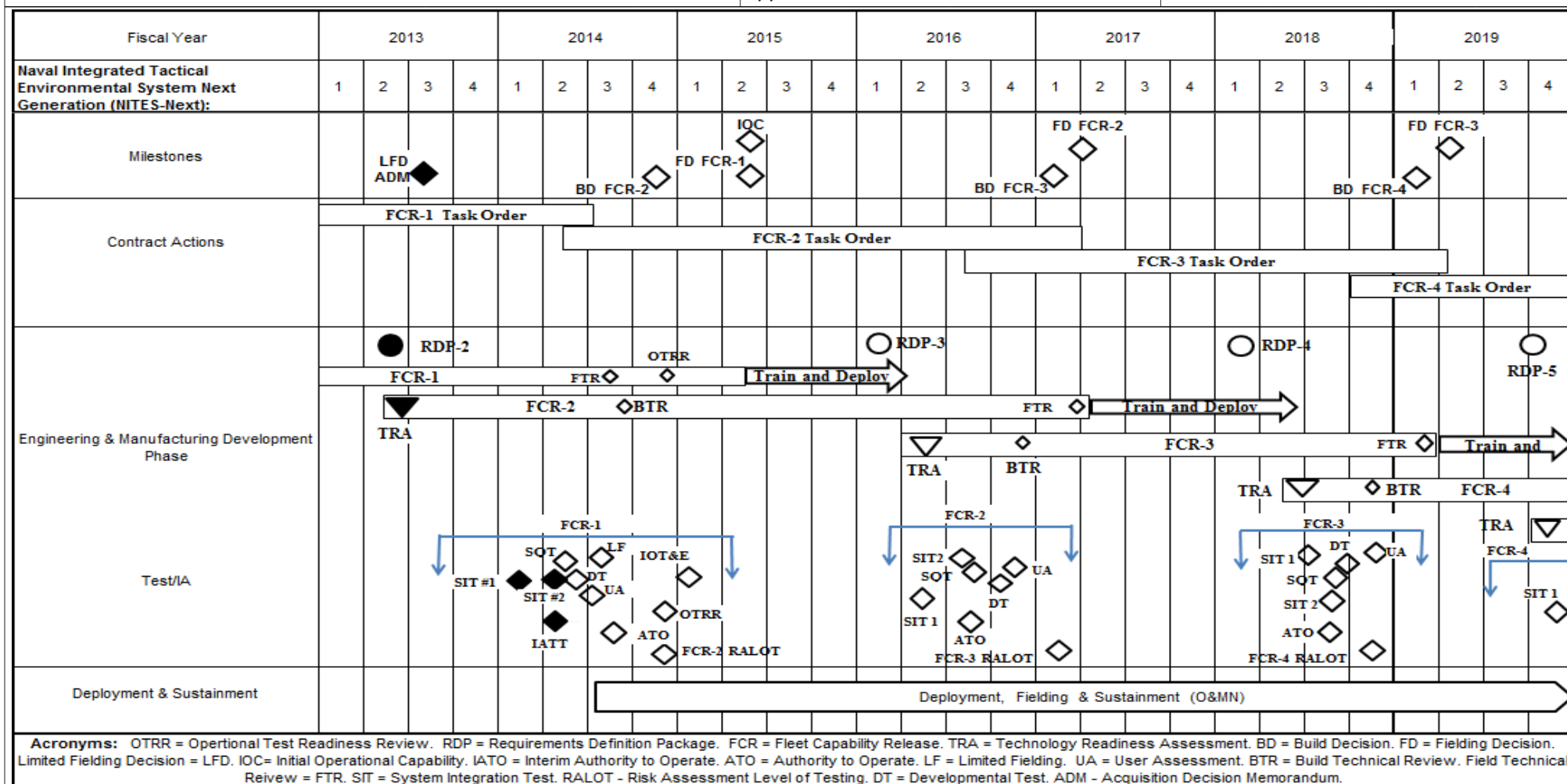
1319 / 4

R-1 Program Element (Number/Name)

PE 0603207N / Air/Ocean Tactical Applications

Project (Number/Name)

2343 / Tactical METOC Applications



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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2344. / Precise Time and Astrometry			
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
2344.: Precise Time and Astrometry	-	2.936	5.914	8.954	-	8.954	2.340	1.179	2.106	1.222	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

The Precise Timing and Astrometry (PTA) project funds research and development of improvements for the U.S. Master Clock (MC) System, the DoD Time Transfer capability, the Earth Orientation System, and the Astrometric Observation System. The MC System and Time Transfer provides precise time for use in modern military and National Technical Means (NTM) navigation, guidance, positioning, and tracking systems. The Earth Orientation System provides precise Earth Orientation Parameters for use by the DoD and the national civilian infrastructure to establish the specific orientation of the Earth and to provide input to the terrestrial reference frame. The Astrometric Observation System provides the basic data needed to generate the celestial reference frame which is the standard for calibrating all inertial navigation systems, satellite orbits, and earth rotation determinations. Improvement to the MC System, Time Transfer, Earth Orientation, and Astrometric Observation Systems are needed to ensure that new and upgraded DoD and NTM capabilities meet their performance requirements. By DoD Directive (CJCSI 6130.01D, encl J, of 13 Apr 2007), the U.S. Naval Observatory (USNO), Washington, D.C., is responsible for coordinating Precise Time and Time Interval (PTTI) requirements and for maintaining a PTTI reference standard (astronomical and atomic) for use by all DoD, Federal agencies, and related scientific laboratories. The Navy is also responsible for providing astronomical data for military and NTM navigation, positioning, and guidance capabilities that are space-based.

The PTA research and development efforts are focused on several areas relating to timing and time transfer: (1) Development of Rubidium Fountain Atomic Clocks and development of improved GPS Timing Receivers in order to meet the precise timing requirements for the GPS III system; (2) Research & development of the capability of distributing timing signals via Optical fiber lines, as an alternative and backup to GPS time distribution; and (3) Research & development into Optical Clock technology, which is expected to be required for future DoD systems. The PTA research and development effort is also focused on the following areas related to Earth Orientation Parameter (EOP) determination: (1) Upgrade of the Very Long Baseline Interferometry (VLBI) data acquisition system / radio telescope at Kokee Park HI; (2) Development of a Software (SW) Correlator for processing of VLBI data, necessary for the generation of Earth Orientation Parameter (EOP) data; (3) Development of the capability for electronic transmission of the VLBI data from remote VLBI sites to the USNO correlator. The new SW Correlator and the eVLBI infrastructure upgrades are necessary in order to support daily updates of EOP data required by GPS III; (4) Development of an automated end-to-end EOP processing system, which combines input from multiple data sets (e.g. VLBI data, GPS orbit data, and laser ranging data, etc.). This process is currently very labor intensive and costly. Automation is necessary to meet future DoD and GPS requirements; and (5) Modifications to the EOP system for compatibility with the new international standard '-VLBI2010'. Starting in FY15, the PTA research and development for astrometry will focus on improvements to the USNO Navy Precision Optical Interferometer (NPOI) at Flagstaff, AZ. It is necessary for maintenance of the Celestial Reference Frame (CRF). Four 1.8m telescopes will be added to the array in order to extend and expand the number of stars in the catalog to fainter stars of 9th magnitude.

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy			Date: March 2014		
Appropriation/Budget Activity 1319 / 4		R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications	Project (Number/Name) 2344. / Precise Time and Astrometry		
The Critical Time Dissemination (CTD) aspect of the PTA program develops enhanced methods of distributing and verifying precise time back to the Master Clock, UTC (USNO). The development aspect of this project has four parts: (1) Development of a mobile time link; (2) Refinement of and modernization of the Hydrogem Maser and Auxiliary Offset Generator (AOG); (3) Customize a timing system to develop a Site Verification System; and (4) Produce a fiber link system to transfer the Master Clock down long-haul fiber. In response to these DoD requirements, this project transitions Research and Exploratory Development efforts, as well as developments in the civilian sector, into the operational capabilities of the USNO.					
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)			FY 2013	FY 2014	FY 2015
Title: Precise Timing and Astronomy Articles: Description: Research and development of improvements for the U.S. Master Clock (MC) System, the DoD Time Transfer capability, the Earth Orientation System, and the Astrometric Observation System. FY 2013 Accomplishments: Master Clock (MC) and Time Distribution: Four Navy Rb Fountains (NRF2-5) are now located in the National Master Clock Facility and have demonstrated excellent prediction -of and agreement- with USNO Universal Time Clock (UTC). Time from NRF2-5 are now included in the USNO MC time scale and being reported to the Bureau International des Poids et Mesures (BIPM) for inclusion in the international coordinated UTC. One Navy Rb Fountain has been completed and shipped to the Alternate Master Clock facility (December 2012). One more Rb Fountain will be completed and sent to the AMC facility by July 2013. Approximately 12 months are needed to verify the performance of the two Rb Fountains once they are in place at the AMC. Earth Orientation: Very Long Baseline Interferomtry System (VLBI) Software (SW) correlator design and development completed. The new 15-station SW Correlator was procured (OPN-funded), delivered and installed in September 2012. It will replace the Hardware (HW) correlator. The Initial Operation Capability (IOC) for the SW Correlator was completed on 7 February 2013. The preliminary version of the Graphical User Interface (GUI) has been delivered. The SW correlator is used for processing the daily National Radio Astronomy Observatory Earth Orientation Parameter (NRAO EOP) intensive series, from the Very Long Baseline Array (VLBA) Mauna Kea, HI, and Pie Town, NM, antennas. In addition, one of the International VLBI Service (IVS) EOP intensive experiments (using the Kokee Park, HI, and Wettzell, Germany, antennas) is correlated on both the SW and HW correlators for intercomparison. Plans for replacement and upgrade of the VLBI radio telescope at Kokee Park HI are progressing. The Kokee Park telescope replacement contract and the Kokee Park Telescope project manager contract is in preparation at Fleet Logistics Center (FLC), Philadelphia, and are expected to be awarded in July 2013. FY 2014 Plans: * Initial Operating Capability (IOC) completed for Rb Fountains at USNO Alternate Master Clock facility * Develop test optical fiber link * Achieve Final Operating Capability (FOC) for the SW Correlator operations			2.936	5.914	8.954
			-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy							Date: March 2014				
Appropriation/Budget Activity 1319 / 4				R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>			Project (Number/Name) 2344. / <i>Precise Time and Astrometry</i>				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)							FY 2013	FY 2014	FY 2015		
* Contract award for the VLBI Receiver Electronics for the radio telescope Kokee Park, HI * Preliminary Design Review (PDR) for Earth Orientation Parameters (EOP) Automation * Begin site preparations for the Kokee Park radio telescope * Lab demonstration of Optical Fiber timing link * Begin Critical Time Dissemination Activities <i>FY 2015 Plans:</i> * Full Operating Capability (FOC) for Rb Fountains at AMC * IOC Kokee Park radio telescope * Begin Navy Precision Optical Interferometer (NPOI)/1.8m telescope installation efforts/activities * Continue Optical Fiber timing link activities * Continue work on EOP automation * Continue Critical Time Dissemination Activities											
Accomplishments/Planned Programs Subtotals							2.936	5.914	8.954		
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
• OPN/0305112N/LI 8126: <i>Oceanography (USNO Astrometric Telescope Subsystem funds for purchase of Software Correlator</i>	1.156	0.290	-	-	-	-	-	-	-	-	1.446
Remarks											
D. Acquisition Strategy											
The included technology developments are primarily in-house with selected contractor participation. However, the Kokee Park, HI, radio telescope upgrade and the SW Correlator (OPN-funded) contract will involve substantial non-Navy contract support. Management oversight by Program Executive Officer for Command, Control, Communications, Computers, and Intelligence.											
E. Performance Metrics											
(1) The Software Correlator will complete Phase 2 and will achieve Initial Operational Capability (IOC). (2) Antenna will be installed at Kokee Park, HI. (3) Rb Fountain System will reach FOC at AMC in FY15.											

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>	Project (Number/Name) 2344. / <i>Precise Time and Astrometry</i>
Metric: Measurable progress toward stated GPS-III requirement to meet or exceed a 2 sigma accuracy of 0.5 nanoseconds (ns) for the M Code Rx error and 0.1ns Master Clock error. Improve star position accuracy to within 10 milliarcseconds in support of National Technical Means (classified) program requirements.		

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PE 0603207N: *Air/Ocean Tactical Applications*
Navy

R-1 Line #25

Project (Number/Name)	Start Date	End Date	Duration (Days)	Actual Cost	Budgeted Cost	Variance	Cost Index	Performance Index	Cost Variance	Cost Performance	Cost Variance	Cost Performance
1	1/1/2020	1/31/2020	31	10000	10000	0	1.0	1.0	0	1.0	0	1.0
2	2/1/2020	2/28/2020	28	15000	15000	0	1.0	1.0	0	1.0	0	1.0
3	3/1/2020	3/31/2020	31	20000	20000	0	1.0	1.0	0	1.0	0	1.0
4	4/1/2020	4/30/2020	30	25000	25000	0	1.0	1.0	0	1.0	0	1.0
5	5/1/2020	5/31/2020	31	30000	30000	0	1.0	1.0	0	1.0	0	1.0
6	6/1/2020	6/30/2020	30	35000	35000	0	1.0	1.0	0	1.0	0	1.0
7	7/1/2020	7/31/2020	31	40000	40000	0	1.0	1.0	0	1.0	0	1.0
8	8/1/2020	8/31/2020	31	45000	45000	0	1.0	1.0	0	1.0	0	1.0
9	9/1/2020	9/30/2020	30	50000	50000	0	1.0	1.0	0	1.0	0	1.0
10	10/1/2020	10/31/2020	31	55000	55000	0	1.0	1.0	0	1.0	0	1.0
11	11/1/2020	11/30/2020	30	60000	60000	0	1.0	1.0	0	1.0	0	1.0
12	12/1/2020	12/31/2020	31	65000	65000	0	1.0	1.0	0	1.0	0	1.0
13	1/1/2021	1/31/2021	31	70000	70000	0	1.0	1.0	0	1.0	0	1.0
14	2/1/2021	2/28/2021	28	75000	75000	0	1.0	1.0	0	1.0	0	1.0
15	3/1/2021	3/31/2021	31	80000	80000	0	1.0	1.0	0	1.0	0	1.0
16	4/1/2021	4/30/2021	30	85000	85000	0	1.0	1.0	0	1.0	0	1.0
17	5/1/2021	5/31/2021	31	90000	90000	0	1.0	1.0	0	1.0	0	1.0
18	6/1/2021	6/30/2021	30	95000	95000	0	1.0	1.0	0	1.0	0	1.0
19	7/1/2021	7/31/2021	31	100000	100000	0	1.0	1.0	0	1.0	0	1.0
20	8/1/2021	8/31/2021	31	105000	105000	0	1.0	1.0	0	1.0	0	1.0
21	9/1/2021	9/30/2021	30	110000	110000	0	1.0	1.0	0	1.0	0	1.0
22	10/1/2021	10/31/2021	31	115000	115000	0	1.0	1.0	0	1.0	0	1.0
23	11/1/2021	11/30/2021	30	120000	120000	0	1.0	1.0	0	1.0	0	1.0
24	12/1/2021	12/31/2021	31	125000	125000	0	1.0	1.0	0	1.0	0	1.0
25	1/1/2022	1/31/2022	31	130000	130000	0	1.0	1.0	0	1.0	0	1.0
26	2/1/2022	2/28/2022	28	135000	135000	0	1.0	1.0	0	1.0	0	1.0
27	3/1/2022	3/31/2022	31	140000	140000	0	1.0	1.0	0	1.0	0	1.0
28	4/1/2022	4/30/2022	30	145000	145000	0	1.0	1.0	0	1.0	0	1.0
29	5/1/2022	5/31/2022	31	150000	150000	0	1.0	1.0	0	1.0	0	1.0
30	6/1/2022	6/30/2022	30	155000	155000	0	1.0	1.0	0	1.0	0	1.0
3												

PE 0603207N / Air/Ocean Tactical Applications

2344. / *Precise Time and Astrometry*[illegible]

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PE 0603207N: *Air/Ocean Tactical Applications*
Navy

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 2363 / Remote Sensing Capability Development			
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
2363: Remote Sensing Capability Development	-	-	-	4.988	-	4.988	2.500	1.000	1.000	0.980	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		
# The FY 2015 OCO Request will be submitted at a later date.												
A. Mission Description and Budget Item Justification Remote Sensing Capability Development characterized the ocean environment using a variety of remote sensing techniques that provide that capability to discriminate atypical oceanographic phenomena from the natural environment that will greatly improve undersea dominance capabilities. The Naval Oceanographic Office will employ oceanographic data to refine and extend environmental characterization of the phenomena and disseminate data to the Fleet. FY 2015 request provides for collecting target data for development of automated algorithms.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)										FY 2013	FY 2014	FY 2015
Title: Remote Sensing Capability Development										-	-	4.988
Articles:										-	-	-
FY 2013 Accomplishments: N/A												
FY 2014 Plans: N/A												
FY 2015 Plans: Collect remote sensing and ground truth data in various weather and sea states to broaden the range of environmental conditions and reduce uncertainty in environmental prediction. Enhance software to automate tools for tasking, reduce false alarms in environmental detection algorithms, and automate tools for analysis and dissemination to increase area coverage, reduce timelines, and decrease analyst workload.												
Accomplishments/Planned Programs Subtotals										-	-	4.988
C. Other Program Funding Summary (\$ in Millions) N/A												
Remarks												

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>	Project (Number/Name) 2363 / <i>Remote Sensing Capability Development</i>

D. Acquisition Strategy

Seeking approval from ASN/RDA as a Rapid Development and Deployment (RDD) project. The RDD will transition to an ACAT Level Program of Record in FY16.

E. Performance Metrics

Collection of performance metrics will begin upon approval of RDD.

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PE 0603207N: *Air/Ocean Tactical Applications*
Navy

R-1 Line #25

Project (Number/Name)

PE 0603207N / Air/Ocean Tactical Applications

2363 / Remote Sensing Capability Development

2015 OSD - 0603207N - 2363

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy										Date: March 2014		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications				Project (Number/Name) 3207 / Fleet Synthetic Training			
COST (\$ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
3207: Fleet Synthetic Training	1.879	0.680	2.853	2.263	-	2.263	1.001	1.019	1.040	1.060	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		
# The FY 2015 OCO Request will be submitted at a later date.												
A. Mission Description and Budget Item Justification												
Fleet Synthetic Training (FST) provides 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 will 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 develops and delivers 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.												
Ballistic Missile Defense (BMD) Fleet Synthetic Training (FST) at Sea effort will provide the capability to conduct integrated Live, Virtual and Constructive (LVC) single or multi-ship exercises with ships at sea using the Navy Continuous Training Environment (NCTE). This capability will support BMD mission area Fleet training and mission rehearsal in theater, allow ships to participate in Combatant Command (COCOM) mandated BMD exercises while pierside or underway, as well as enhance BMD training objective accomplishment in current Fleet Requirements Training Plan (FRTP) underway training events such as Composite Training Unit Exercises (COMPTUEX) and Joint Task Force Exercises (JTFEX). The NCTE and FST directly support Fleet training readiness and strike group and BMD platform deployment certifications.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2013	FY 2014	FY 2015	
Title: Fleet Synthetic Training									0.680	0.970	0.600	
									Articles: -	-	-	
Description: 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.												
Accomplishments include development of meteorological and oceanographic environmental databases for total of 10 of 14 Navy Continuous Training Environment (NCTE) exercise areas. Conducted data and architecture testing between Commander, Naval Meteorology and Oceanography Command (CNMOC) data and the Environmental Data Cube Support system. Integrated environmental database hosting at the Naval Oceanographic Office. Developed capability to realistically simulate bathythermograph data collection based on synthetic ocean environment for total of 6 of 14 NCTE areas. Enhanced realism of												

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014		
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications	Project (Number/Name) 3207 / Fleet Synthetic Training		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014	FY 2015
training environment by providing synthetic satellite/radar imagery based on synthetic enviromental data. Made improvements in generating acoustic performance products used by Anti-Submarine Warfare (ASW) white cell and ASW commander staff. Conducted verification and validation of acoustic performance products. FY 2013 Accomplishments: Developed meteorological and oceanographic environmental databases for a total of 14 Navy Continuous Training Environment (NCTE) exercise areas. Conducted data and architecture testing between CNMOC data and the Environmental Data Cube Support System (EDCSS). Integrated environmental database hosting at the Naval Oceanographic Office. Developed capability to realistically simulate bathythermograph data collection based on synthetic ocean environment for total of 14 NCTE areas. Enhanced realism of training environment by expanding major training areas to provide better upstream data and providing synthetic satellite/radar imagery based on synthetic environmental data. Made improvements in generating acoustic performance products used by Anti-Submarine Warfare (ASW) white cell and ASW commander staff. Conducted verification and validation of acoustic performance products. Initiated study to measure effectiveness of meteorologic and oceanographic products during FST events to better support exercises and real world operations. FY 2014 Plans: * Develop/implement Environmental Data Cube Support System (EDCSS) production capability at Navy Warfare Development Command (NWDC) * Develop Live Virtual Constructive capability in support of Fleet Synthetic training events * Research "Modeling on Demand" capability via EDCSS * Research Modeling on Demand capability using High Performance Computing at Defense Shared Resource Center FY 2015 Plans: * Research/implement automated Tactical Oceanographic Forecast products * Develop additional performance surface capability enhancements * Complete development of Machine-to-Machine (M2M) capability for Environmental Data Cube Support (EDCSS interface in support of environmental product generation * Implement "modeling on demand" capability				
Title: Ballistic Missile Defense (BMD) Fleet Synthetic Training (FST) at Sea Articles: Description: Develop a distributed training capability to provide simulation data via a satellite network to the ship underway to stimulate the combat systems and operators. Coordinate efforts with NAVSEA, SPAWAR, and NAVAIR. FY 2013 Accomplishments:		- -	1.883 -	1.663 -

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Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014	
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / <i>Air/Ocean Tactical Applications</i>	Project (Number/Name) 3207 / <i>Fleet Synthetic Training</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2013	FY 2014
N/A			
FY 2014 Plans: * Develop a distributed training capability to provide simulation data via a satellite network to the ship underway to stimulate the combat systems and operators. * Coordinate efforts with Naval Air Warfare Center Training System Division (NAWC TSD) and Naval Surface Warfare Center (NSWC). Develop BMD FST at Sea capability to support BMD Mission Area training and Mission Rehearsal in Theater.			
FY 2015 Plans: * Finalize development, test, certification and demonstration of the capability. * Test and certification of the capability will be conducted FY 2015.			
Accomplishments/Planned Programs Subtotals		0.680	2.853
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
The included technology developments are primarily in-house with contractor participation through existing vehicles.			
E. Performance Metrics			
1) CNMOC will produce meteorological and oceanographic environmental databases for all Navy Continuous Training Environment (NCTE) exercise areas. Will implement, test, and integrate with JSAF and other federates in accordance with requirements.			
2) CNMOC will complete data and architecture integration, including information assurance compliance for provision of synthetic Meteorological and Oceanographic Command (METOC) data to the NCTE. Data and products will be available via NEP-Oc, DVD and/or Machine-to-Machine (M2M) during planning and execution of FST events.			
3) CNMOC will produce products based on synthetic ocean environment and synthetic satellite/radar imagery based on meteorological environmental data for all NCTE exercise areas. Products are utilized in planning and execution of FST events.			
4) NWDC, in FY14 will develop prototype capability to provide simulation data to the ship underway to stimulate combat systems and operators.			
5) NWDC, in FY15 will finalize development, test, certify, and demonstrate capability for BMD FST at Sea.			

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Exhibit R-4, RDT&E Schedule Profile: PB 2015 Navy																							Date: March 2014						
Appropriation/Budget Activity 1319 / 4												R-1 Program Element (Number/Name) PE 0603207N / Air/Ocean Tactical Applications								Project (Number/Name) 3207 / Fleet Synthetic Training									
Proj 3207		FY 2013				FY 2014				FY 2015				FY 2016				FY 2017				FY 2018				FY 2019			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Fleet Synthetic Training																													
Database Development																													
Architecture																													
Performance Surface Improvements																													
Development Work																													
Studies																													
Configuration Management																													
Ballistic Missile Defense (BMD) FST at Sea																													
Development																													
Testing																													
Certification																													
Technology Demonstration																													