Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy											Date: May 2017	
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 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	537.444	37.126	48.536	48.365	-	48.365	49.741	49.721	50.822	51.868	Continuing	Continuing
2341: *METOC Data Acquisition*	164.046	3.733	4.437	5.483	-	5.483	5.283	5.300	5.405	5.513	Continuing	Continuing
2342: *METOC Data Assimilation and Mod*	214.950	16.174	20.165	21.111	-	21.111	21.407	21.734	22.211	22.676	Continuing	Continuing
2343: *Tactical METOC Applications*	144.390	9.059	13.473	11.715	-	11.715	12.844	13.993	14.304	14.614	Continuing	Continuing
2344.: *Precise Time and Astrometry*	8.600	4.797	5.636	5.190	-	5.190	4.705	3.072	3.127	3.132	Continuing	Continuing
2363.: *Remote Sensing Capability Development*	4.949	2.406	3.855	3.959	-	3.959	3.990	4.033	4.109	4.189	Continuing	Continuing
3207: *Fleet Synthetic Training*	0.509	0.957	0.970	0.253	-	0.253	0.274	0.294	0.315	0.336	Continuing	Continuing
3404: *Tactical Environmental Support*	0.000	0.000	0.000	0.327	-	0.327	0.619	0.648	0.675	0.704	Continuing	Continuing
3405: *Decision Support Products & Dissemination*	0.000	0.000	0.000	0.327	-	0.327	0.619	0.647	0.676	0.704	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

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
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*

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.

Major emphasis areas include the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) and the METOC Data Acquisition, the METOC Data Assimilation & Modeling, the Precise Timing and Astrometry, the Fleet Synthetic Training, the Tactical Environmental Support, Decision Support Products & Dissemination, the Earth System Prediction Capability projects, and the Remote Sensing Capability Development.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	37.832	48.536	49.686	-	49.686
Current President's Budget	37.126	48.536	48.365	-	48.365
Total Adjustments	-0.706	0.000	-1.321	-	-1.321
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.706	0.000			
• Program Adjustments	0.000	0.000	-2.932	-	-2.932
• Rate/Misc Adjustments	0.000	0.000	1.611	-	1.611

Change Summary Explanation

Schedule- 1) The schedule for PTA is updated to reflect the additional required research and upgrades.

2) The schedule for NITES-Next is updated to reflect a 12 month delay to Fleet Capability Release-3 (FCR-3) Build Decision.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2341: *METOC Data Acquisition*	164.046	3.733	4.437	5.483	-	5.483	5.283	5.300	5.405	5.513	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The major work of the Meteorology and Oceanography (METOC) Data Acquisition Project is to provide future mission capabilities to warfighters allowing them to detect and monitor the conditions of the physical environment throughout the entire battlespace. The most promising new sensor technologies (including unmanned vehicles, tactical sensor exploitation, in-situ sensors) 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 to operational and tactical commanders. METOC data requirements have evolved with emphasis on naval warfare shifting to littoral and deep strike battlespace. The need to accurately characterize dynamic conditions are crucial 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 are necessary but not sufficient to support 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 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 area Tactical Oceanographic Capabilities project.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)	3.433	4.230	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: Fleet Naval METOC has updated the definition and structure of the METOC program along the lines of operational mission needs. This update focuses on the operational characteristics of Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) of METOC data and information. Identified efforts supporting METOC are realigned to projects and activities that align to the TCPED updated program structure.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
FY18 funding realigned to sub project METOC Data Acquisition, project 3404 (Tactical Environmental Support), and project 3405 (Decision Support Products & Dissemination). ***FY 2016 Accomplishments:*** Continued 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. Continued to develop technologies to characterize undersea and atmospheric environment in the battlespace. Continued to develop and demonstrate in-situ sampling techniques to support adaptive and advance measurement technologies. Continued to develop tools and techniques to support forecaster's processing, analysis and performance assessment processes. Developed tools to assess reach-back and on scene data fusion to support improved METOC decision support infrastructure. ***FY 2017 Plans:*** 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. Continue development of METOC systems engineering plans, requirements, standards, studies, and other documentation supporting integration of these products. 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. Develop tools to assess reach-back and on scene data fusion to support improved METOC decision support infrastructure. ***FY 2018 Base Plans:*** FY18 funding realigned to sub project METOC Data Acquisition, project 3404 (Tactical Environmental Support), and project 3405 (Decision Support Products & Dissemination). ***FY 2018 OCO Plans:*** N/A					
Title: Tactical Oceanography Capabilities (TOC) / Undersea Warfare (USW)	0.300	0.207	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: Fleet Naval METOC has updated the definition and structure of the METOC program along the lines of operational mission needs. This update focuses on the operational characteristics of Tasking, Collection,					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Processing, Exploitation, and Dissemination (TCPED) of METOC data and information. Identified efforts supporting METOC are realigned to projects and activities that align to the TCPED updated program structure. FY18 funding realigned to sub project METOC Data Acquisition, project 3404 (Tactical Environmental Support), and project 3405 (Decision Support Products & Dissemination). ***FY 2016 Accomplishments:*** Continued 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. Continued 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 2017 Plans:*** 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. Developed 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 2018 Base Plans:*** FY18 funding realigned to sub project METOC Data Acquisition, project 3404 (Tactical Environmental Support), and project 3405 (Decision Support Products & Dissemination). ***FY 2018 OCO Plans:*** N/A					
Title: Meteorological and Oceanographic (METOC) Data Acquisition ***Articles:*** ***Description:*** Data Acquisition provides future scientific and technological warfighting capabilities that detect and continuously monitor environmental (atmospheric, sea surface, oceanographic and seabed) conditions throughout the battlespace. The Navy's mission continues to evolve focusing on the littoral and deep-strike (inland) battlespace. These operating areas (and the transitions between them) have dynamic and complex environmental characteristics and behaviors that require modifying METOC Collections and associated sensing	0.000 -	0.000 -	5.483 -	0.000 -	5.483 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
strategies and methodologies. Without reliable characterization of ocean and atmosphere, the Navy risks ineffective allocation and employment of warfighters and weapon systems, and the sensors that fully enable them. Fleet Naval METOC has updated the definition and structure of the METOC program along the lines of operational mission needs. This update focuses on the operational characteristics of Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) of METOC data and information. Identified efforts supporting METOC are realigned to projects and activities that align to the TCPED updated program structure. FY18 funding realigned to project 2341 METOC Data Acquisition from project 2341 Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC) and Tactical Oceanography Capabilities (TOC)/ Undersea Warfare (USW) and PE 0604218N (Air/Ocean Equipment Engineering) project 2345. This is not a new Start ***FY 2016 Accomplishments:*** N/A ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:*** Continue Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC) (METOC FMC) data acquisition efforts to develop and demonstration of in-situ sampling techniques to support adaptive and advance measurement technologies. Continue development efforts to improve delivery of Geospatial Information and Services (GI&S) within Navy METOC product production centers and throughout the fleet user base. Continue development of METOC systems engineering plans, requirements, standards, studies, and other documentation supporting integration of these products. Continue work on 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 and development of tools to assess reach-back and on scene data fusion to support improved METOC decision support infrastructure. Continue Tactical Oceanography Capabilities (TOC)/Undersea Warfare (USW) (TOC/USW) data acquisition efforts to transition models, algorithms and databases that calculate accurate acoustic transmission loss (TL)					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
and characterize environmental parameters that affect TL. Continue TL calculation implementations to be used in the Navy's Anti-Submarine Warfare (ASW) Tactical Decision Aids (TDAs) and sonar trainers. Continue 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. Continue system development and demonstration of METOC manned, unmanned and automated sensors (to include integration of environmental sensors into a larger environmental sensing strategy). Continue the development of advanced sensor system support technologies and techniques for sensor deployment, data processing and analysis to include performance metrics to optimize sensor performance. Assess viability of sensors and subsystem sensors on unmanned and manned aircraft systems and autonomous undersea systems for collection of automated METOC data. Continue the development infrastructure to acquire, process and distribute METOC data and products. Assess improved sensor capabilities for unmanned and manned aircraft systems and autonomous undersea systems. Initiate work on acoustic transmission loss characterization using in-situ sensors; conduct research to better characterize acoustic bottom loss; conduct calibration/validation work for new sensors to include space based sensors; conduct work to better characterize ocean ice characteristics using satellite imagery; seek out, characterize, and determine suitability of new sources of data for assimilation into atmospheric and oceanic models. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	3.733	4.437	5.483	0.000	5.483

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	3.379	2.222	2.411	-	2.411	2.438	2.456	2.505	0.000	Continuing	Continuing
• RDTEN/0603207N/2342: *METOC DATA ASSIMILATION AND MOD*	8.168	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• RDTEN/0604218N/2346: *METOC SENSOR ENGINEERING*	1.136	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Meteorological and Oceanographic (METOC) Data Acquisition Project to develop, demonstrate, and validate METOC data collection methods and sensors, and to evolve the ability to provide timely and accurate METOC data and products to the Tactical Commander, all with management oversight by the Navy.

E. Performance Metrics

Goal: Develop techniques and tools to acquire Meteorological and Oceanographic (METOC) data to improve the accuracy of global and regional scale meteorological and oceanographic forecast models. 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-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2342: *METOC Data Assimilation and Mod*	214.950	16.174	20.165	21.111	-	21.111	21.407	21.734	22.211	22.676	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; 2) software models,focused 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, 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 Navy Fleet Numerical Meteorology and Oceanography Center (FNMOC), Monterey, CA and Naval Oceanographic Office (NAVO), Stennis Space Center, MS. Improved representation of smaller-scale phenomena, particularly in the littoral, is also an important consideration.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC)	3.809	4.408	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: FY18 funding from project 2342 sub project Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC) realigned to PE 0603207N project 2342 METOC Data Assimilation and Mod, sub project Battlespace Data Assimilation and Prediction.					
FY 2016 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continued 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. Continued to develop METOC fusion algorithms and demonstrate capabilities. Continue to develop METOC Decision Support & Prediction Tools to improve EM/EO system performance. Accelerated the development of the higher resolution global and small scale ocean forecasting systems with 4 dimensional variational data assimilation. Developed and demonstrate a tropospheric environmental modeling capability to support long range EM propagation ***FY 2017 Plans:*** 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. 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. Accelerate the development of the higher resolution global and small scale ocean forecasting systems with four-dimensional variation (4DVAR) data assimilation. ***FY 2018 Base Plans:*** FY18 funding from project 2342 sub project Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC) realigned to PE 0603207N project 2342 METOC Data Assimilation and Mod, sub project Battlespace Data Assimilation and Prediction. ***FY 2018 OCO Plans:*** N/A					
Title: Meteorological and Oceanographic (METOC) Space-Based Sensing Capabilities	2.215	3.544	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: FY18 funding from project 2342 sub project Meteorological and Oceanographic (METOC) Space-Base Sensing Capabilities realigned to PE 0603207N project 2342 METOC Data Assimilation and Mod, sub project Battlespace Data Assimilation and Prediction. ***FY 2016 Accomplishments:*** 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					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
and development of data processing and data assimilation algorithms for the Joint Polar Satellite System-1 (JPSS-1), GOES-S, Earthcare, and OceanSat-3 launches scheduled in FY2017. ***FY 2017 Plans:*** Continue performance assessment on National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP) and Defense Meteorological Satellite Program (DMSP) satellite sensor suites. Furthering assessment of planned Joint Polar Satellite System (JPSS) sensors and assessment of other national, commercial, and foreign earth observing satellite system's sensor data for use in Navy Atmospheric and Oceanographic Prediction Models. Develop performance assessment of planned national earth observing satellite system's sensor data Sentinel 3a and 3b launch for use in Navy Atmospheric and Oceanographic Prediction Models. Develop assessment of planned environmental satellite sensor launches such as Geostationary Operational Environmental Satellite R-Series (GOES-R) and Global Change Observation Mission (GCOM) W-2 scheduled in FY16. ***FY 2018 Base Plans:*** FY18 funding from project 2342 sub project Meteorological and Oceanographic (METOC) Space-Base Sensing Capabilities realigned to PE 0603207N project 2342 METOC Data Assimilation and Mod, sub project Battlespace Data Assimilation and Prediction. ***FY 2018 OCO Plans:*** N/A					
Title: Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)	1.955	2.393	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: FY18 funding from project 2342 sub project Tactical Oceanography Capabilities (TOC)/Undersea Warfare (USW) realigned to PE 0603207N project 2342 METOC Data Assimilation and Mod, sub project Battlespace Data Assimilation and Prediction. ***FY 2016 Accomplishments:*** 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)					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
technologies to collect and transmit environmental data for use by Naval Oceanographic Office (NAVOCEANO) to predict Anti-Submarine Warfare (ASW) sensor performance. Transition, to include Reachback Cells (RBCs), 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. Complete development and transition of a global observing database designed through the Ocean Observing System to characterize national and international ocean observatory locations, sensor grid capabilities and mitigations to address potential U.S. submarine security vulnerabilities.					
FY 2017 Plans: - Furthering 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). - Furthering 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. - Furthering population/upgrade of oceanographic, acoustic and geo-acoustic 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. - Transition 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). - Expand capabilities and increased access speed of acoustic surface scattering and loss modules. - Furthering development of software-based methodologies that characterize and forecast bio-acoustic volume attenuation and scatter functions as observed by the Navy's active hull-mounted sonar systems. - Furthering 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 geo-acoustic 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					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
national and international ocean observatories locations, sensor grid capabilities and mitigations to address potential U.S. submarine security vulnerabilities. - Conduct proof-of-concept at-sea demonstrations of emerging Unmanned Undersea Vehicle (UUV) and Unmanned Surface Vehicle (USV) technologies designed to collect environmental data. - 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 2018 Base Plans:*** FY18 funding from project 2342 sub project Tactical Oceanography Capabilities (TOC)/Undersea Warfare (USW) realigned to PE 0603207N project 2342 METOC Data Assimilation and Mod, sub project Battlespace Data Assimilation and Prediction. ***FY 2018 OCO Plans:*** N/A					
Title: Battlespace Data Assimilation and Prediction ***Articles:***	0.000 -	0.000 -	10.389 -	0.000 -	10.389 -
Description: The Battlespace Data Assimilation and Prediction effort focuses on improvements and adaptions of current models, whereas the ESPC effort is focused on the next suite of models. Battlespace Data Assimilation and Prediction (Processing) related efforts predict the physical environment in support of Navy METOC and all Navy missions. FY18 funding realigned to PE 0603207N (Air/Ocean Tactical Applications) project 2342 Battlespace Data Assimilation and Prediction from PE 0603207N (Air/Ocean Tactical Applications) project 2342 Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC), Meteorological and Oceanographic (METOC) Space-Base Sensing Capabilities and Tactical Oceanography Capabilities (TOC)/Undersea Warfare (USW). This is not a new start ***FY 2016 Accomplishments:***					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:*** Battlespace Data Assimilation and Prediction (Processing) - Continue development of Ocean Observing Systems (OOS) Performance Prediction and Mitigation. Initiate upgrade of the Navy Standard Parabolic Equation Model 6.0/6.1. Initiate development of the Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) TC Ensemble. Initiate development of the Assimilation of Sensor-diagnosed, Effective Modified Refractive Indices (ASDEMRI) modified atmospheric refractive index model in support of EMW. Initiate development of National Unified Operational Prediction Capability (NUOPC). Initiate the development of the Navy Aerosol Analysis and Prediction System (NAAPS). Initiate the development of small scale atmospheric models while constructing Tropical Cyclone forecast aids. Conduct development of advanced METOC prediction systems and architectures that provide improved forecasts and estimates of product accuracies thru improved data fusion and assimilation techniques, data quality and control technologies. Continue work on METOC Decision Support & Prediction Tools to improve EM/EO system performance. Provided technical support to the Naval Oceanographic Office (NAVOCEANO) in updating geo-acoustic 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. Continue 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 2018 OCO Plans:*** N/A					
Title: Chief of Naval Operations Speed to Fleet Initiative	0.000	1.058	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Articles:	-	-	-	-	-
Description: This Speed to Fleet effort will develop a parameterization for the Advanced Propagation Model (APM) electromagnetic energy propagation model to improve modeling of the long range radar performance. This effort will demonstrate the effectiveness of the parameterization and deliver the upgrade to the APM developers for inclusion into future releases of APM to fleet programs. This effort was previously funded in R2A Meteorological and Oceanographic (METOC) Future Mission Capabilities (FMC). ***FY 2016 Accomplishments:*** N/A ***FY 2017 Plans:*** Initiate and complete an effort to quickly transition new Advanced Propagation Model (APM) capability to the U.S. Fleet. ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:*** N/A					
Title: Earth System Prediction Capability (ESPC)	8.195	8.762	10.722	0.000	10.722
Articles:	-	-	-	-	-
Description: 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. Funding increase from FY 2017 to FY 2018 due to a increased investment in forecast projections for land, sea, ice and middle atmosphere modeling. ***FY 2016 Accomplishments:***					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Initiated 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. - Initiated improvements to automated ship routing guidance for safety and energy efficiency at 0-7 day lead times. - Continued science workshops and benchmark testing. - Continued 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. - Continued 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. - Continued 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. - Continued improved DoD decision support for 30-180 Day lead times. - Completed development of a greatly more efficient computational architecture to allow for real-time operational prediction.					
FY 2017 Plans: - Continue all efforts from FY2016, less those noted as complete. - Initiate an Ensemble by design coupled global ocean-atmospheric system for probabilities and risk assessments at longer lead times based on the Navy ESPC deterministic architecture. - Initiate advanced improvements to automated ship routing guidance for safety and energy efficiency from a 7 day maximum to a 14 day maximum lead time. - 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 45 days and longer. - Continue to develop 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. - Continue 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.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Complete initial prototype system, with data cycling and post-model processing for pre-operations evaluation. ***FY 2018 Base Plans:*** Continue all efforts from FY2017, less those noted as complete. Continue an Ensemble by design coupled global ocean-atmospheric system for probabilities and risk assessments at longer lead times based on the Navy ESPC deterministic architecture. Empathizing advanced skillful environmental forecasts and decision guidance (relative to averaged climatology) to improve from the operational capability, currently 7-10 days, to 45 days and longer. Conduct 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 a 7 year reanalysis and reforecast project as well as land, sea, ice and middle atmosphere modeling improvements. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	16.174	20.165	21.111	0.000	21.111

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	3.379	0.354	0.491	-	0.491	0.480	0.458	0.467	0.000	Continuing	Continuing
• RDTEN/0603207N/2341: *METOC DATA ACQUISITION*	3.763	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• RDTEN/0604218N/2346: *METOC SENSOR ENGINEERING*	1.136	0.000	0.000	-	0.000	9.933	0.000	0.000	0.000	Continuing	Continuing
• RDTEN/0305160N/0524: *NAVY METOC SUPPORT (SPACE)*	0.599	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Meteorological and Oceanographic (METOC) Data Assimilation and Modeling Project to develop, demonstrate, and validate METOC data assimilation and environmental prediction capabilities, enabling timely and accurate delivery of METOC prediction data and products to the Tactical Commander, all with management oversight by the Navy.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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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 modeling and computational architectures to allow for real-time operational prediction at comparable skill level to international competitors.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	WR	NRL : Washington DC	121.405	2.926	Nov 2015	3.626	Nov 2016	0.845	Nov 2017	-		0.845	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	Various	Various : Various	46.068	0.000		0.000		0.000		-		0.000	0.000	46.068	-
METOC Space-Based Sensing Capabilities	WR	NRL : Washington, DC	12.269	2.278	Nov 2015	2.545	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	WR	NRL : Washington, DC	7.817	0.523	Nov 2015	1.140	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	University of Texas : TX	1.008	0.155	Apr 2016	0.000		0.100	Nov 2017	-		0.100	0.000	1.263	-
Tactical Oceanography Capabilities / Undersea Warfare	WR	NSWC Carderock : West Bethesda, MD	1.640	0.000		0.450	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	WR	NAVOCEANO : Mississippi	0.549	0.000		0.000		0.000		-		0.000	0.000	0.549	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	University of Washington : Seattle, WA	0.680	0.050	Dec 2015	0.120	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Johns Hopkins University : MD	0.310	0.030	Dec 2015	0.091	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SAIC/QNA : Various	1.605	0.000		0.354	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	SAIC/QNA : Various	1.724	0.758	Jan 2016	0.614	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Penn Sate University : Pennsylvania	0.050	0.075	Dec 2015	0.000		0.000		-		0.000	0.000	0.125	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Tactical Oceanography Capabilities / Undersea Warfare	WR	SSC LANT : North Charleston	0.025	0.025	Nov 2015	0.000		0.000		-		0.000	0.000	0.050	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SPA : Virginia	0.175	0.200	Dec 2015	0.000		0.000		-		0.000	0.000	0.375	-
METOC SUPPORT SPACE-SOFTWARE DEVELOPMENT	WR	NRL : WASHINGTON DC	0.000	0.000		0.515	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	METRON : Virginia	0.000	0.385	Dec 2015	0.000		0.000		-		0.000	0.000	0.385	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Vencore : Virginia	0.000	0.239	Nov 2015	0.000		0.000		-		0.000	0.000	0.239	-
METOC Battlespace Data Assimilation and Prediction	WR	NRL : Monterey, CAl Stennis Spoace Center,MS	0.000	0.000		0.000		8.924	Nov 2017	-		8.924	0.000	8.924	-
Earth Systems Prediction Capability (ONR)	WR	NRL : Washington DC	10.883	5.000	Oct 2015	7.431	Nov 2016	8.847	Nov 2017	-		8.847	Continuing	Continuing	Continuing
ESPC	Various	Various : Various	3.314	2.692	Oct 2015	1.661	Nov 2016	0.681	Nov 2017	-		0.681	Continuing	Continuing	Continuing
CHIEF OF NAVAL OPERATIONS SPEED TO FLEET INITIATIVE	WR	NRL : WASHINGTON DC	0.000	0.000		0.850	Nov 2016	0.000		-		0.000	1.130	1.980	-
		Subtotal	209.522	15.336		19.397		19.397		-		19.397	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	Various	Various : Various	0.795	0.000		0.000		0.000		-		0.000	0.000	0.795	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	C/FP	SAIC : Virginia	0.473	0.000		0.000		0.000		-		0.000	0.000	0.473	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SAIC : Virginia	0.461	0.173	Feb 2016	0.000		0.000		-		0.000	0.000	0.634	-
METOC Future Mission Capabilities	C/FP	SAIC : VIRGINIA	0.000	0.000		0.115	Nov 2016	0.100	Nov 2017	-		0.100	Continuing	Continuing	Continuing
METOC SUPPORT SPACE-PROGRAM SUPPORT	WR	SSC PACIFIC : SAN DIEGO, CA	0.000	0.000		0.090	Nov 2016	0.100	Nov 2017	-		0.100	Continuing	Continuing	Continuing
Earth System Modeling Framework - Common Software Architecture	Various	Various : Boulder, CO; Various	0.000	0.000		0.000		0.660	Nov 2017	-		0.660	0.000	0.660	-
Program Support and Subject Matter Expertise	Various	UW-APL : Seattle, WA	1.250	0.313	Oct 2015	0.000		0.358	Nov 2017	-		0.358	Continuing	Continuing	Continuing
		Subtotal	2.979	0.486		0.205		1.218		-		1.218	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Data Analytics and Machine Learning	TBD	Charles River : Boston, MA	0.000	0.000		0.000		0.234	Nov 2017	-		0.234	0.000	0.234	-
		Subtotal	0.000	0.000		0.000		0.234		-		0.234	0.000	0.234	-

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Various : Various	0.090	0.000		0.000		0.000		-		0.000	0.000	0.090	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Space-Based Sensing Capabilities	Various	Various : Various	1.350	0.000		0.000		0.000		-		0.000	0.000	1.350	-
Tactical Oceanography Capabilities / Undersea Warfare	WR	SSC PAC : San Diego, CA	0.981	0.164	Nov 2015	0.171	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	PSS/BAH : San Diego, CA	0.028	0.188	Dec 2015	0.000		0.000		-		0.000	0.000	0.216	-
METOC Space-Based Sensing Capabilities	C/FP	BAH : VIRGINIA	0.000	0.000		0.142	Nov 2016	0.100	Nov 2017	-		0.100	Continuing	Continuing	Continuing
METOC Space-Based Sensing Capabilities	WR	SSC PAC : SAN DIEGO, CA	0.000	0.000		0.213	Nov 2016	0.100	Nov 2017	-		0.100	Continuing	Continuing	Continuing
METOC Acquisition Management	C/CPFF	PSS/BAH : SAN DIEGO, CA	0.000	0.000		0.037	Nov 2016	0.062	Nov 2017	-		0.062	Continuing	Continuing	Continuing
		Subtotal	2.449	0.352		0.563		0.262		-		0.262	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	214.950	16.174		20.165		21.111		-		21.111	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
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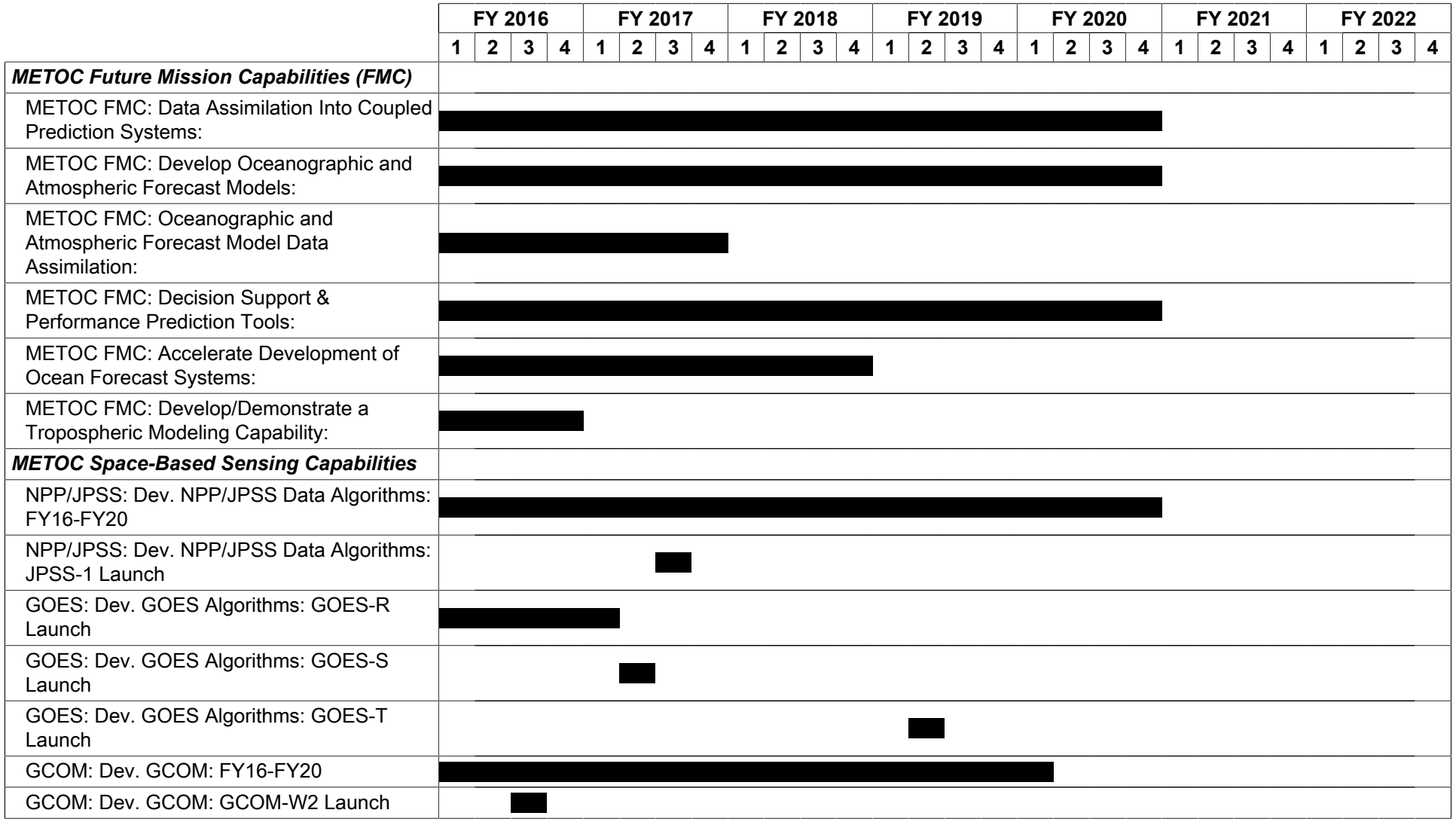

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
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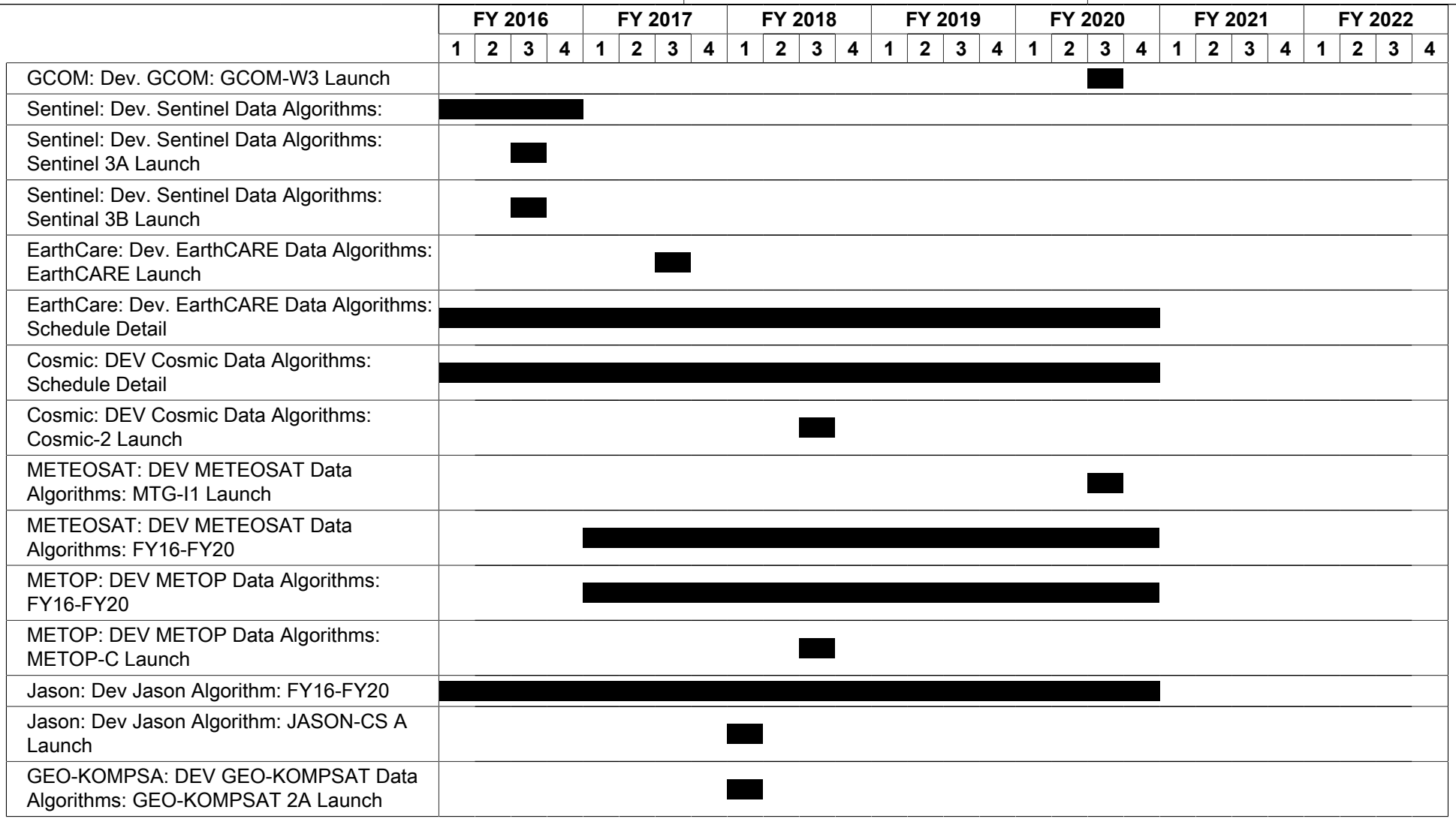


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

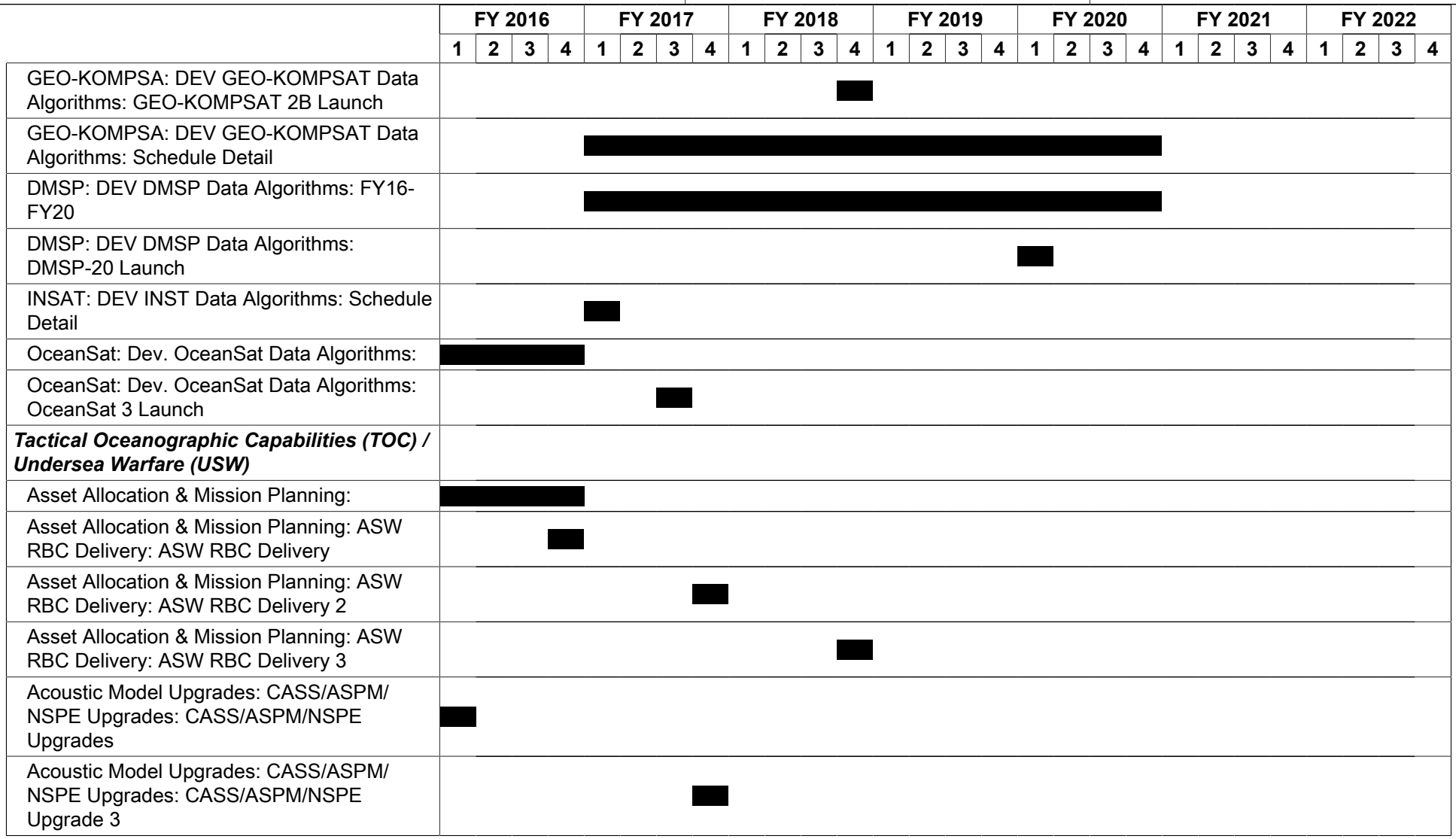


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

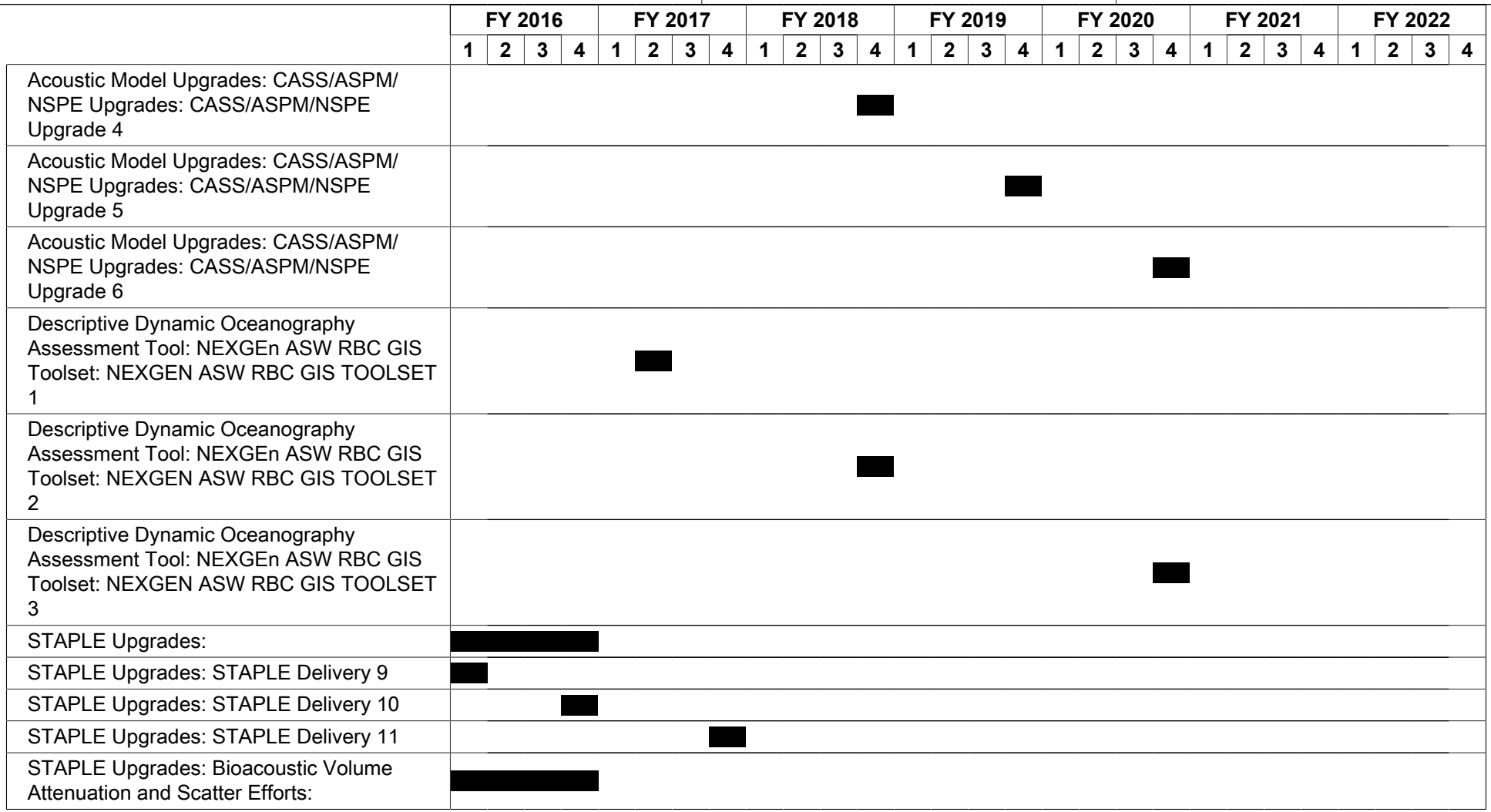


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

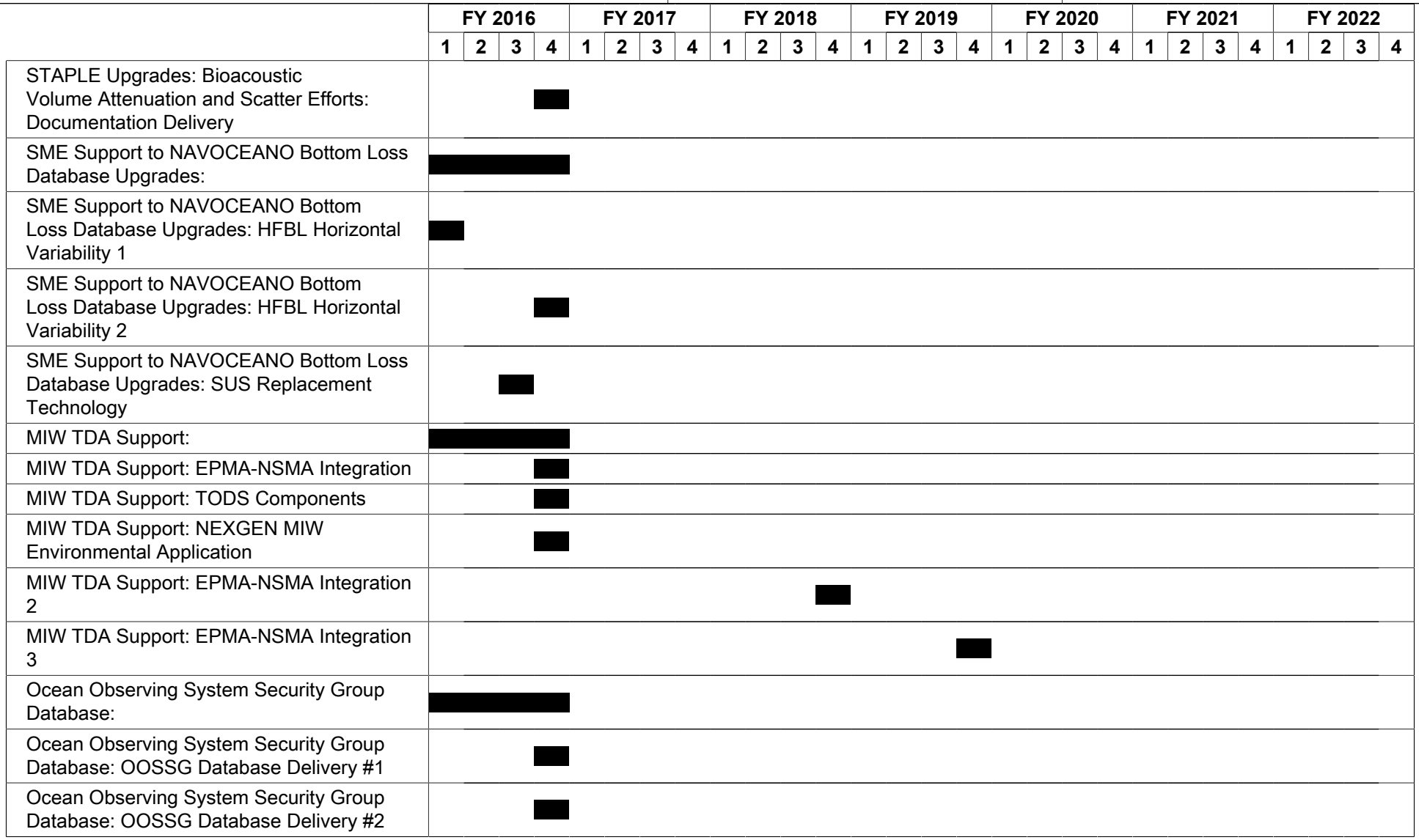


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

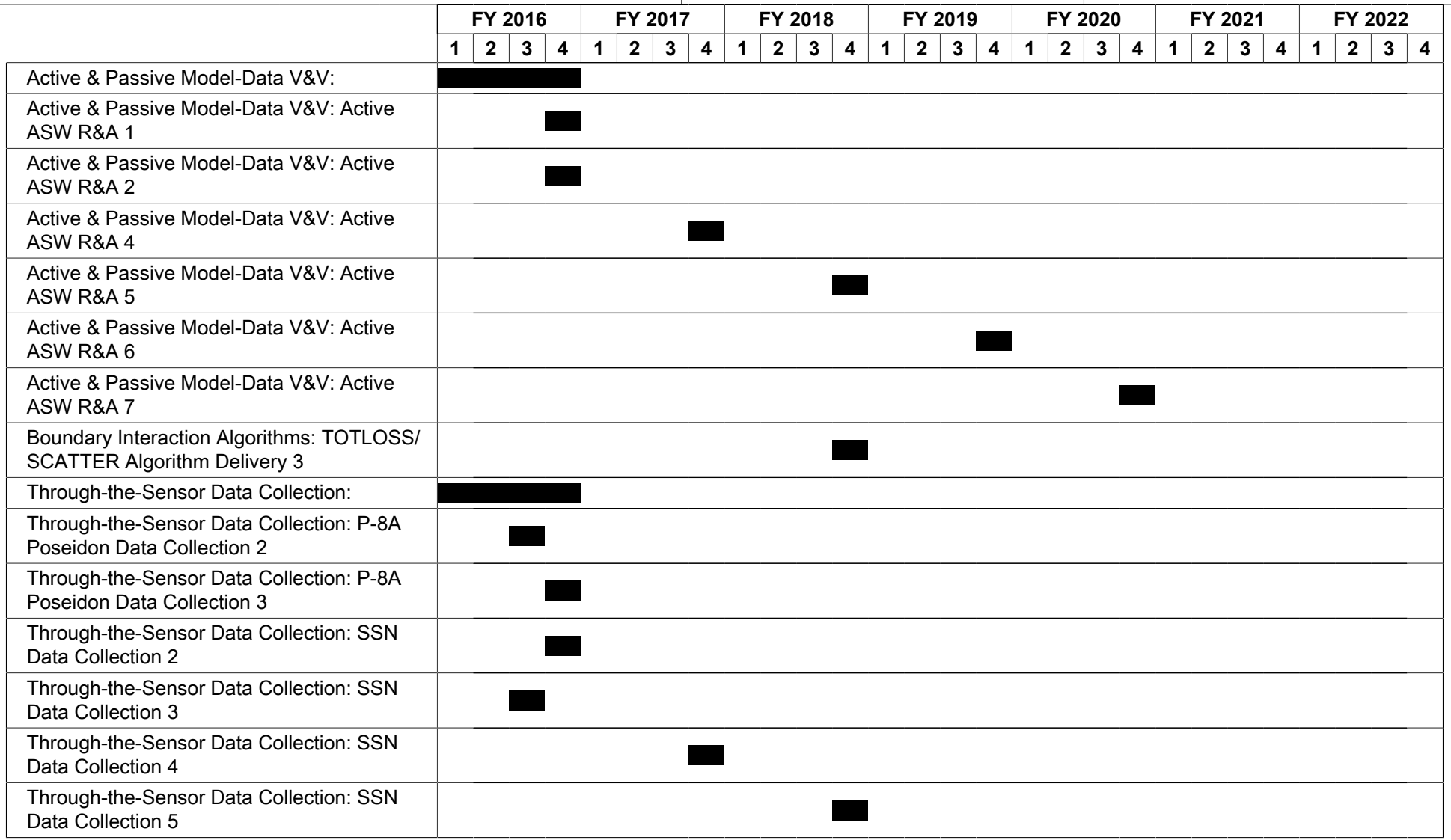


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

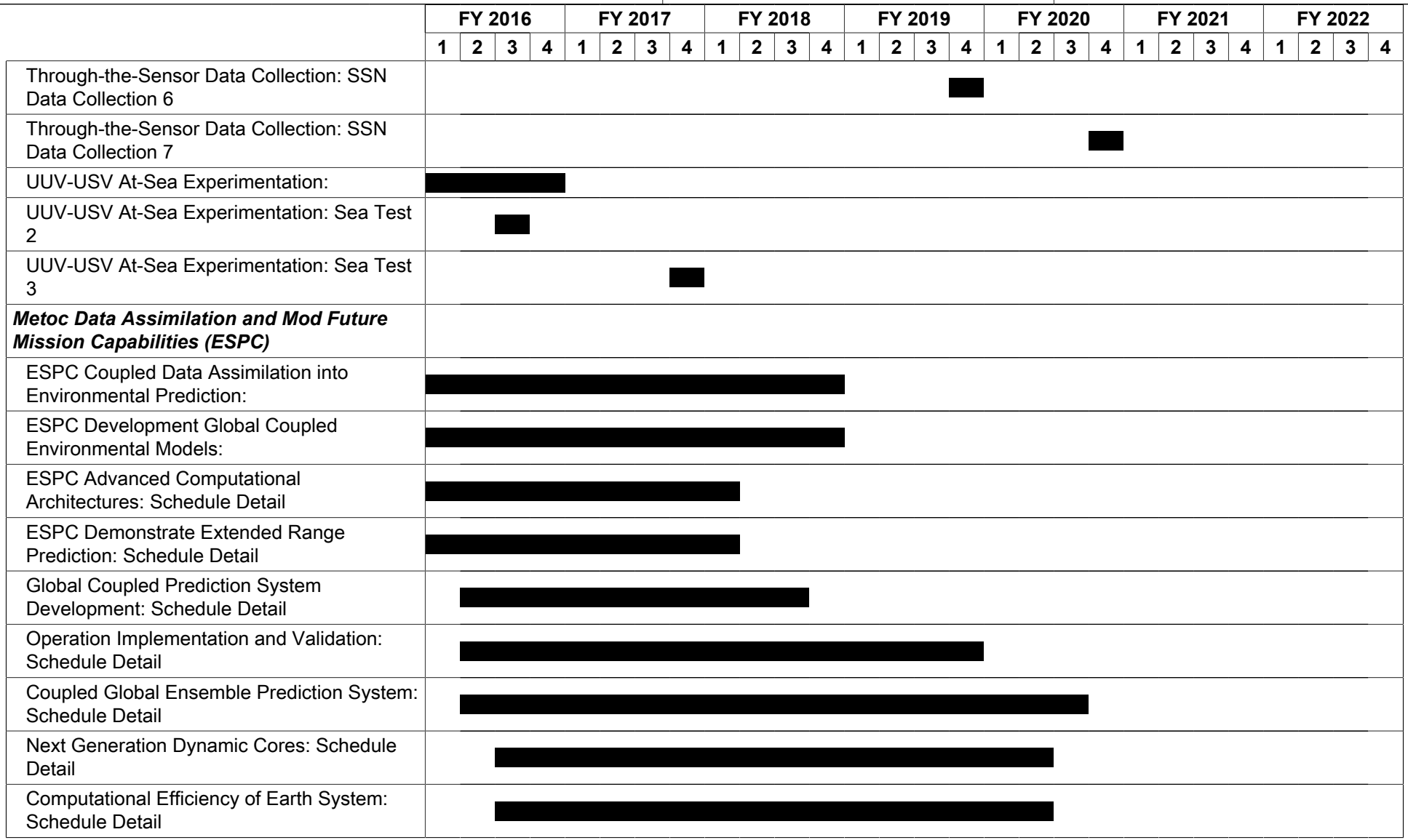


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

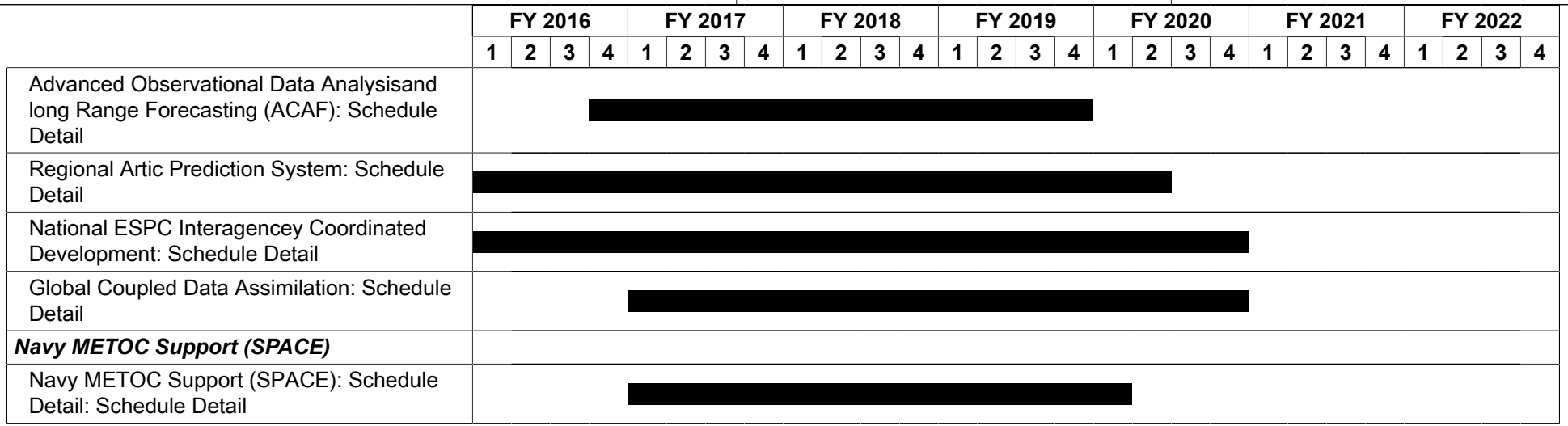


Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

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	2016	4	2020
METOC FMC: Develop Oceanographic and Atmospheric Forecast Models:	1	2016	4	2020
METOC FMC: Oceanographic and Atmospheric Forecast Model Data Assimilation:	1	2016	4	2017
METOC FMC: Decision Support & Performance Prediction Tools:	1	2016	4	2020
METOC FMC: Accelerate Development of Ocean Forecast Systems:	1	2016	4	2018
METOC FMC: Develop/Demonstrate a Tropospheric Modeling Capability:	1	2016	4	2016
METOC Space-Based Sensing Capabilities				
NPP/JPSS: Dev. NPP/JPSS Data Algorithms: FY16-FY20	1	2016	4	2020
NPP/JPSS: Dev. NPP/JPSS Data Algorithms: JPSS-1 Launch	3	2017	3	2017
GOES: Dev. GOES Algorithms: GOES-R Launch	1	2016	1	2017
GOES: Dev. GOES Algorithms: GOES-S Launch	2	2017	2	2017
GOES: Dev. GOES Algorithms: GOES-T Launch	2	2019	2	2019
GCOM: Dev. GCOM: FY16-FY20	1	2016	1	2020
GCOM: Dev. GCOM: GCOM-W2 Launch	3	2016	3	2016
GCOM: Dev. GCOM: GCOM-W3 Launch	3	2020	3	2020
Sentinel: Dev. Sentinel Data Algorithms:	1	2016	4	2016
Sentinel: Dev. Sentinel Data Algorithms: Sentinel 3A Launch	3	2016	3	2016
Sentinel: Dev. Sentinel Data Algorithms: Sentinal 3B Launch	3	2016	3	2016
EarthCare: Dev. EarthCARE Data Algorithms: EarthCARE Launch	3	2017	3	2017
EarthCare: Dev. EarthCARE Data Algorithms: Schedule Detail	1	2016	4	2020
Cosmic: DEV Cosmic Data Algorithms: Schedule Detail	1	2016	4	2020

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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**
Cosmic: DEV Cosmic Data Algorithms: Cosmic-2 Launch	3	2018	3	2018
METEOSAT: DEV METEOSAT Data Algorithms: MTG-I1 Launch	3	2020	3	2020
METEOSAT: DEV METEOSAT Data Algorithms: FY16-FY20	1	2017	4	2020
METOP: DEV METOP Data Algorithms: FY16-FY20	1	2017	4	2020
METOP: DEV METOP Data Algorithms: METOP-C Launch	3	2018	3	2018
Jason: Dev Jason Algorithm: FY16-FY20	1	2016	4	2020
Jason: Dev Jason Algorithm: JASON-CS A Launch	1	2018	1	2018
GEO-KOMPSA: DEV GEO-KOMPSAT Data Algorithms: GEO-KOMPSAT 2A Launch	1	2018	1	2018
GEO-KOMPSA: DEV GEO-KOMPSAT Data Algorithms: GEO-KOMPSAT 2B Launch	4	2018	4	2018
GEO-KOMPSA: DEV GEO-KOMPSAT Data Algorithms: Schedule Detail	1	2017	4	2020
DMSP: DEV DMSP Data Algorithms: FY16-FY20	1	2017	4	2020
DMSP: DEV DMSP Data Algorithms: DMSP-20 Launch	1	2020	1	2020
INSAT: DEV INST Data Algorithms: Schedule Detail	1	2017	1	2017
OceanSat: Dev. OceanSat Data Algorithms:	1	2016	4	2016
OceanSat: Dev. OceanSat Data Algorithms: OceanSat 3 Launch	3	2017	3	2017
Tactical Oceanographic Capabilities (TOC) / Undersea Warfare (USW)				
Asset Allocation & Mission Planning:	1	2016	4	2016
Asset Allocation & Mission Planning: ASW RBC Delivery: ASW RBC Delivery	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 Model Upgrades: CASS/ASPM/NSPE Upgrades: CASS/ASPM/NSPE Upgrades	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

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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**
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: 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
Descriptive Dynamic Oceanography Assessment Tool: NEXGEn ASW RBC GIS Toolset: NEXGEN ASW RBC GIS TOOLSET 3	4	2020	4	2020
STAPLE Upgrades:	1	2016	4	2016
STAPLE Upgrades: STAPLE Delivery 9	1	2016	1	2016
STAPLE Upgrades: STAPLE Delivery 10	4	2016	4	2016
STAPLE Upgrades: STAPLE Delivery 11	4	2017	4	2017
STAPLE Upgrades: Bioacoustic Volume Attenuation and Scatter Efforts:	1	2016	4	2016
STAPLE Upgrades: Bioacoustic Volume Attenuation and Scatter Efforts: Documentation Delivery	4	2016	4	2016
SME Support to NAVOCEANO Bottom Loss Database Upgrades:	1	2016	4	2016
SME Support to NAVOCEANO Bottom Loss Database Upgrades: HFBL Horizontal Variability 1	1	2016	1	2016
SME Support to NAVOCEANO Bottom Loss Database Upgrades: HFBL Horizontal Variability 2	4	2016	4	2016
SME Support to NAVOCEANO Bottom Loss Database Upgrades: SUS Replacement Technology	3	2016	3	2016
MIW TDA Support:	1	2016	4	2016
MIW TDA Support: EPMA-NSMA Integration	4	2016	4	2016
MIW TDA Support: TODS Components	4	2016	4	2016

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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**
MIW TDA Support: NEXGEN MIW Environmental Application	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
Ocean Observing System Security Group Database:	1	2016	4	2016
Ocean Observing System Security Group Database: OOSSG Database Delivery #1	4	2016	4	2016
Ocean Observing System Security Group Database: OOSSG Database Delivery #2	4	2016	4	2016
Active & Passive Model-Data V&V:	1	2016	4	2016
Active & Passive Model-Data V&V: Active ASW R&A 1	4	2016	4	2016
Active & Passive Model-Data V&V: Active ASW R&A 2	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
Boundary Interaction Algorithms: TOTLOSS/SCATTER Algorithm Delivery 3	4	2018	4	2018
Through-the-Sensor Data Collection:	1	2016	4	2016
Through-the-Sensor Data Collection: P-8A Poseidon Data Collection 2	3	2016	3	2016
Through-the-Sensor Data Collection: P-8A Poseidon Data Collection 3	4	2016	4	2016
Through-the-Sensor Data Collection: SSN Data Collection 2	4	2016	4	2016
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:	1	2016	4	2016
UUV-USV At-Sea Experimentation: Sea Test 2	3	2016	3	2016

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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**
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	2016	4	2018
ESPC Development Global Coupled Environmental Models:	1	2016	4	2018
ESPC Advanced Computational Architectures: Schedule Detail	1	2016	1	2018
ESPC Demonstrate Extended Range Prediction: Schedule Detail	1	2016	1	2018
Global Coupled Prediction System Development: Schedule Detail	2	2016	3	2018
Operation Implementation and Validation: Schedule Detail	2	2016	4	2019
Coupled Global Ensemble Prediction System: Schedule Detail	2	2016	3	2020
Next Generation Dynamic Cores: Schedule Detail	3	2016	2	2020
Computational Efficiency of Earth System: Schedule Detail	3	2016	2	2020
Advanced Observational Data Analysisand long Range Forecasting (ACAF): Schedule Detail	4	2016	4	2019
Regional Artic Prediction System: Schedule Detail	1	2016	2	2020
National ESPC Interagencey Coordinated Development: Schedule Detail	1	2016	4	2020
Global Coupled Data Assimilation: Schedule Detail	1	2017	4	2020
Navy METOC Support (SPACE)				
Navy METOC Support (SPACE): Schedule Detail: Schedule Detail	1	2017	1	2020

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy										Date: May 2017		
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 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
2343: *Tactical METOC Applications*	144.390	9.059	13.473	11.715	-	11.715	12.844	13.993	14.304	14.614	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Tactical Meteorology and Oceanography (METOC) Applications Project provides cyber secure operational effects decision aid capabilities for Navy and Marine Corps warfighters in the context of Joint Operations in a net-centric environment. This project funds the agile software development of the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program of record. NITES-Next program identifies and transitions state-of-the-art decision support software technologies from the government 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 (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare (AAW), Strike Warfare (STW), Expeditionary Warfare (EXW), Electronic Warfare (EW), Information Operations (IO), Intelligence Operations (INT), Non-Combat Operations (NCO), Command, Control, Communication (CCC), 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 and, 2) Operational Effects Decision Aids (OEDAs). Meteorological and Oceanographic (METOC) Decision Aides 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 use the METOC Decision Aide 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, and AMW ingress and egress points. METOC Decision Aides 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). METOC Decision Aides and OEDAs also use data obtained through direct interfaces to Navy combat systems. Cyber secure capabilities are a current emphasis 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.

FY 2018 request provides for NITES-Next Fleet Capability Release-3 (FCR-3) Build Technical Review (BTR), FCR-3 Build Decision (BD), and FCR-3 development. NITES-Next will conduct Application Integration (AI) System Integration Test (SIT) on the Consolidated Afloat Networks and Enterprise Services (CANES) Network. NITES-Next will also begin the development of a new mobile variant which will replace the current NITES-Fielded mobile variant.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Naval Integrated Tactical Environmental System Next Generation (NITES-Next)	9.059	13.473	11.715	0.000	11.715
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Naval Integrated Tactical Environment System - Next Generation (NITES-Next) conducted System Integration Testing (SIT) #1, SIT #2, Systems Qualification Testing (SQT), User Assessment (UA) and Developmental Testing and Evaluation (DT&E) events for Fleet Capability Releases (FCR)-2. Participated in Consolidated Afloat Network and Enterprise Services (CANES) Application Integration (AI) SIT events. NITES-Next continued to improve the FCR-2 software capability using the follow-on contract. NITES-Next conducted the Fielding Technical Review (FTR) for FCR-2. The program planned the FCR-3 development activities.					
FY 2017 Plans: The program obtained an FCR-2 Fielding Decision (FD) from the Milestone Decision Authority (MDA). The program obtained an Authorization to Operate (ATO) for FCR-2. The program will integrate FCR-2 into the Navy Tactical Cloud Reference Implementation (NTCRI). NITES-Next will incorporate new, robust Department of Defense (DoD)/Department of Navy (DoN) cybersecurity standards in the design of FCR-3 software and finalize the documentation (including Requisition Definition Package (RDP), Technology Readiness Assessment (TRA) Addendum 2, Cost Analysis Requirements Description (CARD), Program Life Cycle Cost Estimate (PLCCE), Acquisition Strategy (AS), and Acquisition Program Baseline (APB) for the FCR-3 Build Decision (BD). NITES-Next will award a task order for the development of FCR-3. NITES-Next will prepare for and conduct an FCR-3 Build Technical Review (BTR), prepare for FCR-3 BD, and begin to develop FCR-3 software that is anti-tamper proof and releasable to our allies to enhance our interoperability with their information warfare systems. NITES-Next will plan for SIT, SQT, UA, and DT&E for FCR-3. The program will plan the initial FCR-4 development activities and begin planning for contract actions in support of FCR-4.					
FY 2018 Base Plans: NITES-Next will continue work on the FCR-3 Task Order. NITES-Next will begin initial software development of FCR 3 mobile variant, which integrates new mobile variant requirements with the previous afloat version of FCR 2. The new mobile variant will replace the current NITES-Fielded suite of systems that have been determined to have cyber vulnerabilities and need to be retired as soon as possible. The NITES-Next program will begin SIT and SQT activities in support of the planned CANES AI/SIT and DT&E events. The program will continue planning for the FCR-4 development activities (including updating of all required documentation, RDP, CARD, PLCCE). NITES-Next will continue integration into the Navy Tactical Cloud Reference Implementation (NTCRI).					
FY 2018 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Accomplishments/Planned Programs Subtotals	9.059	13.473	11.715	0.000	11.715

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program 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 assessment capabilities for open ocean and littoral operating environments. The Department of the Navy (DoN) maintains management oversight of the NITES-Next program's acquisition and contracting strategies. The DoN's requirements for the NITES-Next program's acquisition and contracting strategies are based on approved Joint Capabilities Integration and Development System (JCIDS) documentation.

E. Performance Metrics

Goal: Field software decision aid capabilities for Navy and Marine Corps war fighters in order to facilitate the characterization and prediction of the physical environment in the battlespace.

Metric: Meet the performance metrics identified in approved NITES-Next Program's requirements documents (e.g., Concept Definition Document (CDD) and individual Requirements Definition Packages (RDPs)).

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
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 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NITES/NITES-Next	Various	Various : Various	111.017	0.000		0.000		0.000		-		0.000	0.000	111.017	-
NITES-Next	WR	SSC Pacific : San Diego, CA	16.027	3.707	Dec 2015	4.212	Oct 2016	3.758	Nov 2017	-		3.758	Continuing	Continuing	Continuing
NITES-Next	C/FP	SAIC : Virginia	5.431	2.013	Dec 2015	2.472	Feb 2017	2.051	Dec 2017	-		2.051	Continuing	Continuing	Continuing
NITES-Next	WR	SSC Atlantic : South Carolina	0.200	0.071	Oct 2015	0.105	Apr 2017	0.087	Oct 2017	-		0.087	Continuing	Continuing	Continuing
NITES-Next / Engineering	C/IDIQ	NAVSUP : Pennsylvania	0.000	0.000		1.300	May 2017	0.000		-		0.000	0.000	1.300	-
NITES-Next/ SW	C/FP	GDIT : Virginia	4.120	0.000		0.000		0.000		-		0.000	0.000	4.120	-
NITES-Next / Eng	C/IDIQ	SSC PACIFIC : Various	0.000	1.650	May 2016	0.000		0.000		-		0.000	0.000	1.650	-
NITES-Next / Engineering	C/IDIQ	SSC PACIFIC : Various	0.000	0.000		3.423	May 2017	3.791	May 2018	-		3.791	Continuing	Continuing	Continuing
NITES-Next	C/BA	PS&E : Washington	0.207	0.000		0.000		0.000		-		0.000	0.000	0.207	-
NITES-Next	C/BA	COTF : Virginia	0.121	0.000		0.000		0.000		-		0.000	0.000	0.121	-
		Subtotal	137.123	7.441		11.512		9.687		-		9.687	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Cost	C/CPIF	IPD : Various	0.595	0.000		0.000		0.000		-		0.000	0.000	0.595	-
NITES-Next	C/FP	SAIC : Virginia	4.265	0.959	Dec 2015	1.191	Feb 2017	1.232	Dec 2017	-		1.232	Continuing	Continuing	Continuing
NITES-Next	C/FP	NAVAIR : Maryland	0.125	0.000		0.000		0.000		-		0.000	0.000	0.125	-
		Subtotal	4.985	0.959		1.191		1.232		-		1.232	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

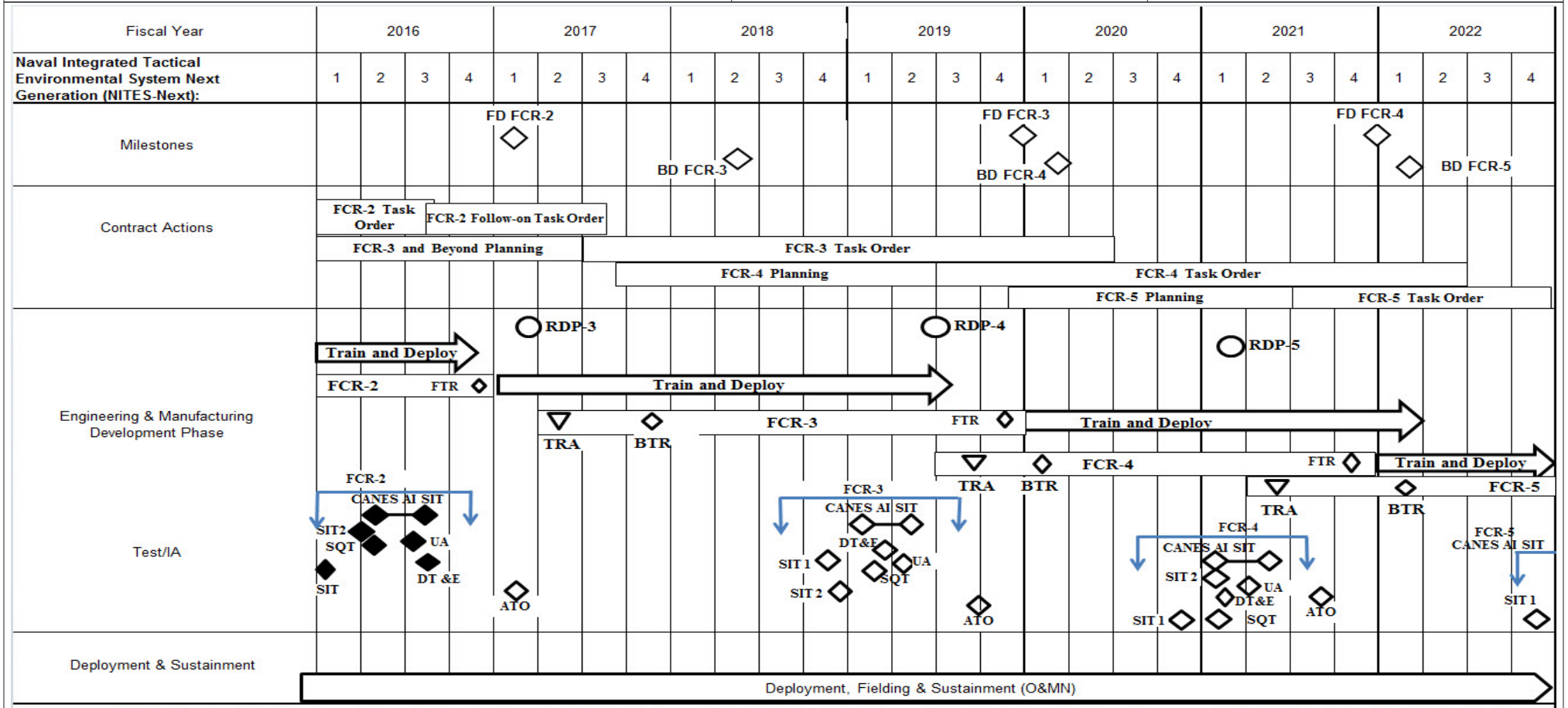
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Various : Various	0.031	0.000		0.000		0.000		-		0.000	0.000	0.031	-
NITES-Next	WR	SSC Pacific : San Diego, CA	0.800	0.340	Dec 2015	0.293	Oct 2016	0.303	Nov 2017	-		0.303	Continuing	Continuing	Continuing
NITES-Next	C/FP	BAH : San Diego, CA	1.451	0.319	Dec 2015	0.477	Dec 2016	0.493	Dec 2017	-		0.493	0.000	2.740	-
		Subtotal	2.282	0.659		0.770		0.796		-		0.796	-	-	-

	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	144.390	9.059		13.473		11.715		-		11.715	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*



Acronyms: OTRR = Opertional Test Readiness Review. RDP = Requirements Definition Package. FCR = Fleet Capability Release. TRA = Technology Readiness Assessment. BD = Build Decision. FD = Fielding Decision. Limited Fielding Decision = LFD. IOC= Initial Operational Capability. IATO = Interim Authority to Operate. ATO = Authority to Operate. UA = User Assessment. BTR = Build Technical Review. Field Technical Reivew = FTR. SIT = System Integration Test. RALOT = Risk Assessment Level of Testing. DT&E = Developmental Test & Evaluation. ADM - Acquisition Decision Memorandum. SOVT = System Verification Operational Test. CANES = Consolidated Afloat Networks and Enterprise Services. AI = Application Integration.

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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 - 3	2	2018	2	2018
Milestones: Fielding Decision Fleet Capability Release - 2	1	2017	1	2017
Milestones: Build Decision Fleet Capability Release - 4	1	2020	1	2020
Milestones: Fielding Decision Fleet Capability Release - 3	4	2019	4	2019
Milestones: Fielding Decision Fleet Capability Release - 4	4	2021	4	2021
Milestones: Building Decision Fleet Capability Release - 5	1	2022	1	2022
Contract Actions: FCR-2 Task Order	1	2016	3	2016
Contract Actions: FCR-3 Task Order	3	2017	2	2020
Contract Actions: FCR-3-Beyond Planning	1	2016	2	2017
Contract Actions: FCR-4 Task Order	3	2019	2	2022
Contract Actions: FCR-4 Planning	3	2017	2	2019
Contract Actions: FCR-5 Planning	4	2019	3	2021
Contract Actions: FCR-5 Task Order	3	2021	4	2022
Engineering & Manufacturing Development Phase: Fleet Capability Release - 2 / Train Deploy	1	2017	3	2019
Engineering & Manufacturing Development Phase: Fleet Capability Release - 3 / Train Deploy	1	2020	1	2022
Engineering & Manufacturing Development Phase: Fleet Capability Release - 4 / Train and Deploy	1	2022	4	2022
Engineering & Manufacturing Development Phase: Fleet Capability Release - 5	2	2021	4	2022
Engineering & Manufacturing Development Phase: Requirements Definition Package - 3	1	2017	1	2017

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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: Requirements Definition Package - 4	2	2019	2	2019
Engineering & Manufacturing Development Phase: Requirements Definition Package - 5	1	2021	1	2021
Engineering & Manufacturing Development Phase: Build Technical Review FCR-3	4	2017	4	2017
Engineering & Manufacturing Development Phase: Build Technical Review FCR-4	1	2020	1	2020
Engineering & Manufacturing Development Phase: Build Technical Review FCR-5	1	2022	1	2022
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 3	2	2017	2	2017
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 4	3	2019	3	2019
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 5	2	2021	2	2021
Engineering & Manufacturing Development Phase: Field Technical Review FCR-2	4	2016	4	2016
Engineering & Manufacturing Development Phase: Field Technical Review FCR-3	4	2019	4	2019
Engineering & Manufacturing Development Phase: Field Technical Review FCR-4	4	2021	4	2021
Test/IA: Fleet Capability Release - 2	1	2016	4	2016
Test/IA: Fleet Capability Release - 3	3	2018	3	2019
Test/IA: Fleet Capability Release - 4	3	2020	3	2021
Test/IA: Fleet Capability Release - 5	4	2022	4	2022
Test/IA: System Integration Test - 1 (FCR-2)	1	2016	1	2016
Test/IA: System Integration Test - 2 (FCR-2)	2	2016	2	2016
Test/IA: System Integration Test - 1 (FCR-3)	4	2018	4	2018
Test/IA: System Integration Test - 2 (FCR-3)	4	2018	4	2018
Test/IA: System Integration Test - 1 (FCR-4)	4	2020	4	2020
Test/IA: System Integration Test - 2 (FCR4)	1	2021	1	2021
Test/IA: System Integration Test - 1 (FCR-5)	4	2022	4	2022

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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: Authority to Operate FCR-2	1	2017	1	2017
Test/IA: Authority to Operate FCR-3	3	2019	3	2019
Test/IA: Authority to Operate FCR-4	3	2021	3	2021
Test/IA: System Qualification Test FCR-2	2	2016	2	2016
Test/IA: System Qualification Test FCR-3	1	2019	1	2019
Test/IA: System Qualification Test FCR-4	1	2021	1	2021
Test/IA: Developmental Test Fleet Capability Release - FCR-2	3	2016	3	2016
Test/IA: Developmental Test Fleet Capability Release - FCR-3	1	2019	1	2019
Test/IA: Developmental Test Fleet Capability Release - FCR-4	1	2021	1	2021
Test/IA: User Assessment FCR-2	3	2016	3	2016
Test/IA: User Assessment FCR-3	2	2019	2	2019
Test/IA: User Assessment FCR-4	2	2021	2	2021
Test/IA: CANES AI SIT FCR-2	2	2016	3	2016
Test/IA: CANES AI SIT FCR-3	1	2019	2	2019
Test/IA: CANES AI SIT FCR-4	1	2021	2	2021
Test/IA: Deployment and Sustainment: Deployment, fielding and Sustainment (OMN)	1	2016	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2344.: *Precise Time and Astrometry*	8.600	4.797	5.636	5.190	-	5.190	4.705	3.072	3.127	3.132	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. 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 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'.

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 Hydrogen Maser and 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.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Precise Timing and Astronomy	4.797	5.636	5.190	0.000	5.190
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 2016 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 and have achieved Initial Office Capability (IOC). Lab demonstration of the fiber optic cable have been successful and a fiber link between USNO and NRL is showing excellent stability. Critical Time Dissemination tech refresh activities are proceeding. Earth Orientation: Very Long Baseline Interferomtry System (VLBI) Software (SW) correlator has achieved FOC and is now the operational VLBI correlator at United States Naval Observatory (USNO). The Graphical User Interface (GUI) is now the primary method of interfacing with the SW correlator. The VLBI2010 antenna has been installed and accepted at Kokee Park Observatory in Hawaii. The VLBI 2010 signal chain has been installed and the entire system has achieved Initial Office Capability (IOC). Two contracts for a programmers to work on the EOP Automation have been awarded and one of the three processing paths for EOP production is now under software monitoring.					
FY 2017 Plans: - Final Operating Capability (FOC) for Rb Fountains at USNO Alternate Master Clock facility - Continue Optical Fiber timing link demonstrations in fiber network - Continue Critical Time Dissemination Activities - Continue EOP Automation work - Complete FACD study for 1.8m telescope enclosure at NOFS - Begin 1.8m construction contracting and kickoff activities					
FY 2018 Base Plans: - Field operational Optical Fiber timing link in DC metro area - Lab demonstration of optical clock prototype - Continue Critical Time Dissemination Activities - Transition EOP automation products to operations - FOC for Kokee Park radio telescope					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
* Complete 1.8m telescope enclosure at NOFS ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	4.797	5.636	5.190	0.000	5.190

C. Other Program Funding Summary ($ in Millions)

N/A

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 FY17.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2363.: *Remote Sensing Capability Development*	4.949	2.406	3.855	3.959	-	3.959	3.990	4.033	4.109	4.189	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Remote Sensing Capability Development characterizes 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 2018 request provides for continued target data collection, enhancements on algorithms and continue to integrate algorithms for access over the network.

FY18 funds increase to develop and deliver algorithms in support of the Remote Sensing Capability Development (RSCD) project and will support Fleet Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) missions.
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.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Remote Sensing Capability Development	1.770	3.636	3.899	0.000	3.899
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued data collection in various weather and sea states to broaden the range of environmental conditions and reduced uncertainty in environmental prediction. Continued software algorithm enhancements to automatically detect oceanographic phenomena. Conducted algorithm Acceptance Decision. Continued to integrate algorithms for access over the network. Conducted Algorithm Transition Board. Continued to evolve development of training to provide the user community education on using the different tools and applications. Coordinate Task, Collect, Process, Exploit, Disseminate (TCPED) process amongst inter-agencies to support Navy Missions. Provided Navy leadership status on emerging capabilities.					
FY 2017 Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Develop data collection strategy and collections process. Continue data collection in various weather and sea states to broaden the range of environmental conditions and reduce uncertainty in environmental prediction. Conduct software algorithm performance analysis. Continue software algorithm enhancements to automatically detect oceanographic phenomena. Continue software algorithm enhancements and modifications to support transition to a new architecture. Develop and implement the algorithm performance assessment strategy as well as the test and evaluation plans. Document software algorithm test reports. Conduct algorithm Acceptance Decision. Continue to integrate algorithms for access over the network. Conduct algorithm Fielding Decision. Continue development of training to provide the user community education on using the different tools and applications. Coordinate Task, Collect, Process, Exploit, Disseminate (TCPED) process amongst inter-agencies to support Navy Missions. Provide Navy leadership status on emerging capabilities. ***FY 2018 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 software algorithm performance analysis. Continue software algorithm enhancements to automatically detect oceanographic phenomena. Continue software algorithm enhancements and modifications to support transition to a new architecture. Continue to implement the algorithm performance assessment strategy as well as the test and evaluation plans. Document software algorithm test reports. Conduct algorithm Integration Decision. Continue to integrate algorithms for access over the network. Continue development of training to provide the user community education on using the different tools and applications. Coordinate TCPED process amongst inter-agencies to support Navy Missions. Award contract for Development and Integration efforts. Conduct algorithm Fielding Decision. Award contract for Development and Integration efforts. ***FY 2018 OCO Plans:*** N/A					
Title: Remote Sensing Capability Dev. ***Articles:*** ***Description:*** 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. (Details held at a higher classification)	0.636 -	0.219 -	0.060 -	0.000 -	0.060 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
FY 2016 Accomplishments: -Continue remote sensing system capability development -Develop and enhance software algorithms to automatically detect oceanographic phenomena ***FY 2017 Plans:*** - Continue all efforts of FY 2016 less those noted as completed above. - Coordinate TCPED process across DoD and civilian government agencies to support Navy Missions. ***FY 2018 Base Plans:*** Continue all efforts of FY 2017 less those noted as completed above. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	2.406	3.855	3.959	0.000	3.959

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Remote Sensing Capability Development is being managed as a PEO Project, via a Project Definition Document (PDD) construct for acquisition rigor and oversight. 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

Available in the Project's Requirements Definition Package (RDP).
Classified performance metrics are available in the Project's Requirements Definition Package (RDP) approved 14 July 2015

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
3207: *Fleet Synthetic Training*	0.509	0.957	0.970	0.253	-	0.253	0.274	0.294	0.315	0.336	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 Readiness 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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Fleet Synthetic Training	0.957	0.970	0.253	0.000	0.253
Articles:	-	-	-	-	-
Description: Develop and deliver software that characterizes the ocean and atmospheric environments; adjusts to meet fleet-required training scenarios; allows synthetic training to be conducted in areas of planned and contingency operations; and provides sufficient detail to simulate the real-world conditions of the physical environment in those areas of interest. Accomplishments include development of meteorological and oceanographic environmental databases for total of 14 Navy Continuous Training Environment (NCTE) exercise areas. Conducted data and architecture testing between Commander, Naval Meteorology and Oceanography Command (CNMOC) data and the Environmental Data Cube Support System (EDCSS). Integrated environmental database hosting at the Naval Oceanographic Office. Developed capability to realistically simulate bathythermograph data collection based on					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
synthetic ocean environment for total 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.					
FY 2016 Accomplishments: - Developed Modeling on Demand capability resident in new version of Coupled Ocean/Atmosphere Mesoscale Prediction System On Scene (COAMPS-OS). - Completed conversion of 17 year Hybrid Coordinate Ocean Model (HYCOM) database to mineable format. - Commenced development of a virtual testbed to develop new EDCSS related capabilities. Commenced development of a wide-area network capability to overcome bandwidth limitations and more effectively deliver METOC to all NCTE constituencies. - Commenced development of an in-situ modification capability for EDCSS (WxSim). Continued work on FMV support and research into METOC impacts on Joint Semi-Automated Forces (JSAF) application, and NextGen Threat System. - Completed accreditation of EDCSS.					
FY 2017 Plans: - Complete development of METOC Base Objective Model (BOM) content delivery mechanism on the Wide Area Network (WAN) - Research EDCSS Cloud architecture (COOP capability and potential for shipboard integration). - Complete work on virtual testbed and research METOC impacts on Joint Semi-Automated Forces (JSAF) application, and NextGen Threat System. - Develop WxSim (On-site METOC scenario control and editing)					
FY 2018 Base Plans: - Develop Machine-to-Machine (M2M) capability for Environmental Data Cube Support System (EDCSS) interface in support of environmental product generation. - Research possible Fleet Synthetic Training (FST) integration into advanced training (Integrated team trainers, warfighting development center support, etc.) - Research/Implement live virtual constructive capability leveraging virtual testbed and Full Motion Video/Joint Semi-Automatic Forces/Next Generation Threat System research.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Develop support for Electromagnetic Spectrum Maneuver Warfare (EMMW) leveraging Full Motion Video/Joint Semi-Automatic Forces/Next Generation Threat System research. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.957	0.970	0.253	0.000	0.253

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) Naval Information Forces (NAVIFOR) will produce meteorological and oceanographic environmental databases for all Navy Continuous Training Environment (NCTE) exercise areas. Will implement, test, and integrate with Joint Semi Automated Forces (JSAF) and other federates in accordance with requirements.

2) NAVIFOR 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) NAVIFOR 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.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3404 / *Tactical Environmental Support*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
3404: *Tactical Environmental Support*	0.000	0.000	0.000	0.327	-	0.327	0.619	0.648	0.675	0.704	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Tactical Environment Support, initiated in FY 2018, enables the warfighter to leverage environmental data by incorporating them into technological applications that shape the way commanders engage the enemy, take advantage of environmental conditions (and their impacts on systems and sensors) and complete the mission in the most efficient manner feasible. Software decision support tools complement and provide capabilities found in Naval Integrated Tactical Environmental System Next Generation (NITES-Next) Program of Record (POR), and provide platform, sensor, communications, and weapon systems performance assessments for littoral and deep-strike warfighters. The following warfighting disciplines benefit directly from these METOC Exploitation capabilities: (1) Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare, (AAW), Strike Warfare (STW), Expeditionary Warfare (EXW), Electronic Warfare (EW), Information Operations (IO), Intelligence Operations (INT), Non-Combat Operations (NCO), Command, Control, Communication (CCC), and Naval Special Warfare (NSW).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Tactical Environmental Support	0.000	0.000	0.327	0.000	0.327
Articles:	-	-	-	-	-
Description: Fleet Naval METOC has updated the definition and structure of the METOC program along the lines of operational mission needs. This update focuses on the operational characteristics of Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) of METOC data and information. Identified efforts supporting METOC Tactical Environmental Support are realigned to projects and activities that align to the TCPED updated program structure. The Tactical Environmental Support project consolidates environmental focused prior year efforts previously identified in 0603207N (Air/Ocean Tactical Applications) projects Meteorological and Oceanographic (METOC) Data Assimilation and Mod, Meteorological and Oceanographic (METOC) Data Acquisition and in PE 0604218N (Air/Ocean Equipment Engineering) Project 2345.					
FY 2016 Accomplishments: N/A					
FY 2017 Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A ***FY 2018 Base Plans:*** - Continue model data validation efforts - Continue Scalable Tactical Acoustic Propagation Loss Engine (STAPLE) transitions - Continue verification and validation of algorithms through Commander Naval Meteorology and Oceanography Command for operational use - Continued development of Advanced Refractive Effects Prediction System (AREPS) Advance Propagation Model (APM) modules and visualization - Continue development, integration and transition of Naval Research Lab Atmospheric Acoustic Propagation (NRL-AAP) v 3.2. - Continue research that emphasizes the enhancement of METOC Decision Aids (MDAs) and Operational Effects Decision Aids (OEDAs), such as Target Acquisition Weapons Software (TAWS), Electro-optical (EO) - View, STAPLE, ocean wave applications, ship-routing applications and illegal trafficking probability applications. - Continue the enhancement of observational, assimilated and predicted METOC data in order to improve the reliability of MDAs and OEDAs that rely on these data for effectiveness. - Continue work on the ability for MDAs and OEDAs to access data obtained through direct interfaces to Navy combat systems, making them more relevant to specific missions and weapons systems. - Continue efforts that focus on cyber security of all METOC Dissemination applications. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.000	0.000	0.327	0.000	0.327

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Tactical Environmental Support Project to develop, demonstrate and validate products and decision aids to understand and predict the impact of the environment on military operations.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

E. Performance Metrics

Goal: Develop techniques and tools to transform traditional METOC predicted variables into more directly tactially relevant variables, and allow METOC personnel and others to understand the impact of the environment on sensors, communications, and weapons. Focus areas include, but are not limited to, electromagnetic maneuver warfare, electro-optical impacts (of environment on sensors and weapons systems), and anstisubmarine warfare. Metric -- Tasks will address no less than 75% of applicable capability gaps and requirements.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3405 / *Decision Support Products & Dissemination*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
3405: *Decision Support Products & Dissemination*	0.000	0.000	0.000	0.327	-	0.327	0.619	0.647	0.676	0.704	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Decision Support Products & Dissemination efforts enable the future warfighter to leverage environmental data gathered, assimilated, predicted and exploited by optimizing data formatting, compression, packaging, depiction, data-basing and transfer methodologies that permit the rapid dissemination of actionable battlespace environmental (METOC) information over tactical and reach-back networks. This project ensures warfighters, commanders and those who support them are fully synchronized in terms of environmental data products shared among a multitude of platforms, systems and common operating pictures (COPs). METOC information is highly dynamic. Just as time synchronization is essential to navigation principles, timely METOC knowledge and information are vital to battlespace environmental exploitation, placing the warfighter and support elements in spatial and temporal synchronization, and at a collective advantage, in terms of the current and predicted states of the ocean and atmosphere.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Decision Support Products & Dissemination	0.000	0.000	0.327	0.000	0.327
Articles:	-	-	-	-	-
Description: Decision Support Products & Dissemination focuses on efforts to combine real time data (tasking and collection) meteorological and oceanographic forecasts (processing), further derived tactical products (exploitation) into decision support products that can be merged with other sources of operational and intelligence data to clarify the operating environment for commanders at all levels. Fleet Naval METOC has updated the definition and structure of the METOC program along the lines of operational mission needs. This update focuses on the operational characteristics of Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) of METOC data and information. Identified efforts supporting METOC are realigned to projects and activities that align to the TCPED updated program structure. Decision Support Products and Dissemination related efforts previously identified in 0603207N (Air/Ocean Tactical Applications) projects Meteorological and Oceanographic (METOC) Data Assimilation and Mod, Meteorological and Oceanographic (METOC) Data Acquisition and in PE 0604218N (Air/Ocean Equipment Engineering) Project 2345.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
FY 2016 Accomplishments: N/A ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:*** - Continue efforts pertaining to ocean and atmosphere model performance assessment and verification to better inform decision makers and mission planners. - Continue development of ASW planning and evaluation tools. - Continue development of optimum ship-routing planning and execution tools. - Continue work to narrow gaps between the NITES-Next POR and existing METOC planning tools and decision aids. - Continue efforts to provide decision aids, or feed environmental information to other developing decision aids to assist commanders at the tactical, operational, and strategic levels of warfare and for non-combat operations. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.000	0.000	0.327	0.000	0.327

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Decision Support Products & Dissemination Project to develop, demonstrate and validate products and decision aids to provide environmentally based recommendations to commanders at the Strategic, Operational, and Tactical levels of military operations.

E. Performance Metrics

Goal: Develop techniques and tools to provide tactially relevant METOC based advice to military commanders. Focus areas include, but are not limited to, electromagnetic maneuver warfare, electro-optical impacts (of environment on sensors and weapons systems), and anstisubmarine warfare. Metric -- Tasks will address no less than 75% of applicable capability gaps and requirements.