Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Navy											Date: February 2015	
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*							
COST ($ in Millions)	**Prior Years**	**FY 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
Total Program Element	474.775	41.137	40.429	41.832	-	41.832	50.430	46.304	47.122	44.825	Continuing	Continuing
2341: *METOC Data Acquisition*	155.413	6.146	2.518	3.763	-	3.763	4.797	5.321	5.211	5.315	Continuing	Continuing
2342.: *METOC Data Assimilation and Mod*	187.327	14.733	12.582	16.360	-	16.360	19.869	20.121	21.011	21.419	Continuing	Continuing
2343: *Tactical METOC Applications*	126.540	8.908	9.124	13.260	-	13.260	14.642	15.517	15.400	15.715	Continuing	Continuing
2344.: *Precise Time and Astrometry*	2.936	8.600	8.954	4.977	-	4.977	9.134	3.331	3.480	0.313	Continuing	Continuing
2363: *Remote Sensing Capability Development*	0.000	-	4.988	2.479	-	2.479	0.977	0.981	0.965	0.987	Continuing	Continuing
3207: *Fleet Synthetic Training*	2.559	2.750	2.263	0.993	-	0.993	1.011	1.033	1.055	1.076	Continuing	Continuing

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Navy	Date: February 2015
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 (FMC), 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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Previous President's Budget	39.246	40.429	40.974	-	40.974
Current President's Budget	41.137	40.429	41.832	-	41.832
Total Adjustments	1.891	-	0.858	-	0.858
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	3.000	-			
• SBIR/STTR Transfer	-1.109	-			
• Program Adjustments	-	-	-6.491	-	-6.491
• Rate/Misc Adjustments	-	-	7.349	-	7.349

Change Summary Explanation

The FY 2016 funding request was reduced by $3.6 million to account for the availability of prior year execution balances.

Technical - Increase in funding in FY16 - FY19 for Precise Time and Astrometry (PTA) program efforts.

Schedule- The schedule for PTA is updated to reflect the additional required research and upgrades.

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2341: *METOC Data Acquisition*	155.413	6.146	2.518	3.763	-	3.763	4.797	5.321	5.211	5.315	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 2016 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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)	5.794	2.219	3.462	-	3.462
Articles:	-	-	-	-	-
FY 2014 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
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 to develop technologies that use tactical detection systems where applicable to characterize undersea and atmospheric environment in the battlespace. Developed and demonstrated in-situ sampling techniques to support adaptive and advance measurement technologies. Developed techniques to improve delivery of GI&S within Navy METOC product production centers and throughout the fleet user base. Continued 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. Develop tools and techniques to support forecaster's processing, analysis and performance assessment processes. ***FY 2016 Base Plans:*** Continue advanced component and prototype development efforts associated with acquiring environmental data. 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 to characterize undersea and atmospheric environment in the battlespace. Continue to develop and demonstrate in-situ sampling techniques to support adaptive and advance measurement technologies. Continue to develop tools and techniques to support forecaster's processing, analysis and performance assessment processes. Develop tools to assess reach-back and on scene data fusion to support improved METOC decision support infrastructure. ***FY 2016 OCO Plans:*** N/A					
Title: Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW)	0.352	0.299	0.301	-	0.301
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
FY 2014 Accomplishments: Continued to transition models, algorithms and databases that calculate accurate acoustic transmission loss (TL) and characterize environmental parameters that affect TL. Developed TL calculation implementations to be used in the Navy's Anti-Submarine Warfare (ASW) Tactical Decision Aids (TDAs) and sonar trainers. Continued 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. ***FY 2016 Base 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 with emphasis on developing an active radial province capability. ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	6.146	2.518	3.763	-	3.763

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	2.542	1.224	3.379	-	3.379	0.923	1.356	1.939	1.980	Continuing	Continuing
• RDTEN/0603207N/2342: *METOC DATA ASSIMILATION AND MOD*	9.942	4.937	8.168	-	8.168	9.372	9.430	10.107	10.290	Continuing	Continuing
• RDTEN/0604218N/2346: *METOC SENSOR ENGINEERING*	1.373	0.940	1.136	-	1.136	1.233	1.244	1.253	1.280	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost

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.

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2341 / *METOC Data Acquisition*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	WR	Naval Research Laboartory : Washington, DC	68.981	4.409	Nov 2013	1.669	Nov 2014	2.601	Nov 2015	-		2.601	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	WR	SSC PAC : California	22.033	-		-		-		-		-	-	22.033	-
METOC Future Mission Capabilities	Various	Various : Various	42.421	-		-		-		-		-	-	42.421	-
LBS-G	C/CPIF	Teledyne Brown Eng : Alabama	6.557	-		-		-		-		-	-	6.557	-
METOC Future Mission Capabilities	WR	NPGS : Monterey, CA	0.600	-		-		-		-		-	-	0.600	-
METOC Future Mission Capabilities	C/FP	Penn State University : PA	0.300	-		-		-		-		-	-	0.300	-
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	WR	NRL : Washington, DC	1.400	-		-		-		-		-	-	1.400	-
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	C/FP	Hydroid INC : Pocasset, MA	1.865	-		-		-		-		-	-	1.865	-
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	C/FP	Univ. of Texas : Texas	1.300	-		-		-		-		-	-	1.300	-
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	WR	SSC PAC : California	2.754	-		-		-		-		-	-	2.754	-
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	WR	NSWC : Bethesda, MD	0.314	0.352	Feb 2014	0.299	Dec 2014	0.301	Dec 2015	-		0.301	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	C/FP	SAIC : Virginia	0.310	-		-		-		-		-	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2341 / *METOC Data Acquisition*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	C/FP	University of Washington : Seattle, WA	0.190	-		-		-		-		-	-	0.190	-
METOC Future Mission Capabilities	C/FP	Applied Science Associates (ASA) : Rhode Island	1.570	0.435	Dec 2013	0.150	Dec 2014	0.235	Dec 2015	-		0.235	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	SAIC : Virginia	0.850	0.550	Dec 2013	0.200	Jan 2015	0.313	Dec 2015	-		0.313	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	CSC : Virginia	0.000	0.400	Jan 2014	0.200	Jan 2015	0.313	Dec 2015	-		0.313	Continuing	Continuing	Continuing
		Subtotal	151.445	6.146		2.518		3.763		-		3.763	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	C/CPIF	Various : Various	2.672	-		-		-		-		-	-	2.672	-
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	C/FP	SAIC : Virginia	0.600	-		-		-		-		-	-	0.600	-
		Subtotal	3.272	-		-		-		-		-	-	3.272	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	WR	OPTEVFOR : Virginia	0.160	-		-		-		-		-	-	0.160	-
METOC Future Mission Capabilities	MIPR	JITC : Arizona	0.040	-		-		-		-		-	-	0.040	-
		Subtotal	0.200	-		-		-		-		-	-	0.200	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Not Specified : Not Specified	0.096	-		-		-		-		-	-	0.096	-
METOC Future Mission Capabilities Management Support	C/FP	BAH : Virginia	0.400	-		-		-		-		-	-	0.400	-
		Subtotal	0.496	-		-		-		-		-	-	0.496	-

	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	155.413	6.146		2.518		3.763		-		3.763	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

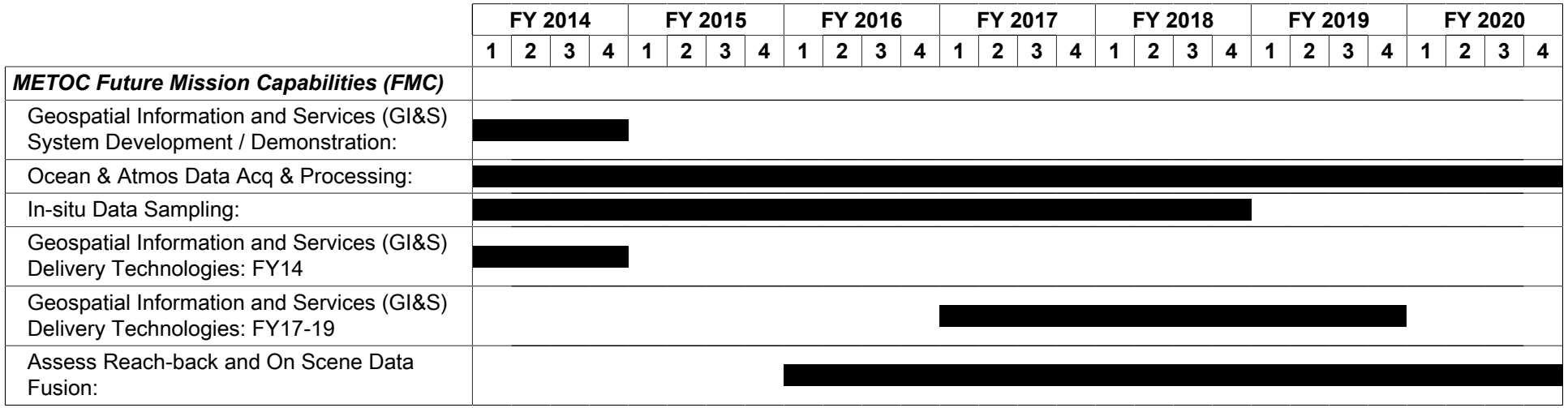


Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Future Mission Capabilities (FMC)				
Geospatial Information and Services (GI&S) System Development / Demonstration:	1	2014	4	2014
Ocean & Atmos Data Acq & Processing:	1	2014	4	2020
In-situ Data Sampling:	1	2014	4	2018
Geospatial Information and Services (GI&S) Delivery Technologies: FY14	1	2014	4	2014
Geospatial Information and Services (GI&S) Delivery Technologies: FY17-19	1	2017	4	2019
Assess Reach-back and On Scene Data Fusion:	1	2016	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2342.: *METOC Data Assimilation and Mod*	187.327	14.733	12.582	16.360	-	16.360	19.869	20.121	21.011	21.419	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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.

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).

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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*

FY 2016 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 Joint Polar Satellite System-1 (JPSS-1), Free-Flyer, GOES-S, EarthCARE, and OceanSat launch. Continue to Develop Meteorological and Oceanographic (METOC) Decision Support & Prediction Tools to improve Electromagnetic and Electro-optical (EM/EO) system performance. The Navy Earth System Prediction Capability (ESPC) program will provide a more accurate, longer range, global ocean and atmospheric forecast system for decision support to DoD Maritime Operations through the development of an integrated, coupled atmosphere, ocean, sea ice, land and near-space prediction system with improved deterministic and probabilistic skill over the current operational modeling suite. It will result in increased accuracy for lead times of 1-30 days as well as a new capability for accurate forecasts in the Arctic at all lead times. Additionally it will seek to develop more computationally efficient environmental prediction for emerging architectures and provide Navy R&D support to the National ESPC.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)	3.891	2.521	3.872	-	3.872
Articles:	-	-	-	-	-
FY 2014 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 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. Continued 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 systems. Continue to develop METOC and GI&S fusion algorithms and demonstrate capabilities. Develop METOC Decision Support & Prediction Tools to improve Electromagnetic and Electro-optical (EM/EO) systems performance.					
FY 2016 Base 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					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
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 fusion algorithms and demonstrate capabilities. Continue to develop METOC Decision Support & Prediction Tools to improve EM/EO system performance. Accelerate the development of the higher resolution global and small scale ocean forecasting systems with 4 dimensional variational data assimilation. ***FY 2016 OCO Plans:*** N/A					
Title: Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities	2.170	0.642	2.278	-	2.278
Articles:	-	-	-	-	-
FY 2014 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 DMSP satellite data. Continued assimilation of Meteorological satellite data from other Federal non-DOD, commercial, and foreign earth observing satellite systems. Continued preparation to ingest data from Joint Polar Satellite System (JPSS) program satellites. Began research and development of data processing and data assimilation algorithms for the Geostationary Operational Environmental Satellite (GOES) program. ***FY 2015 Plans:*** Preparation to ingest data from earth observing satellite systems, specifically Sentinel launches. Begin research and development of data processing and data assimilation algorithms for the GOES-R launch. ***FY 2016 Base Plans:*** Preparation to ingest data from earth observing satellite systems, Geostationary Operational Environmental Satellite R-Series (GOES-R), and Global Change Observation Mission (GCOM) W-2 sensors. Begin research and development of data processing and data assimilation algorithms for the Joint Polar Satellite System-1 (JPSS-1), Free-Flyer, GOES-S, Earthcare, and OceanSat-3 launches scheduled in FY17. ***FY 2016 OCO Plans:*** N/A					
Title: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)	3.881	1.774	2.018	-	2.018
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
FY 2014 Accomplishments: Continued 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. Verified, validated and transitioned this software technology through the Oceanographic and Atmospheric Master Library (OAML). Continued to refine and validate USW-related performance surface and decision support software applications for use afloat and at ASW RBCs to determine appropriate tactical Courses of Action (COAs) in ASW. Continued population/upgrade of oceanographic, acoustic and geoacoustic databases in COCOM areas of interest. Began developing Maritime Patrol & Reconnaissance Aircraft (MPRA) 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. Transitioned software algorithms that capture and communicate variability and uncertainty contained in the output of underlying model and database components of ASW Tactical Decision Aids (TDAs). Expanded capabilities and increased access speed of acoustic surface scattering and loss modules. Continued 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. Continued to develop and transition the environmental software components of Mine Warfare (MIW) TDAs in use by the U.S. Navy's MIW Forces and Naval Oceanography enterprise (NOe) personnel supporting them. Provided technical support to the NAVOCEANO in updating geoacoustic bottom loss & scatter data bases for sonar performance predictions. Began to design, develop, demonstrate and transition a geospatially-enabled global ocean observing system database through the Ocean Observing System (OOS) designed to characterize national and international ocean observatories locations, sensor grid capabilities and mitigations to address potential U.S. submarine security vulnerabilities. Conducted 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 Oceanographic and 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					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
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 & scatter data bases for sonar performance predictions. Continue to design, develop, demonstrate and transition a geospatially-enabled global ocean observing system database through the Ocean Observing System (OOS) designed to characterize national and international ocean observatories locations, sensor grid capabilities and mitigations to address potential U.S. submarine security vulnerabilities. ***FY 2016 Base 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 Oceanographic and Atmospheric Master Library (OAML). Continue population/upgrade of oceanographic, acoustic and geoacoustic databases in COCOM areas of interest. Complete development of Maritime Patrol & Reconnaissance Aircraft (MPRA) 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). Restart efforts to increase access speed of acoustic surface scattering and loss modules for ASW applications. Continue to develop and transition the environmental software components of Mine Warfare (MIW) TDAs in use by the U.S. Navy's MIW Forces and Naval Oceanography enterprise (NOe) personnel supporting them. Conduct additional proof-of-concept at-sea demonstrations of emerging Unmanned Undersea Vehicle (UUV) and Unmanned Surface Vehicle (USV) technologies designed to collect environmental data based on feedback received on FY14 at-sea demonstration results. ***FY 2016 OCO Plans:*** N/A					
Title: Earth System Prediction Capability (ESPC)	4.791	7.645	8.192	-	8.192
Articles:	-	-	-	-	-
Description: Funding increased from FY 2014 to FY 2015 due to an increased effort to fully develop the prototype system based on initial progress in 2013-2014. This increase will be applied to full system testing and operational cycling for future capability to predict the coupled global air-ocean-wave-land-sea ice system to 30					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
day lead times at eddy-resolving spatial scales in a computationally efficient, massively parallel architecture towards real-time operational environmental prediction. ***FY 2014 Accomplishments:*** - 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. - 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. ***FY 2016 Base Plans:*** - Continue all efforts from FY2015, less those noted as complete. - Complete development of a greatly more efficient computational architecture to allow for real-time operational prediction. - Continue science workshops and benchmark testing.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- 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, NSF and DOE. - Continue improved scalability and computational performance of a fully coupled global atmosphere / wave / ocean / land / sea ice prediction system providing daily predictions out to 16 days and weekly predictions out to 30-90 days. - Continue improved DoD decision support for 30-180 Day lead times. - Initiate high resolution and high fidelity Regional Arctic Prediction System development for improved decision support to maritime operations for 0-7 days as well as monthly and seasonal outlooks - Initiate improvements to automated ship routing guidance for safety and energy efficiency at 0-7 day lead times. ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	14.733	12.582	16.360	-	16.360

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
• OPN/4226: *METEOROLOGICAL EQUIPMENT*	19.118	12.825	15.090	-	15.090	13.397	12.992	13.342	13.132	Continuing	Continuing
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	2.542	1.224	3.379	-	3.379	0.923	1.356	1.939	1.980	Continuing	Continuing
• RDTEN/0603207N/2341: *METOC DATA ACQUISITION*	6.146	2.518	3.763	-	3.763	4.797	5.321	5.211	5.315	Continuing	Continuing
• RDTEN/0604218N/2346: *METOC SENSOR ENGINEERING*	1.373	0.940	1.136	-	1.136	1.233	1.244	1.253	1.280	Continuing	Continuing
• RDTEN/0305160N/0524: *NAVY METOC SUPPORT (SPACE)*	0.726	0.359	0.599	-	0.599	0.670	0.680	0.677	0.691	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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*

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 associated 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 Navy 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.

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 deterministic and ensemble prediction system that significantly improves skill over the current modeling suite. Additionally develop a common modeling architecture to improve cross-Agency collaboration, and greatly more efficient environmental modelling and computational architectures to allow for real-time operational prediction at skill levels comparable to any international peer competitor for 0-30 day global operational planning.

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
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*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	WR	NRL : Washington DC	115.891	3.216	Nov 2013	2.046	Nov 2014	3.143	Nov 2015	-		3.143	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	WR	SSCs : California, South Carolina	2.272	-		-		-		-		-	-	2.272	-
METOC Future Mission Capabilities	Various	Various : Various	41.183	-		-		-		-		-	-	41.183	-
METOC Future Mission Capabilities	C/FP	Univ. S. Miss. : Mississippi	2.413	-		-		-		-		-	-	2.413	-
METOC Space-Based Sensing Capabilities	WR	NRL : Washington, DC	9.757	1.870	Nov 2013	0.542	Nov 2014	1.923	Nov 2015	-		1.923	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	WR	NRL : Washington, DC	5.222	2.066	Nov 2013	0.809	Nov 2014	0.920	Nov 2015	-		0.920	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	University of Texas : TX	0.800	-		-		-		-		-	-	0.800	-
Tactical Oceanography Capabilities / Undersea Warfare	WR	NSWC Carderock : West Bethesda, MD	0.950	0.685	Feb 2014	0.365	Nov 2014	0.415	Nov 2015	-		0.415	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	WR	NAVOCEANO : Mississippi	0.549	-		-		-		-		-	-	0.549	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	University of Washington : Seattle, WA	0.450	0.180	Feb 2014	0.095	Dec 2014	0.108	Dec 2015	-		0.108	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Johns Hopkins University : MD	0.160	0.150	Dec 2013	0.080	Dec 2014	0.091	Dec 2015	-		0.091	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SAIC/QNA : Various	0.975	0.515	Nov 2013	0.275	Jan 2015	0.313	Nov 2015	-		0.313	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	SAIC/QNA : Various	1.000	0.575	Dec 2013	0.400	Feb 2015	0.614	Dec 2015	-		0.614	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
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*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	C/FP	Johns Hopkins University : MD	0.200	-		-		-		-		-	-	0.200	-
Earth Systems Prediction Capability (ONR)	WR	NRL : Washington DC	2.048	3.835	Oct 2013	5.000	Oct 2014	5.000	Oct 2015	-		5.000	Continuing	Continuing	Continuing
ESPC	Various	Various : Various	0.609	0.756	Oct 2013	2.195	Oct 2014	2.692	Oct 2015	-		2.692	Continuing	Continuing	Continuing
		Subtotal	184.479	13.848		11.807		15.219		-		15.219	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	C/CPIF	SSA/CSC : MISC	0.295	-		-		-		-		-	-	0.295	-
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	C/FP	SAIC : Virginia	0.473	-		-		-		-		-	-	0.473	-
METOC Future Mission Capabilities	C/FP	SAIC : Virginia	0.400	0.100	Nov 2013	0.075	Nov 2014	0.115	Nov 2015	-		0.115	Continuing	Continuing	Continuing
Program Support and Subject Matter Expertise	Various	UW-APL : Seattle, WA	0.000	0.200	Oct 2013	0.450	Oct 2014	0.500	Oct 2015	-		0.500	-	1.150	-
		Subtotal	1.168	0.300		0.525		0.615		-		0.615	-	-	-

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Not Specified : Not Specified	0.090	-		-		-		-		-	-	0.090	-
METOC Space-Based Sensing Capabilities	C/FP	BAH : Virginia	0.850	0.125	Nov 2013	0.040	Nov 2014	0.142	Nov 2015	-		0.142	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
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*	

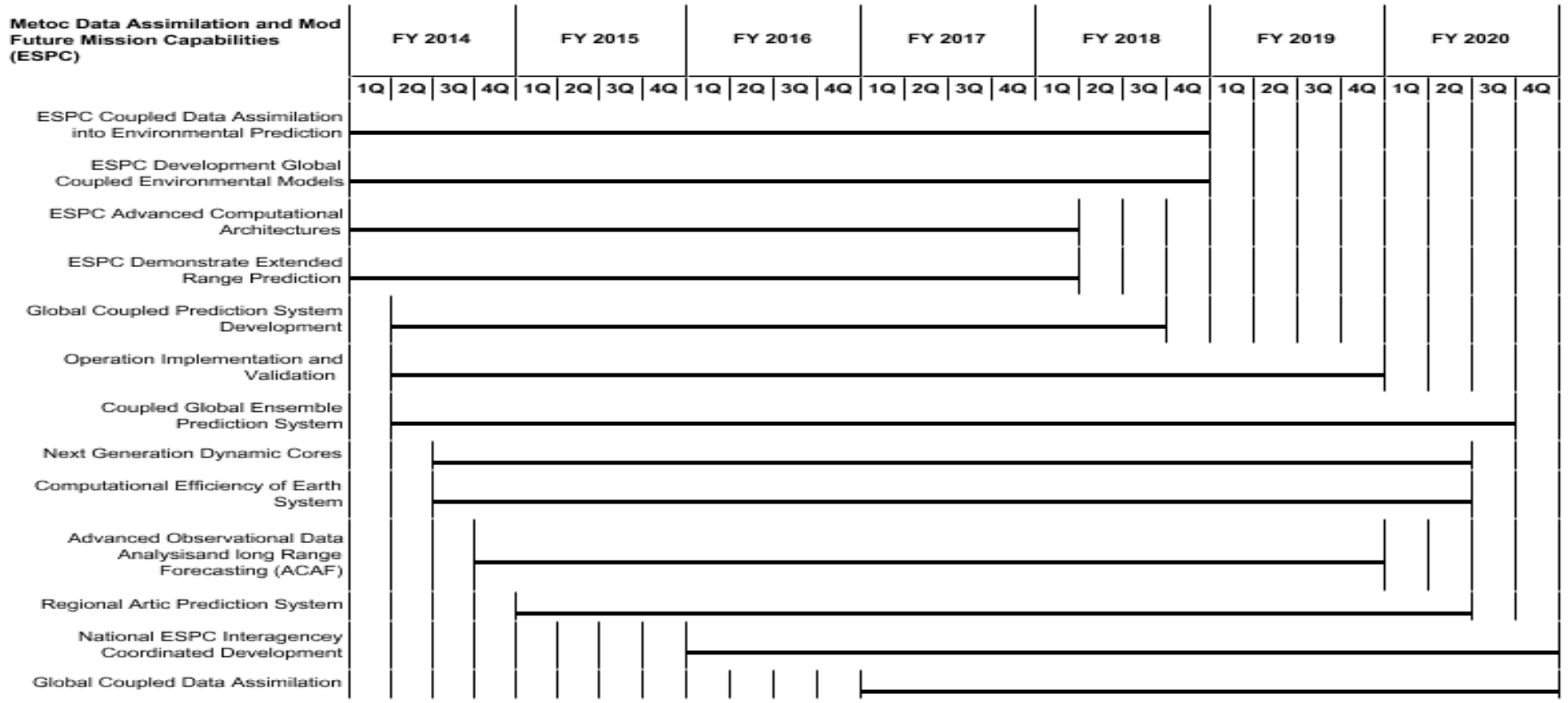
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Tactical Oceanography Capabilities / Undersea Warfare	WR	SSC PAC : San Diego, CA	0.540	0.285	Nov 2013	0.150	Nov 2014	0.171	Nov 2015	-		0.171	Continuing	Continuing	Continuing
METOC Space-Based Sensing Capabilities	WR	SSC PAC : San Diego, CA	0.200	0.175	Nov 2013	0.060	Nov 2014	0.213	Nov 2015	-		0.213	Continuing	Continuing	Continuing
		Subtotal	1.680	0.585		0.250		0.526		-		0.526	-	-	-

	Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	187.327	14.733		12.582		16.360		-		16.360	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
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*



2016DON - 0603207N - 2342.S14

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Future Mission Capabilities (FMC)				
METOC FMC: Data Assimilation Into Coupled Prediction Systems:	1	2014	4	2020
METOC FMC: Develop Oceanographic and Atmospheric Forecast Models:	1	2014	4	2020
METOC FMC: Oceanographic and Atmospheric Forecast Model Data Assimilation:	1	2014	4	2017
METOC FMC: Decision Support & Performance Prediction Tools:	1	2015	4	2020
METOC FMC: Accelerate Development of Ocean Forecast Systems:	1	2016	4	2018
METOC Space-Based Sensing Capabilities				
NPP/JPSS: Dev. NPP/JPSS Data Algorithims: FY14	1	2014	4	2014
NPP/JPSS: Dev. NPP/JPSS Data Algorithims: FY16-FY20	1	2016	4	2020
NPP/JPSS: Dev. NPP/JPSS Data Algorithims: JPSS-1 Launch	3	2017	3	2017
METOP: Dev. METOP Data Algorithims: FY14	1	2014	4	2014
METOP: Dev. METOP Data Algorithims: FY16-FY20	1	2016	4	2020
METOP: Dev. METOP Data Algorithims: METOP-C Launch	3	2018	3	2018
METEOSAT: Dev. METEOSAT Data Algorithims: FY14	1	2014	4	2014
METEOSAT: Dev. METEOSAT Data Algorithims: FY16-FY20	1	2016	4	2020
METEOSAT: Dev. METEOSAT Data Algorithims: MTG-I1 Launch	3	2019	3	2019
GOES: Dev. GOES Algorithims:	1	2014	4	2020
GOES: Dev. GOES Algorithims: GOES-R Launch	1	2016	1	2016
GOES: Dev. GOES Algorithims: GOES-S Launch	2	2017	2	2017
GOES: Dev. GOES Algorithims: GOES-T Launch	2	2019	2	2019
GCOM: Dev. GCOM: FY14	1	2014	4	2014
GCOM: Dev. GCOM: FY16-FY20	1	2016	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GCOM: Dev. GCOM: GCOM-W2 Launch	3	2016	3	2016
GCOM: Dev. GCOM: GCOM-W3 Launch	3	2020	3	2020
Jason: Dev. Jason Algorithims: FY14	1	2014	4	2014
Jason: Dev. Jason Algorithims: FY16-FY20	1	2016	4	2020
Jason: Dev. Jason Algorithims: JASON-CS-A Launch	1	2018	1	2018
Sentinel: Dev. Sentinel Data Algorithims:	1	2014	4	2020
Sentinel: Dev. Sentinel Data Algorithims: Sentinel 3A Launch	3	2015	3	2015
Sentinel: Dev. Sentinel Data Algorithims: Sentinal 3B Launch	3	2015	3	2015
EarthCare: Dev. EarthCARE Data Algorithms:	1	2017	4	2020
EarthCare: Dev. EarthCARE Data Algorithms: EarthCARE Launch	3	2017	3	2017
Cosmic: Dev. Cosmic Data Algorithms:	1	2016	4	2020
Cosmic: Dev. Cosmic Data Algorithms: COSMIC-2 (7-12) Launch	3	2018	3	2018
OceanSat: Dev. OceanSat Data Algorithms:	1	2016	4	2020
OceanSat: Dev. OceanSat Data Algorithms: OceanSat-3 Launch	3	2017	3	2017
INSAT: DEV. INSAT Data Algorithms: FY16-FY20	1	2016	4	2020
GEO-KOMPSA: Dev. GEO-KOMPSAT Data Algorithms:	1	2016	4	2020
GEO-KOMPSA: Dev. GEO-KOMPSAT Data Algorithms: GEO-KOMSAT-2A Launch	1	2018	1	2018
GEO-KOMPSA: Dev. GEO-KOMPSAT Data Algorithms: GEO-KOMSAT-2B Launch	4	2018	4	2018
DMSP: Dev. DMSP Data Algorithms: FY14	1	2014	4	2014
DMSP: Dev. DMSP Data Algorithms: FY6-FY20	1	2016	4	2020
DMSP: Dev. DMSP Data Algorithms: DMSP-19 Launch	2	2014	2	2014
DMSP: Dev. DMSP Data Algorithms: DMSP-20 Launch	1	2020	1	2020
Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)				
Asset Allocation & Mission Planning: FY14	1	2014	4	2014
Asset Allocation & Mission Planning: FY16-18	1	2016	4	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Asset Allocation & Mission Planning: ASW TDA Delivery: ASW TDA Delivery	4	2014	4	2014
Asset Allocation & Mission Planning: ASW RBC Delivery: ASW RBC Delivery 1	4	2016	4	2016
Asset Allocation & Mission Planning: ASW RBC Delivery: ASW RBC Delivery 2	4	2017	4	2017
Asset Allocation & Mission Planning: ASW RBC Delivery: ASW RBC Delivery 3	4	2018	4	2018
Acoustic Performance Surface Toolset:	1	2014	4	2014
Acoustic Performance Surface Toolset: NEXGEN Stochastic Bond Tier II/III Acoustic Toolsets: NEXGEN Stochastic Bond Tier II/III Acoustic Toolset 1	4	2014	4	2014
Acoustic Model Upgrades:	1	2014	4	2020
Acoustic Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrade 1	3	2014	3	2014
Acoustic Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrade 2	1	2016	1	2016
Acoustic Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrade 3	4	2017	4	2017
Acoustic Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrade 4	4	2018	4	2018
Acoustic Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrade 5	4	2019	4	2019
Acoustic Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrade 6	4	2020	4	2020
Descriptive Dynamic Oceanography Assessment Tool:	1	2014	4	2020
Descriptive Dynamic Oceanography Assessment Tool: NEXGEn ASW RBC GIS Toolset	1	2017	1	2017
Descriptive Dynamic Oceanography Assessment Tool: Schedule Detail	4	2018	4	2018
Descriptive Dynamic Oceanography Assessment Tool: NEXGEN ASW RBC GIS TOOLSET: NEXGEN ASW RBC GIS TOOLSET 1	2	2017	2	2017
Descriptive Dynamic Oceanography Assessment Tool: NEXGEN ASW RBC GIS TOOLSET: NEXGEN ASW RBC GIS TOOLSET 2	4	2018	4	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Descriptive Dynamic Oceanography Assessment Tool: NEXGEN ASW RBC GIS TOOLSET: NEXGEN ASW RBC GIS TOOLSET 3	4	2020	4	2020
STAPLE Upgrades:	1	2014	4	2020
STAPLE Upgrades: STAPLE Delivery 8	4	2014	4	2014
STAPLE Upgrades: STAPLE Delivery 9	4	2015	4	2015
STAPLE Upgrades: STAPLE Delivery 10	4	2016	4	2016
STAPLE Upgrades: STAPLE Delivery 11	4	2017	4	2017
STAPLE Upgrades: STAPLE Delivery 12	4	2018	4	2018
STAPLE Upgrades: STAPLE Delivery 13	4	2019	4	2019
STAPLE Upgrades: STAPLE Delivery 14	4	2020	4	2020
Boundary Interaction Algorithims: FY14	1	2014	4	2014
Boundary Interaction Algorithims: FY16-18	1	2016	1	2018
Boundary Interaction Algorithims: TOTLOSS/SCATTER Algorithm Delivery	4	2014	4	2014
Boundary Interaction Algorithims: TOTLOSS/SCATTER Algorithm Delivery 2	2	2016	2	2016
Boundary Interaction Algorithims: TOTLOSS/SCATTER Algorithm Delivery 3	4	2018	4	2018
Boundary Interaction Algorithims: TOTLOSS Algorithm	4	2014	4	2014
Boundary Interaction Algorithims: TOTLOSS Algorithm 2	2	2016	2	2016
Boundary Interaction Algorithims: TOTLOSS Algorithm 3	4	2018	4	2018
Boundary Interaction Algorithims: SESSS Algorithm Upgrade	2	2014	2	2014
Boundary Interaction Algorithims: Bioacoustic Volume Attenuation and Scatter Efforts:	1	2014	4	2014
Boundary Interaction Algorithims: Bioacoustic Volume Attenuation and Scatter Efforts: Documentation Delivery	2	2014	2	2014
Boundary Interaction Algorithims: Bioacoustic Volume Attenuation and Scatter Efforts: VSS Database Upgrade	4	2014	4	2014
SME Support to NAVOCEANO Bottom Loss Database Upgrades:	1	2014	4	2015

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SME Support to NAVOCEANO Bottom Loss Database Upgrades: HFBL Horizontal Variability	1	2015	1	2015
SME Support to NAVOCEANO Bottom Loss Database Upgrades: SUS Replacement Technology	3	2015	3	2015
MIW TDA Support:	1	2014	4	2019
MIW TDA Support: EPMA Build 6	4	2014	4	2014
MIW TDA Support: EPMA-NSMA Integration 1	4	2016	4	2016
MIW TDA Support: EPMA-NSMA Integration 2	4	2018	4	2018
MIW TDA Support: EPMA-NSMA Integration 3	4	2019	4	2019
MIW TDA Support: TODS Components 2	4	2014	4	2014
MIW TDA Support: TODS Components 3	4	2015	4	2015
MIW TDA Support: NEXGEN MIW Environmental Application	4	2015	4	2015
Ocean Observing System Security Group Database:	1	2014	4	2015
Ocean Observing System Security Group Database: OOSSG Database Delivery #1	4	2015	4	2015
Active & Passive Model-Data V&V:	1	2014	4	2020
Active & Passive Model-Data V&V: Active ASW R&A 1	4	2014	4	2014
Active & Passive Model-Data V&V: Active ASW R&A 2	4	2015	4	2015
Active & Passive Model-Data V&V: Active ASW R&A 3	4	2016	4	2016
Active & Passive Model-Data V&V: Active ASW R&A 4	4	2017	4	2017
Active & Passive Model-Data V&V: Active ASW R&A 5	4	2018	4	2018
Active & Passive Model-Data V&V: Active ASW R&A 6	4	2019	4	2019
Active & Passive Model-Data V&V: Active ASW R&A 7	4	2020	4	2020
Through-the-Sensor Data Collection:	1	2014	4	2020
Through-the-Sensor Data Collection: P-8A Poseidon Data Collection 1	4	2014	4	2014
Through-the-Sensor Data Collection: P-8A Poseidon Data Collection 2	3	2015	3	2015
Through-the-Sensor Data Collection: P-8A Poseidon Data Collection 3	4	2016	4	2016

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Through-the-Sensor Data Collection: SSN Data Collection 1	3	2014	3	2014
Through-the-Sensor Data Collection: SSN Data Collection 2	4	2015	4	2015
Through-the-Sensor Data Collection: SSN Data Collection 3	3	2016	3	2016
Through-the-Sensor Data Collection: SSN Data Collection 4	4	2017	4	2017
Through-the-Sensor Data Collection: SSN Data Collection 5	4	2018	4	2018
Through-the-Sensor Data Collection: SSN Data Collection 6	4	2019	4	2019
Through-the-Sensor Data Collection: SSN Data Collection 7	4	2020	4	2020
UUV-USV At-Sea Experimentation: FY14	1	2014	4	2014
UUV-USV At-Sea Experimentation: FY16-17	1	2016	4	2017
UUV-USV At-Sea Experimentation: Sea Test 1	3	2014	3	2014
UUV-USV At-Sea Experimentation: Sea Test 2	3	2016	3	2016
UUV-USV At-Sea Experimentation: Sea Test 3	4	2017	4	2017
Metoc Data Assimilation and Mod Future Mission Capabilities (ESPC)				
ESPC Coupled Data Assimilation into Environmental Prediction:	1	2014	4	2018
ESPC Development Global Coupled Environmental Models:	1	2014	4	2018
ESPC Advanced Computational Architectures: Schedule Detail	1	2014	1	2018
ESPC Demonstrate Extended Range Prediction: Schedule Detail	1	2014	1	2018
Global Coupled Prediction System Development: Schedule Detail	2	2014	3	2018
Operation Implementation and Validation: Schedule Detail	2	2014	4	2019
Coupled Global Ensemble Prediction System: Schedule Detail	2	2014	3	2020
Next Generation Dynamic Cores: Schedule Detail	3	2014	2	2020
Computational Efficiency of Earth System: Schedule Detail	3	2014	2	2020
Advanced Observational Data Analysisand long Range Forecasting (ACAF): Schedule Detail	4	2014	4	2019
Regional Artic Prediction System: Schedule Detail	1	2015	2	2020
National ESPC Interagencey Coordinated Development: Schedule Detail	1	2016	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Global Coupled Data Assimilation: Schedule Detail	1	2017	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2343: *Tactical METOC Applications*	126.540	8.908	9.124	13.260	-	13.260	14.642	15.517	15.400	15.715	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 2016 request provides for Fleet Capability Release (FCR)-2 test events, finalize documentation and plan/begin the development efforts for FCR-3.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Naval Integrated Tactical Environmental System Next Generation (NITES-Next)	8.908	9.124	13.260	-	13.260
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
FY 2014 Accomplishments: Conducted System Integration Tests (SIT) #1 and #2, System Qualification Test (SQT), lab Developmental Test and Evaluation (DT&E), Fielding Technical Review (FTR), and User Assessment (UA) for Fleet Capability Release (FCR)-1. Obtained interim authority to test (IATT) for live network testing. Completed draft and initiated routing of Navy Training System Plan (NTSP). Completed installation and System Operational Verification Test (SOVT) of FCR-1. Completed shipboard DT&E of FCR-1. Planned the FCR-2 development activities. Awarded task order and started development, integration, and testing of FCR-2. Completed Risk Assessment Level of test (RALOT) for FCR-2 and beyond. ***FY 2015 Plans:*** Conduct Operational Test Readiness Review (OTRR) with the System Engineering Technical Review (SETR) board, and the Milestone Decision Authority (MDA). Conduct Initial Operational Test and Evaluation (IOT&E) in support of FCR-1 Fielding Decision (FD). Complete Independent Logistics Assessment (ILA) for FCR-1. Obtain authority to operate (ATO) for FCR-1. Begin sustainment of FCR-1 software. Conduct FCR-1 FD with the MDA and achieve Initial Operational Capability (IOC). Conduct the SETR Build Technical Review (BTR) in support of FCR-2. Conduct the Build Decision (BD) for FCR-2. Continue developing, integrating, and testing FCR-2 software. Begin documentation, and preparation (including Requirements Definition Package (RDP), Technology Readiness Assessment (TRA) Addendum 2, Cost Analysis Requirements Description (CARD), Acquisition Strategy (AS), and Acquisition Program Baseline (APB)) for FCR-3. Begin planning for contract actions in support of FCR-3. Continue planning contract in support of FCR-3. Plan for SIT and SQT for FCR-2. ***FY 2016 Base Plans:*** Conduct SIT #1, SIT #2, SQT, UA, and DT&E for FCR-2. Participate in the Consolidated Afloat Network and Enterprise Services (CANES) Application Integration (AI) SIT event. Update the NTSP and ILA for FCR-2. Receive ATO for FCR-2. Finalize documentation (including RDP, TRA Addendum 2, CARD, AS and APB) for FCR-3. Plan the FCR-3 development activities. Award task order and start development of FCR-3. Conduct the BTR for FCR-3 and prepare for the FCR-3 BD. Plan and prepare for integration into the Navy Tactical Cloud Reference Implementation (NTCRI). ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	8.908	9.124	13.260	-	13.260

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

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 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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2343 / *Tactical METOC Applications*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NITES/NITES-Next	WR	NRL : Washington, DC	3.893	-		-		-		-		-	-	3.893	-
NITES/NITES-Next	WR	SSCs : California, South Carolina	8.673	-		-		-		-		-	-	8.673	-
NITES/NITES-Next	Various	Various : Various	5.775	-		-		-		-		-	-	5.775	-
NITES	Various	Various : Various	61.400	-		-		-		-		-	-	61.400	-
NITES-Next	C/CPIF	GD-IT : Virginia	25.551	-		-		-		-		-	-	25.551	-
NITES-Next	WR	NAVOCEANO : Mississippi	0.125	-		-		-		-		-	-	0.125	-
NITES-Next	WR	SSC Pacific : San Diego, CA	8.442	3.767	Nov 2013	4.441	Nov 2014	6.422	Nov 2015	-		6.422	Continuing	Continuing	Continuing
NITES-Next	C/FP	SAIC : Virginia	2.580	1.406	Nov 2013	1.445	Jan 2015	2.110	Nov 2015	-		2.110	Continuing	Continuing	Continuing
NITES-Next	C/FP	FSI : San Diego, CA	5.600	-		-		-		-		-	-	5.600	-
NITES-Next	WR	SSC Atlantic : South Carolina	0.200	-		-		-		-		-	-	0.200	-
NITES-Next	C/FP	GDIT : Virginia	0.000	3.000	Aug 2014	2.493	Mar 2015	3.640	Feb 2016	-		3.640	Continuing	Continuing	Continuing
		Subtotal	122.239	8.173		8.379		12.172		-		12.172	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Cost	C/CPIF	IPD : Various	0.595	-		-		-		-		-	-	0.595	-
NITES-Next	C/FP	SAIC : Virginia	2.400	0.335	Nov 2013	0.345	Jan 2015	0.504	Nov 2015	-		0.504	Continuing	Continuing	Continuing
NITES-Next	C/FP	NAVAIR : Maryland	0.125	-		-		-		-		-	-	0.125	-
NITES-Next	C/FP	COMOPTEVFOR : Norfolk, VA	0.000	-		-		-		-		-	-	-	-
		Subtotal	3.120	0.335		0.345		0.504		-		0.504	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Various : Various	0.031	-		-		-		-		-	-	0.031	-
NITES-Next	WR	SSC Pacific : San Diego, CA	0.350	0.250	Nov 2013	0.250	Nov 2014	0.365	Nov 2015	-		0.365	Continuing	Continuing	Continuing
NITES-Next	C/FP	BAH : Virgina	0.800	0.150	Nov 2013	0.150	Nov 2014	0.219	Nov 2015	-		0.219	Continuing	Continuing	Continuing
		Subtotal	1.181	0.400		0.400		0.584		-		0.584	-	-	-

	Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	126.540	8.908		9.124		13.260		-		13.260	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

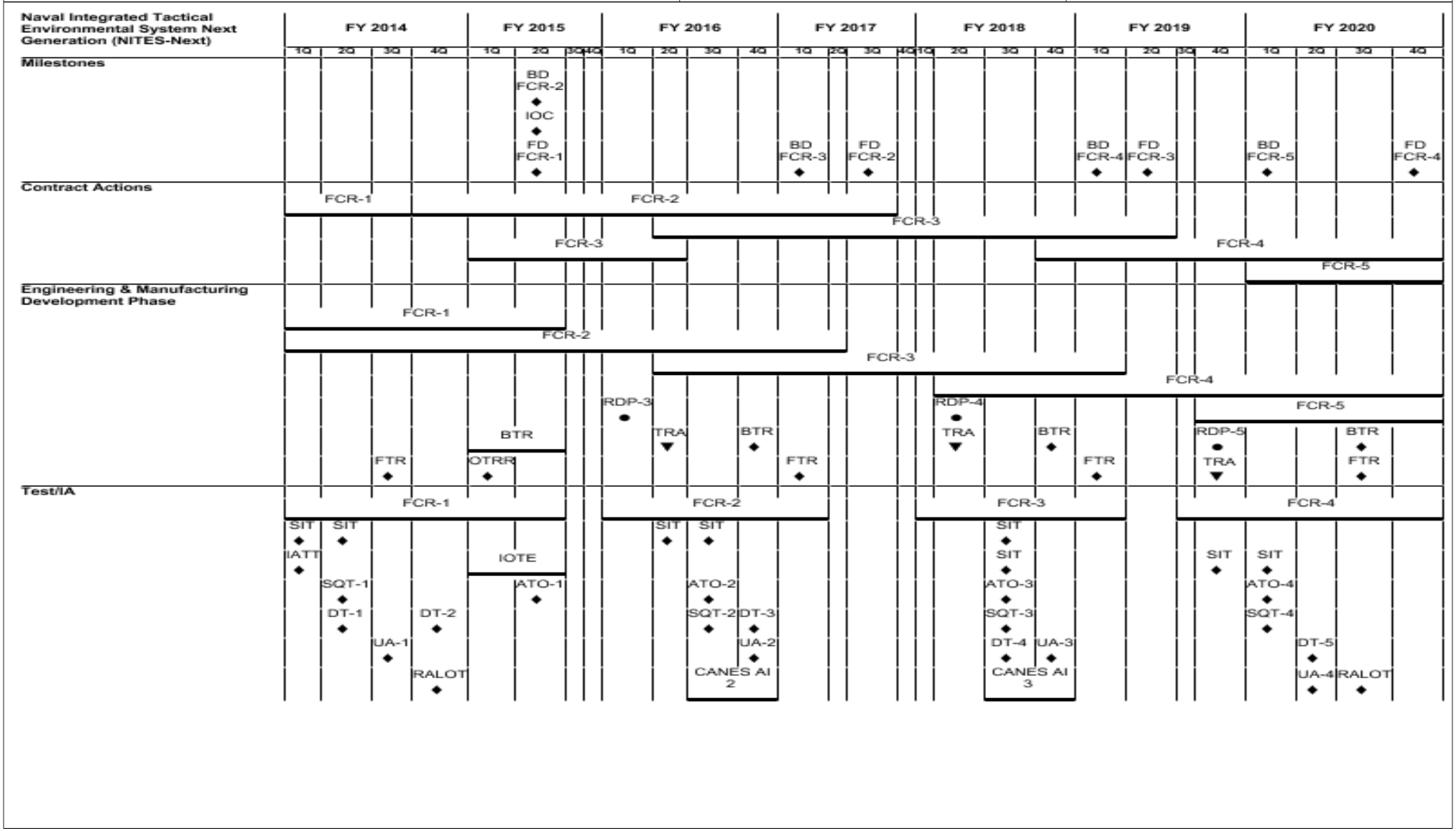


Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

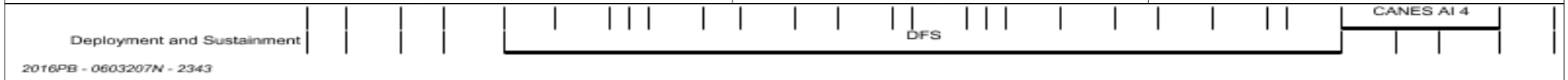


Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Naval Integrated Tactical Environmental System Next Generation (NITES-Next)				
Milestones: Build Decision Fleet Capability Release - 2	1	2015	2	2015
Milestones: Initial Operational Capability	2	2015	2	2015
Milestones: Fielding Decision Fleet Capability Release - 1	2	2015	2	2015
Milestones: Build Decision Fleet Capability Release - 3	1	2017	1	2017
Milestones: Fielding Decision Fleet Capability Release - 2	3	2017	3	2017
Milestones: Build Decision Fleet Capability Release - 4	1	2019	1	2019
Milestones: Fielding Decision Fleet Capability Release - 3	2	2019	2	2019
Milestones: Build Decision Fleet Capability Release - 5	1	2020	1	2020
Milestones: Fielding Decision Fleet Capability Release - 4	4	2020	4	2020
Contract Actions: FCR-1 Task Order	1	2014	3	2014
Contract Actions: FCR-2 Task Order	4	2014	3	2017
Contract Actions: FCR-3 Task Order	2	2016	2	2019
Contract Actions: FCR-3-Beyond Planning	1	2015	2	2016
Contract Actions: FCR-4 Task Order	4	2018	4	2020
Contract Actions: FCR-5 Task Order	1	2020	4	2020
Engineering & Manufacturing Development Phase: Fleet Capability Release - 1 / Train and Deploy	1	2014	2	2015
Engineering & Manufacturing Development Phase: Fleet Capability Release - 2 / Train Deploy	1	2014	2	2017
Engineering & Manufacturing Development Phase: Fleet Capability Release - 3 / Train Deploy	2	2016	1	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Engineering & Manufacturing Development Phase: Fleet Capability Release - 4 / Train and Deploy	2	2018	4	2020
Engineering & Manufacturing Development Phase: Fleet Capability Release - 5 / Train and Deploy	4	2019	4	2020
Engineering & Manufacturing Development Phase: Requirements Definition Package - 3	1	2016	1	2016
Engineering & Manufacturing Development Phase: Requirements Definition Package - 4	2	2018	2	2018
Engineering & Manufacturing Development Phase: Requirements Definition Package - 5	4	2019	4	2019
Engineering & Manufacturing Development Phase: Build Technical Review FCR-2	1	2015	2	2015
Engineering & Manufacturing Development Phase: Build Technical Review FCR-3	4	2016	4	2016
Engineering & Manufacturing Development Phase: Build Technical Review FCR-4	4	2018	4	2018
Engineering & Manufacturing Development Phase: Build Technical Review FCR-5	3	2020	3	2020
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 3	2	2016	2	2016
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 4	2	2018	2	2018
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 5	4	2019	4	2019
Engineering & Manufacturing Development Phase: Field Technical Review FCR-1	3	2014	3	2014
Engineering & Manufacturing Development Phase: Field Technical Review FCR-2	1	2017	1	2017
Engineering & Manufacturing Development Phase: Field Technical Review FCR-3	1	2019	1	2019
Engineering & Manufacturing Development Phase: Field Technical Review FCR-4	3	2020	3	2020
Engineering & Manufacturing Development Phase: Operational Test Readiness Review FCR-1	1	2015	1	2015
Test/IA: Fleet Capability Release - 1	1	2014	2	2015

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Test/IA: Fleet Capability Release - 2	1	2016	1	2017
Test/IA: Fleet Capability Release - 3	1	2018	1	2019
Test/IA: Fleet Capability Release - 4	3	2019	4	2020
Test/IA: System Integration Test - 1 (FCR-1)	1	2014	1	2014
Test/IA: System Integration Test - 2 (FCR-1)	2	2014	2	2014
Test/IA: System Integration Test - 1 (FCR-2)	2	2016	2	2016
Test/IA: System Integration Test - 2 (FCR-2)	3	2016	3	2016
Test/IA: System Integration Test - 1 (FCR-3)	3	2018	3	2018
Test/IA: System Integration Test - 2 (FCR-3)	3	2018	3	2018
Test/IA: System Integration Test - 1 (FCR-4)	4	2019	4	2019
Test/IA: System Integration Test - 2 (FCR4)	1	2020	1	2020
Test/IA: Interim Authority to Test	1	2014	1	2014
Test/IA: Initial Operational Test and Evaluation	1	2015	2	2015
Test/IA: Authority to Operate FCR-1	2	2015	2	2015
Test/IA: Authority to Operate FCR-2	3	2016	3	2016
Test/IA: Authority to Operate FCR-3	3	2018	3	2018
Test/IA: Authority to Operate FCR-4	1	2020	1	2020
Test/IA: System Qualification Test FCR-1	2	2014	2	2014
Test/IA: System Qualification Test FCR-2	3	2016	3	2016
Test/IA: System Qualification Test FCR-3	3	2018	3	2018
Test/IA: System Qualification Test FCR-4	1	2020	1	2020
Test/IA: Developmental Test Fleet Capability Release (LAB) - FCR-1	2	2014	2	2014
Test/IA: Developmental Test Fleet Capability Release (Shipboard) FCR-1	4	2014	4	2014
Test/IA: Developmental Test Fleet Capability Release - FCR-2	4	2016	4	2016
Test/IA: Developmental Test Fleet Capability Release - FCR-3	3	2018	3	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Test/IA: Developmental Test Fleet Capability Release - FCR-4	2	2020	2	2020
Test/IA: User Assessment FCR-1	3	2014	3	2014
Test/IA: User Assessment FCR-2	4	2016	4	2016
Test/IA: User Assessment FCR-3	4	2018	4	2018
Test/IA: User Assessment FCR-4	2	2020	2	2020
Test/IA: FCR-2 Risk Assessment Level of Test	4	2014	4	2014
Test/IA: FCR-4 Risk Assessment Level of Test	3	2020	3	2020
Test/IA: CANES AI SIT FCR-2	3	2016	4	2016
Test/IA: CANES AI SIT FCR-3	3	2018	4	2018
Test/IA: CANES AI SIT FCR-4	1	2020	3	2020
Test/IA: Deployment and Sustainment: Deployment, fielding and Sustainment (OMN)	1	2015	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2344.: *Precise Time and Astrometry*	2.936	8.600	8.954	4.977	-	4.977	9.134	3.331	3.480	0.313	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 (VBLI) 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.

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

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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*

Auxilary 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.

Note: Prior to FY13, the USNO Precise Timing and Astrometry RDTEN funds were administered out of BSO 39 (SPAWAR/PMW120).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Precise Timing and Astronomy	8.600	8.954	4.977	-	4.977
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 2014 Accomplishments:
* Master Clock and Time Distribution: Two Navy Rb Fountains (NRF6 and NRF7) are now located in the Alternate Master Clock Facility and have demonstrated excellent stability. Initial Operating Capability (IOC) for AMC Rb Fountains anticipated FY14 Q4. Lab demonstration of the fiber optic cable have been successful. Critical Time Dissemination tech refresh activities are proceeding.

* Earth Orientation: Very Long Baseline Interferomtry System (VLBI) Software (SW) correlator is undergoing the final test and evaluation before achieving FOC and becoming the operational VLBI correlator at USNO. The Graphical User Interface (GUI) is now the primary method of interfacing with the SW correlator. The contract for the VLBI2010 antenna was awarded on 30 Sep 2013. Critical Design Review (CDR) for the antenna contract was completed in May 2014. Funding to cover the site preparation has been MIPRed to NASA and work is beginning on the plans for construction at the NASA site. Additional funding for the VLBI2010 signal chain has recently been MIPRed to NASA. One contract for a programmer to work on the EOP Automation was awarded in June 2014; the second contract was awarded 4Q FY14.

FY 2015 Plans:
* Final Operating Capability (FOC) for Rb Fountains at USNO Alternate Master Clock facility.
* Continue Optical Fiber timing link activities.
* Continue Critical Time Dissemination Activities.
* PDR for EOP Automation.
* Install Kokee Park radio telescope.

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
* Begin NPOI/1.8m construction activities (relocate roads, install concrete piers, fabricate and install domes and electrical services). ***FY 2016 Base Plans:*** * Demo Optical Fiber timing link in fiber network. * Lab demonstration of optical clock prototype. * Continue Critical Time Dissemination Activities. * Continue work on EOP Automation. * IOC for Kokee Park radio telescope. * Continue NPOI/1.8m construction activities (relocate roads, install concrete piers, fabricate and install domes and electrical services). ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	8.600	8.954	4.977	-	4.977

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
• OPN/0305112N/LI 8126: *Oceanography (USNO Astrometric Telescope Subsystem funds for purchase of Software Correlator*	-	-	-	-	-	-	-	-	-	-	1.156

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.

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy		Date: February 2015
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*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development (Antenna Procurement)	C/FFP	Intertronics, Inc. : Quebec, Canada	2.005	-		-		-		-		-	-	2.005	-
Primary Hardware Development (Site Prep)	MIPR	NASA/GSFC : HI	0.000	0.750	May 2014	-		-		-		-	-	0.750	-
Primary Hardware Development (Antenna Receiver Electronics)	MIPR	NASA : GSFC	0.000	1.000	Jun 2014	-		-		-		-	-	1.000	-
Primary Hardware Development for CTD (Critical Mobil Pod)	MIPR	Classified : Not Specified	0.000	-		1.500	Oct 2014	-		-		-	-	1.500	-
Primary Hardware Development for CTD (Develop Site Verification System)	C/FFP	Classified : Not Specified	0.000	-		0.550	Dec 2014	-		-		-	-	0.550	-
Primary Hardware Development for CTD (Fiber Link System)	MIPR	Classified : Not Specified	0.000	-		2.310	Mar 2015	-		-		-	-	2.310	-
Primary Hardware Development (NPOI) 1.8m Telescope Project (1)	SS/FFP	Lowell Observatory : Flagstaff, AZ	0.000	-		2.669	Oct 2014	0.482	Mar 2016	-		0.482	-	3.151	-
Primary Hardware Development (NPOI) 1.8m Telescope (2)	SS/FFP	AZ Embeded System : Not Specified	0.000	-		-		0.200	Oct 2015	-		0.200	-	0.200	-
Ancillary Hardware Development 1	Various	U.S. Naval Observatory : Washington, DC	0.210	0.057	Oct 2013	0.058	Oct 2014	0.020	Oct 2015	-		0.020	-	0.345	-
Ancillary Hardware Development 2	Various	U.S. Naval Observatory : Washington, DC	0.000	0.057	Jan 2014	0.058	Oct 2014	0.020	Jan 2016	-		0.020	-	0.135	-
Ancillary Hardware Development 3	Various	U.S. Naval Observatory : Washington, DC	0.000	0.094	Apr 2014	0.058	Apr 2015	0.021	Apr 2016	-		0.021	-	0.173	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy		Date: February 2015
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*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ancillary Hardware Development 4	Various	U.S. Naval Observatory : Washington, DC	0.000	-		0.059	Jul 2015	0.021	Jul 2016	-		0.021	-	0.080	-
Primary Hardware Development for CTD (System Integration)	C/FP	Classified : Not Specified	0.000	1.644	Sep 2014	-		0.600	Dec 2015	-		0.600	-	2.244	-
Primary Hardware Development for CTD (RF Interface)	MIPR	Classified : Not Specified	0.000	1.580	Sep 2014	-		1.000	Dec 2015	-		1.000	-	2.580	-
Primary Hardware Development for CTD (Line Interface)	MIPR	Classified : Not Specified	0.000	1.775	Sep 2014	-		0.963	Dec 2015	-		0.963	-	2.738	-
Primary Hardware Development for CTD (Reference Upgrade)	C/FFP	Symmetricom : San Jose, CA	0.000	0.200	Sep 2014	-		0.100	Jun 2016	-		0.100	-	0.300	-
Two Way Satellite Time Transfer Modernization	TBD	TBD : Not Specified	0.000	-		-		-		-		-	-	-	-
		Subtotal	2.215	7.157		7.262		3.427		-		3.427	-	20.061	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support (All PTA - Labor) 1	Allot	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.000	0.195	Oct 2013	0.195	Oct 2014	0.102	Oct 2015	-		0.102	Continuing	Continuing	Continuing
Development Support (All PTA - Labor) 2	Allot	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.196	0.195	Jan 2014	0.195	Jan 2015	0.102	Jan 2016	-		0.102	Continuing	Continuing	Continuing
Development Support (All PTA - Labor) 3	Allot	U.S. Naval Observatory (Civilian	0.196	0.195	Apr 2014	0.195	Apr 2015	0.103	Apr 2016	-		0.103	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
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*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Labor) : Washington, DC													
Development Support (All PTA - Labor) 4	Allot	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.196	0.195	Jul 2014	0.195	Jul 2015	0.103	Jul 2016	-		0.103	Continuing	Continuing	Continuing
Software Development (SW Correlator GUI)	SS/FFP	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.118	0.025	Jul 2014	-		-		-		-	-	0.143	-
Software Development (EOP Automation)	C/FFP	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.000	0.568	Jun 2014	0.602	Dec 2014	0.440	Jun 2016	-		0.440	-	1.610	-
Travel 1	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.000	0.017	Oct 2013	0.020	Dec 2014	0.005	Oct 2015	-		0.005	-	0.042	-
Travel 2	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.000	0.017	Jan 2014	0.020	Jan 2015	0.005	Jan 2016	-		0.005	-	0.042	-
Travel 3	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.015	0.018	Apr 2014	0.020	Apr 2015	0.005	Apr 2016	-		0.005	-	0.058	-
Travel 4	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.000	0.018	Jul 2014	0.020	Jul 2015	0.005	Jul 2016	-		0.005	-	0.043	-
VLBI2010 Testing and Integration	MIPR	NASA : GSFC	0.000	-		-		0.680	Jan 2016	-		0.680	-	0.680	-
		Subtotal	0.721	1.443		1.462		1.550		-		1.550	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy		Date: February 2015
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*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Management Contractor Services for Kokee Park Antenna Project	C/FFP	TBD : TBD	0.000	-		0.230	Jul 2015	-		-		-	-	0.230	-
		Subtotal	0.000	-		0.230		-		-		-	-	0.230	-

	Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.936	8.600		8.954		4.977		-		4.977	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
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*

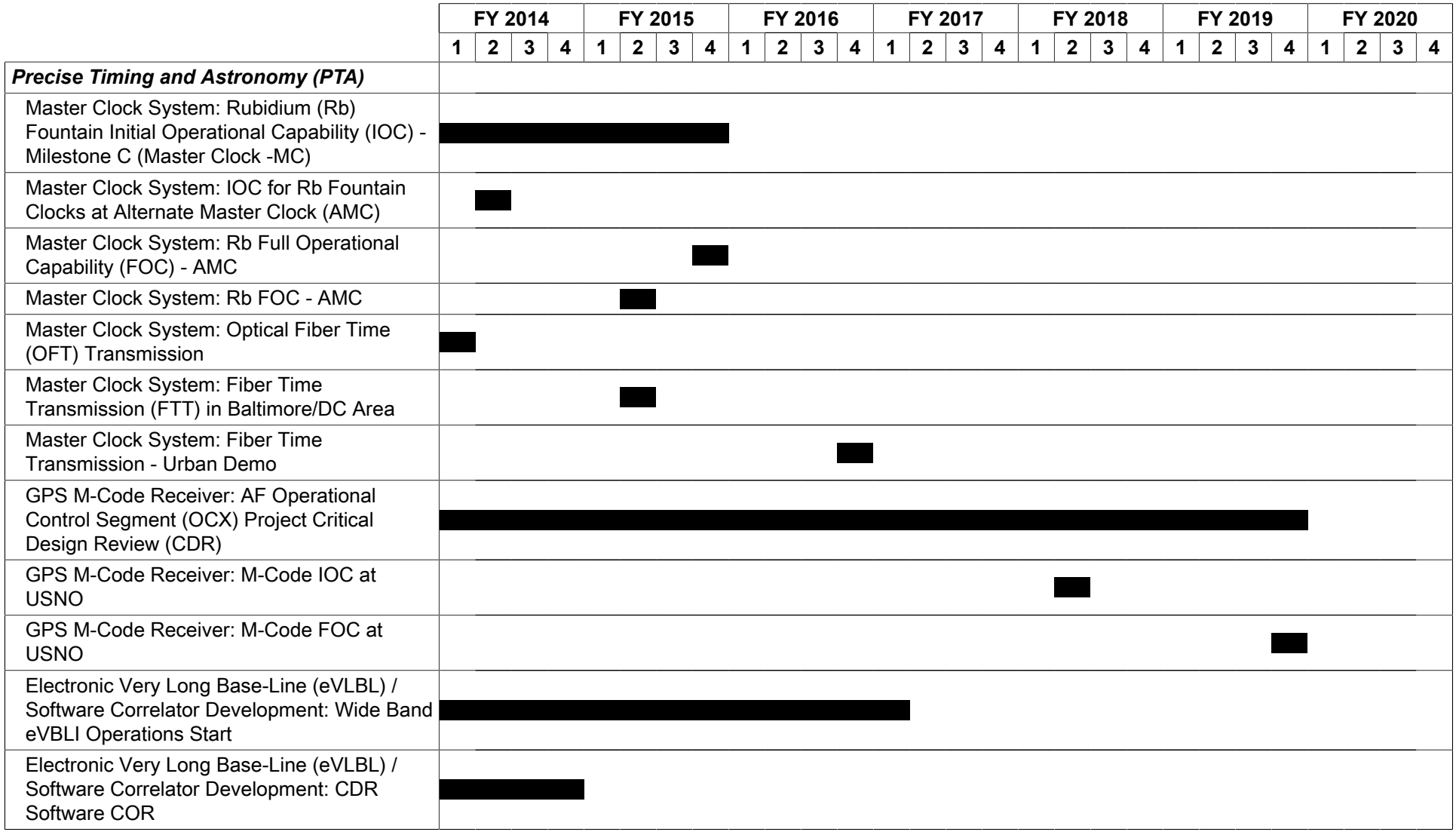


Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344. / *Precise Time and Astrometry*

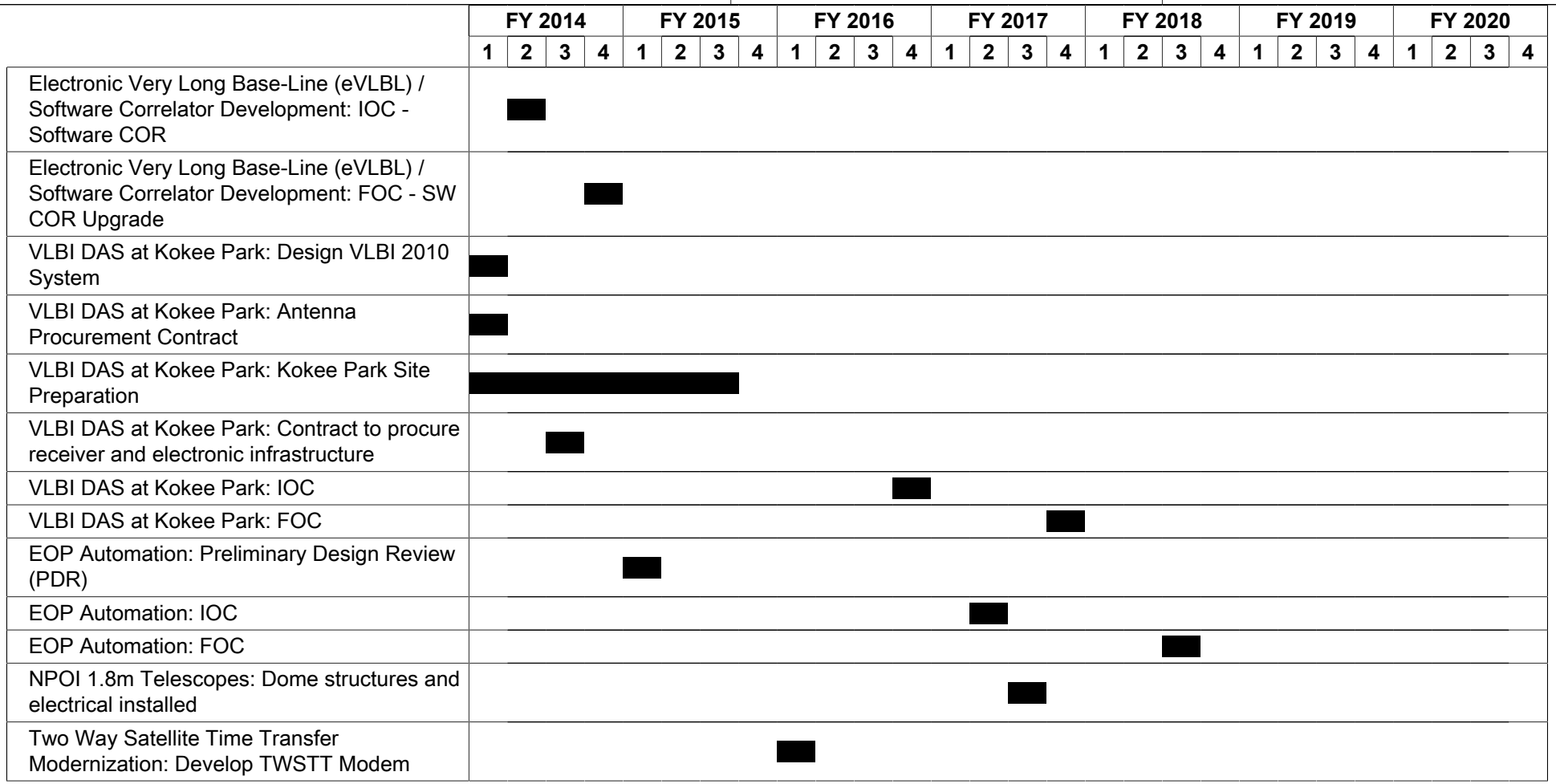


Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344. / *Precise Time and Astrometry*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Precise Timing and Astronomy (PTA)				
Master Clock System: Rubidium (Rb) Fountain Initial Operational Capability (IOC) - Milestone C (Master Clock -MC)	1	2014	4	2015
Master Clock System: IOC for Rb Fountain Clocks at Alternate Master Clock (AMC)	2	2014	2	2014
Master Clock System: Rb Full Operational Capability (FOC) - AMC	4	2015	4	2015
Master Clock System: Rb FOC - AMC	2	2015	2	2015
Master Clock System: Optical Fiber Time (OFT) Transmission	1	2014	1	2014
Master Clock System: Fiber Time Transmission (FTT) in Baltimore/DC Area	2	2015	2	2015
Master Clock System: Fiber Time Transmission - Urban Demo	4	2016	4	2016
GPS M-Code Receiver: AF Operational Control Segment (OCX) Project Critical Design Review (CDR)	1	2014	4	2019
GPS M-Code Receiver: M-Code IOC at USNO	2	2018	2	2018
GPS M-Code Receiver: M-Code FOC at USNO	4	2019	4	2019
Electronic Very Long Base-Line (eVLBL) / Software Correlator Development: Wide Band eVBLI Operations Start	1	2014	1	2017
Electronic Very Long Base-Line (eVLBL) / Software Correlator Development: CDR Software COR	1	2014	4	2014
Electronic Very Long Base-Line (eVLBL) / Software Correlator Development: IOC - Software COR	2	2014	2	2014
Electronic Very Long Base-Line (eVLBL) / Software Correlator Development: FOC - SW COR Upgrade	4	2014	4	2014
VLBI DAS at Kokee Park: Design VLBI 2010 System	1	2014	1	2014
VLBI DAS at Kokee Park: Antenna Procurement Contract	1	2014	1	2014
VLBI DAS at Kokee Park: Kokee Park Site Preparation	1	2014	3	2015

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
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*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
VLBI DAS at Kokee Park: Contract to procure receiver and electronic infrastructure	3	2014	3	2014
VLBI DAS at Kokee Park: IOC	4	2016	4	2016
VLBI DAS at Kokee Park: FOC	4	2017	4	2017
EOP Automation: Preliminary Design Review (PDR)	1	2015	1	2015
EOP Automation: IOC	2	2017	2	2017
EOP Automation: FOC	3	2018	3	2018
NPOI 1.8m Telescopes: Dome structures and electrical installed	3	2017	3	2017
Two Way Satellite Time Transfer Modernization: Develop TWSTT Modem	1	2016	1	2016

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy											Date: February 2015	
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 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
2363: *Remote Sensing Capability Development*	-	-	4.988	2.479	-	2.479	0.977	0.981	0.965	0.987	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 2016 request provides for continued target data collection for development of automated algorithms.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Remote Sensing Capability Development	-	4.988	2.479	-	2.479
Articles:	-	-	-	-	-
FY 2014 Accomplishments: 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. Develop and enhance software algorithms to automatically detect oceanographic phenomena. Integrate algorithms for access over the network. Enhance existing toolsets to provide users robust applications to assist in their daily tasks. Develop training to provide the user community education on using the different tools and applications.					
FY 2016 Base Plans: Continue data collection in various weather and sea states to broaden the range of environmental conditions and reduce uncertainty in environmental prediction. Continue to develop new algorithms to detect oceanographic phenomena using various sensor data. Continue software enhancements on algorithms to automatically detect oceanographic phenomena. Continue to integrate algorithms for access over the network. Continue to enhance existing toolsets to provide users robust applications to assist in their daily tasks. Continue evolving training to					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
provide the user community education on using the different tools and applications. Coordinate TCPED process amongst inter-agencies to support Navy Missions. Provide Navy leadership status on emerging capabilities. ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	-	4.988	2.479	-	2.479

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Remote Sensing Capability Development is being managed as a PEO Project leveraging the Rapid Development and Deployment (RDD) construct for rigor and discipline.

E. Performance Metrics

Will be developed from the requirements generation phase currently being performed.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
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*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	TBD	Unknown : Unknown	0.000	-		3.242	Feb 2015	1.604	Jan 2016	-		1.604	Continuing	Continuing	Continuing
		Subtotal	0.000	-		3.242		1.604		-		1.604	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	TBD	Unknown : Unknown	0.000	-		1.247	Feb 2015	0.625	Jan 2016	-		0.625	-	1.872	-
		Subtotal	0.000	-		1.247		0.625		-		0.625	-	1.872	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	WR	SSC PAC : San Diego, CA	0.000	-		0.250	Dec 2014	0.125	Oct 2015	-		0.125	-	0.375	-
		Subtotal	0.000	-		0.250		0.125		-		0.125	-	0.375	-

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	C/FP	BAH : Virgina	0.000	-		0.249	Feb 2015	0.125	Dec 2015	-		0.125	-	0.374	-
		Subtotal	0.000	-		0.249		0.125		-		0.125	-	0.374	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
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*	

	Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		4.988		2.479		-		2.479	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
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*

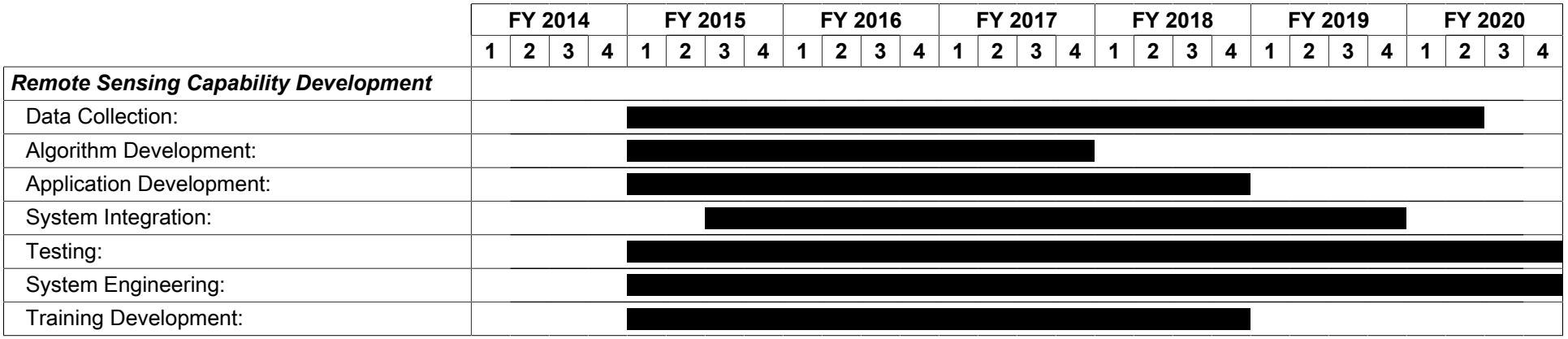


Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2363 / *Remote Sensing Capability Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Remote Sensing Capability Development				
Data Collection:	1	2015	2	2020
Algorithm Development:	1	2015	4	2017
Application Development:	1	2015	4	2018
System Integration:	3	2015	4	2019
Testing:	1	2015	4	2020
System Engineering:	1	2015	4	2020
Training Development:	1	2015	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
3207: *Fleet Synthetic Training*	2.559	2.750	2.263	0.993	-	0.993	1.011	1.033	1.055	1.076	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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, strike group and BMD platform deployment certifications.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Fleet Synthetic Training	0.867	0.600	0.993	-	0.993
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 (METOC) environmental databases for total of 10 of 14 Navy Continuous Training Environment (NCTE) exercise areas. Conducted data and architecture testing between Commander, Navy Information Dominance Forces Command (NAVIDFOR) data and the Environmental Data Cube Support system (EDCSS). Integrated environmental database hosting					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
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 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. United States Fleet Forces and United States Pacific Fleet jointly signed out the Fleet Live, Virtual, and Constructive (LVC) Training Capability Requirement on 31 Jan 2013. The document states that an integrated LVC Training Environment is essential for future force readiness. As such, physical environment efforts are required to be undertaken to meet the desired LVC end state of a seamless training environment that enables robust, realistic, and cost effective training by integrating live, virtual, and constructive training systems to support the effective and efficient generation of maritime forces in support of Combatant Commander requirements. Specifically, Live, Virtual, and Constructive simulations each have unique requirements for METOC representation, as well as their Concept of Operations (CONOPS) for its use. The EDCSS is capable of providing a single integrated METOC representation to each simulation in a manner and format uniquely suited to that platform. In addition, EDCSS is source agnostic and can provide such representations from historical reference scenarios or live operational METOC data sources. These capabilities of EDCSS have been previously developed, however their use within LVC federations, most notable NCTE, continues to be defined and as such the final technical approach, deployment and validation must still be accomplished. ***FY 2014 Accomplishments:*** Developed EDCSS production capability at NWDC. Installed hardware, software, commenced integration and began certification and accreditation procedures. Continued assessment of viability to support live virtual and contructive capability. Began work on more realistic depiction of clouds to support Full Motion Video (FMV). Concluded that using Defense Shared Resource Center (DSRC) for Modeling on demand was not a viable option. Developed Modeling on Demand capability resident in new version of Coupled Ocean/Atmosphere Mesoscale Prediction System On Scene (COAMPS-OS). ***FY 2015 Plans:*** * Complete full integration of EDCSS production capability at NWDC. * Complete COAMPS-OS Modeling on Demand. IOC estimated in Q2 FY15.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
* Continue work on FMV support. * Convert 17 year HYbrid Coordinate Ocean Model (HYCOM) database to a mineable format. ***FY 2016 Base Plans:*** * Research/implement live virtual constructive capability. * Develop support for Electromagnetic Spectrum Maneuver Warfare (EMMW) and FMV. * Develop Machine-to-Machine (M2M) capability for EDCSS interface in support of environmental product generation. ***FY 2016 OCO Plans:*** N/A					
Title: Ballistic Missile Defense (BMD) Fleet Synthetic Training (FST) at Sea	1.883	1.663	-	-	-
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 2014 Accomplishments:*** * 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. ***FY 2016 Base Plans:*** N/A ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	2.750	2.263	0.993	-	0.993

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

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) NAVIDFOR 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) NAVIDFOR 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) NAVIDFOR 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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3207 / *Fleet Synthetic Training*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NAWC TSD : Orlando, FL	0.248	-		-		-		-		-	0.248	0.496	-
		Subtotal	0.248	-		-		-		-		-	0.248	0.496	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	NRL / AER : MS / CA / VA	0.839	0.230	Nov 2013	0.600	Nov 2014	0.507	Nov 2015	-		0.507	Continuing	Continuing	Continuing
Software Development	SS/CPFF	AER / GEOCENT : VA / MS	0.864	0.640	Jan 2014	-		0.200	Jan 2016	-		0.200	Continuing	Continuing	Continuing
Configuration Management	WR	AER / GEOCENT : VA / MS	0.382	0.064	Mar 2014	-		0.201	Mar 2016	-		0.201	-	0.647	-
Studies and Analysis	Various	Various : Various	0.226	-		-		-		-		-	-	0.226	-
TCSS Development	WR	NAWC TSD : Orlando, FL	0.000	0.350	Nov 2013	0.150	Nov 2014	-		-		-	-	0.500	-
TechnologyDevelopment	C/CPFF	Alion Science & Technology : Norfolk, VA	0.000	1.216	Dec 2013	1.513	Dec 2014	-		-		-	-	2.729	-
Testing/Certification	WR	NSWC : Dahlgren, VA	0.000	0.250	Mar 2014	-		-		-		-	-	0.250	-
		Subtotal	2.311	2.750		2.263		0.908		-		0.908	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test and Evaluation	WR	NRL : Monterey, CA	0.000	-		-		0.085	Nov 2015	-		0.085	-	0.085	-
		Subtotal	0.000	-		-		0.085		-		0.085	-	0.085	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3207 / *Fleet Synthetic Training*	

	Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.559	2.750		2.263		0.993		-		0.993	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

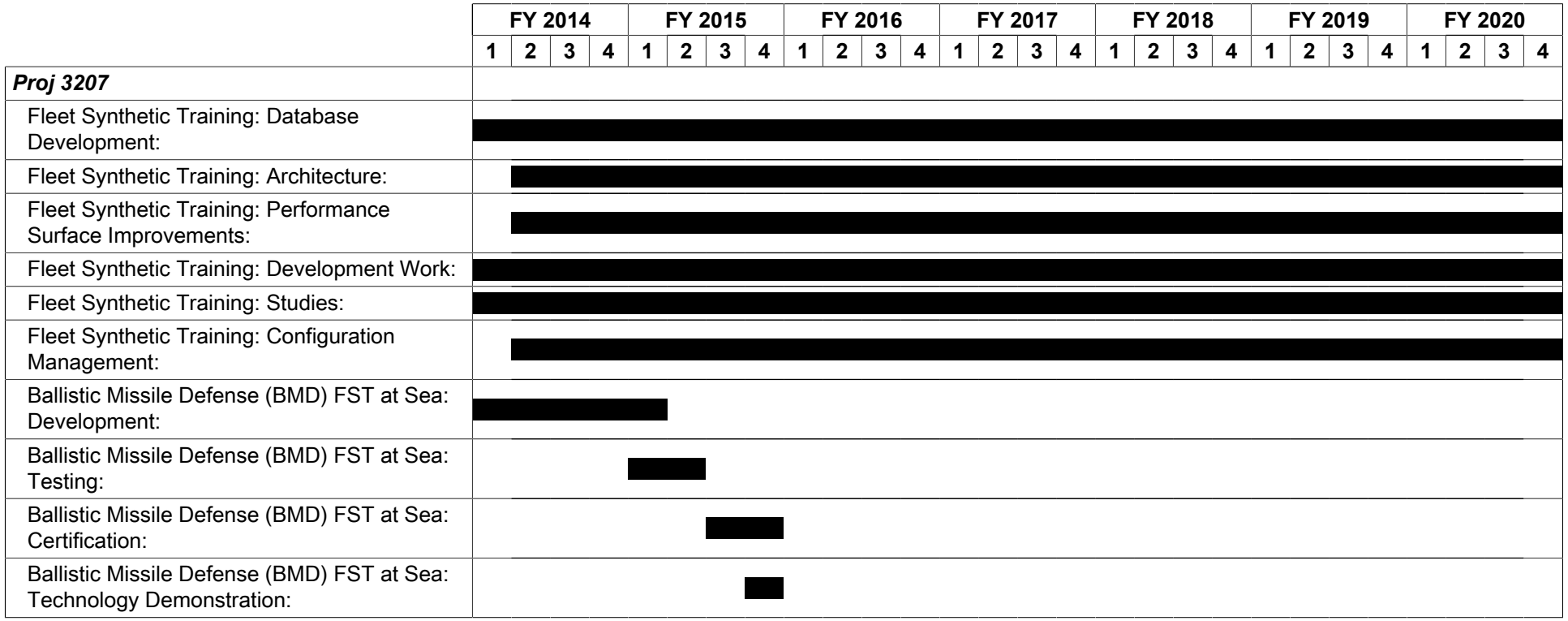


Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3207				
Fleet Synthetic Training: Database Development:	1	2014	4	2020
Fleet Synthetic Training: Architecture:	2	2014	4	2020
Fleet Synthetic Training: Performance Surface Improvements:	2	2014	4	2020
Fleet Synthetic Training: Development Work:	1	2014	4	2020
Fleet Synthetic Training: Studies:	1	2014	4	2020
Fleet Synthetic Training: Configuration Management:	2	2014	4	2020
Ballistic Missile Defense (BMD) FST at Sea: Development:	1	2014	1	2015
Ballistic Missile Defense (BMD) FST at Sea: Testing:	1	2015	2	2015
Ballistic Missile Defense (BMD) FST at Sea: Certification:	3	2015	4	2015
Ballistic Missile Defense (BMD) FST at Sea: Technology Demonstration:	4	2015	4	2015