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 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604218N *I Air/Ocean Equipment Engineering*							
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	81.339	4.406	3.875	0.782	-	0.782	0.690	0.719	0.739	0.747	Continuing	Continuing
2345: *Fleet METOC Equipment*	58.719	3.281	2.692	0.782	-	0.782	0.690	0.719	0.739	0.747	Continuing	Continuing
2346: *METOC Sensor Engineering*	22.620	1.125	1.183	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.928

A. Mission Description and Budget Item Justification

The Air/Ocean Equipment Engineering (AOEE) Program Element provides new capabilities to support naval combat forces. This program engineers and developmentally tests organic and remote sensors, communication interfaces, and processing and display devices. This equipment is engineered to measure, ingest, store, process, distribute and display conditions of the physical environment that are essential to the optimum employment and performance of naval warfare systems. AOEE also engineers capabilities for shipboard and shore-based tactical systems. A major area of focus for the AOEE program is to provide the engineering development of specialized equipment and measurement capabilities that are intended to monitor specific conditions of the physical environment in hostile and remote areas in response to fleet demand signals for increased sensing capability and capacity to support battlespace collections and prediction on short to intermediate time scales. With such capabilities, the war fighters' situational awareness of the operational effects of the physical environment are made more certain.

Major emphasis is on the Meteorological and Oceanographic Future Mission Capabilities (METOC FMC) project.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	4.515	3.875	4.563	-	4.563
Current President's Budget	4.406	3.875	0.782	-	0.782
Total Adjustments	-0.109	0.000	-3.781	-	-3.781
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.109	0.000			
• Program Adjustments	0.000	0.000	-3.827	-	-3.827
• Rate/Misc Adjustments	0.000	0.000	0.046	-	0.046

Change Summary Explanation

Decrease in FY18 funding for Fleet METOC Equipment is a result of a realignment from Research and Development (RDT&E,N) to Other Procurement, Navy (OP,N), BLI 4226 Littoral Battlespace Systems -Autonomous Unmanned Vehicle, Submarine Variant (LBS-AUV(S)).

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604218N / *Air/Ocean Equipment Engineering*	Project (Number/Name) 2345 / *Fleet METOC Equipment*	

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
2345: *Fleet METOC Equipment*	58.719	3.281	2.692	0.782	-	0.782	0.690	0.719	0.739	0.747	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides for the engineering and manufacturing development of sensors, communication interfaces, processing and display meteorological and oceanographic (METOC) equipment. This equipment is designed to provide future mission capabilities for war fighters to measure, ingest, store, process, distribute and display METOC parameters and derived products.

This project also exploits new government off-the-shelf /commercial off-the-shelf technologies, tactical sensors and web enablement for the Navy's computer-based tactical shipboard and shore capability used to predict and assess the operational effects of the physical environment on the performance of platforms, weapons and sensor systems. This project includes development of warfare specific mission planning modules to support unmanned systems with integration of data from environmental and tactical sensor systems, model forecast information and Geospatial Information & Services Databases. This project also supports development of autonomous environmental sensing systems for situational awareness and tactical decision aid/mission planner support, as well as iridium and advanced satellite communication integration in METOC sensor, vehicle control and mission planning systems that will be required to achieve Chief of Naval Operation objectives for information dominance and decision superiority.

Major emphasis areas include the Meteorological and Oceanographic Future Mission Capabilities (METOC FMC) project, Littoral Battlespace Sensors - Unmanned Undersea Vehicles (LBS-UUV) and the Environmental Satellite Receiver Processor (ESRP) (comprised of AN/SMQ-11 (sea and shore configuration) and AN/FMQ-17 (shore configuration)) program.

FY 2018 request provides for the Littoral Battlespace Sensors - Gliders (LBS-G) and Littoral Battlespace Sensors - Autonomous Undersea Vehicles (LBS-AUV) engineering design studies as well as the development of Engineering Change Proposals (ECP's) for any identified software and or hardware deficiencies. FY18 request also provides for continued investigation of next generation propulsion technologies.

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)	2.861	0.470	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued advanced METOC infrastructure development for METOC decision support software applications and interfaces to tactical and strategic decision aids along with component and prototype efforts associated with acquiring environmental data. Continued development of an end-to-end methodology to collect, fuse, and					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604218N / *Air/Ocean Equipment Engineering*	**Project (Number/Name)** 2345 / *Fleet METOC Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
integrate these data into Navy and DoD networks and command & control nodes. Continued development of support infrastructure for advanced global & regional Meteorological Oceanographic (METOC) prediction systems. Began the Dual Band (air surveillance) Radar design and development for the new weather radar processing and display software for CVN 78 class ships. ***FY 2017 Plans:*** Advanced software tools development for METOC asset allocation, METOC decision support software applications, and interfaces to tactical and strategic decision aids along with component and prototype efforts associated with acquiring environmental data. Development of an end-to-end methodology to collect, fuse, and integrate these data into Navy and DoD networks and command & control nodes. Development of support infrastructure for advanced global & regional METOC prediction systems. The Navy decided to discontinue the FMC project label, starting in 2018. This was done as part of an effort to restructure METOC research and development funding into the Tasking, Collection, Prediction, Exploitation, and Dissemination (TCPED) construct coming into common use throughout Naval Information Forces. This restructuring for FY18 moves all METOC RDT&E into PE 0603207N. FY2017 FMC efforts will be remapped to TCPED based projects in FY2018. ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:*** N/A					
Title: Littoral Battlespace Sensors - Unmanned Undersea Vehicle (LBS-UUV)	0.138	1.957	0.463	0.000	0.463
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Conducted Littoral Battlespace Sensors - Gliders (LBS-G) and Littoral Battlespace Sensors - Autonomous Undersea Vehicles (LBS-AUV) engineering design studies as required. Developed system upgrades via Engineering Change Proposals (ECP's) to correct any identified software and hardware deficiencies. Continued efforts on AUV autonomy. Continued Glider Operations Center (GOC) automation efforts and battery redesign investigations. Began investigating next generation propulsion technologies such as the Hybrid Thruster, battery chemistry, thermal engines, and universal buoyancy engines for potential system upgrades as directed. ***FY 2017 Plans:*** Conduct LBS-G and LBS-AUV engineering design studies as required. Develop LBS-AUV submarine variant technical data package for sensor payloads. Develop system upgrades via ECPs and correct any identified					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604218N / *Air/Ocean Equipment Engineering*	**Project (Number/Name)** 2345 / *Fleet METOC Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
software and/or hardware deficiencies as required. Continue efforts on AUV autonomy. Continue GOC automation efforts. Continue investigating next generation propulsion technologies such as the Hybrid Thruster, battery chemistry, thermal engines, and universal buoyancy engines for potential system upgrades. ***FY 2018 Base Plans:*** Conduct Littoral Battlespace Sensors - Gliders (LBS-G) and Littoral Battlespace Sensors - Autonomous Undersea Vehicles (LBS-AUV) engineering design studies. Develop system upgrades via Engineering Change Proposals (ECP's) and correct any identified software and/or hardware deficiencies. Continue investigating next generation propulsion technologies such as Hybrid Thruster, battery chemistry, thermal engines, and universal buoyancy engines for potential system upgrades. ***FY 2018 OCO Plans:*** N/A					
Title: Environmental Satellite Receiver Processor (ESRP)	0.282	0.265	0.319	0.000	0.319
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued to develop and test annual hardware and software upgrades to integrate new METOC Satellite Sensors available in the Geostationary Operational Environmental Satellites (GOES) and Polar Orbiting Environmental Satellites (POES). Continued integration of ESRP systems in support of Joint Polar Satellite System (JPSS) and Europe Meteorology Satellites (EUMETSAT). Overall program efforts included investigation of emerging technologies through study, development and associated testing for feasibility of program insertion. ***FY 2017 Plans:*** Continue to develop and test annual hardware and software upgrades to integrate new METOC Satellite Sensors available in the GOES and the POES. Continue integration of ESRP systems in support of JPSS, and EUMETSAT. Overall program efforts include investigation of emerging technologies through study, development and associated testing for feasibility of program insertion. ***FY 2018 Base Plans:*** Continue to develop and test annual hardware and software upgrades to integrate new METOC Satellite Sensors available in the GOES and the POES. Continue integration of ESRP systems in support of Defense Weather Satellite System (DWSS), which has replaced JPSS, and EUMETSAT. Overall program efforts include					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604218N / *Air/Ocean Equipment Engineering*	**Project (Number/Name)** 2345 / *Fleet METOC Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
investigation of emerging technologies through study, development and associated testing for feasibility of program insertion. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	3.281	2.692	0.782	0.000	0.782

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
• OPN/4226: *Meteorological Equipment*	14.997	29.253	21.137	-	21.137	21.669	40.947	46.331	26.091	Continuing	Continuing
• RDTEN/0603207N/2341: *METOC Data Acquisition*	3.733	4.437	5.483	-	5.483	5.283	5.300	5.405	5.513	Continuing	Continuing
• RDTEN/0603207N/2342: *METOC Data Assimilation and MOD*	16.174	20.165	21.111	-	21.111	21.407	21.734	22.211	22.676	Continuing	Continuing
• RDTEN/0604218N/2346: *METOC Sensor Engineering*	1.125	1.183	0.000	-	0.000	9.933	0.000	0.000	0.000	0.000	34.861

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support engineering and manufacturing development by providing funds to Naval Research Laboratories and miscellaneous contractors, with management oversight by the Office of Naval Research.

E. Performance Metrics

Goal: Develop and engineer equipment to acquire meteorological and oceanographic (METOC) data in order to improve the accuracy of global and regional scale Meteorological and Oceanographic forecast models.
Metric: Tasks will address no less than 75% of applicable capability gaps and requirements, as identified by Resource and Requirements Sponsor(s). As tasks relate to exploitation of fleet sensors for METOC data (Through-the-Sensor), no less than 80% of approved initiatives will maintain cost, schedule, performance and transition risk analysis certification that will have been completed within the past 12 months.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604218N / *Air/Ocean Equipment Engineering*	Project (Number/Name) 2346 / *METOC Sensor Engineering*	

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
2346: *METOC Sensor Engineering*	22.620	1.125	1.183	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.928
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides for the engineering and manufacturing development of specialized, high resolution instrumentation systems and measurement capabilities for obtaining near real-time, in-situ Meteorological and Oceanographic (METOC) data in hostile, remote, and denied areas. The project's objectives are to engineer near term future mission sensing capabilities that are intended to survive the harsh littoral and deep-strike environments and also to meet demanding requirements for timeliness and accuracy. Engineering is performed within this project to ensure that air and safety certification for deployment from fleet aircraft or ships is met and that the proper data formats are engineered for electronic communications transmissions, human interface displays, and inputs to predictive models. The major area of emphasis is the METOC Future Mission Capabilities (FMC) 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)	1.125	1.183	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Navy decided to discontinue the FMC project label, starting in 2018. This was done as part of an effort to restructure METOC research and development funding into the Tasking, Collection, Prediction, Exploitation, and Dissemination (TCPED) construct coming into common use throughout Naval Information Forces. This restructuring for FY18 moves METOC RDT&E into PE 0603207N.					
FY 2016 Accomplishments: Systems development of METOC manned, unmanned and automated sensing technologies (to include integration of environmental sensors into a larger environmental sensing strategy). Continued 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. Continued to develop infrastructure to acquire, process and distribute METOC data and products. Additionally, FY16 funding assessed new sensor capabilities.					
FY 2017 Plans: 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,					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604218N / *Air/Ocean Equipment Engineering*	**Project (Number/Name)** 2346 / *METOC Sensor Engineering*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
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 Meteorological and Oceanographic (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. The Navy has decided to discontinue the FMC project label, starting in 2018. This was done as part of an effort to restructure METOC research and development funding into the Tasking, Collection, Prediction, Exploitation, and Dissemination (TCPED) construct coming into common use throughout Naval Information Forces. ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	1.125	1.183	0.000	0.000	0.000

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/0603207N/2341: *METOC DATA ACQUISITION*	3.733	4.437	5.467	-	5.467	5.316	5.341	5.447	5.556	Continuing	Continuing
• RDTEN/0603207N/2342: *METOC DATA ASSIMILATION AND MOD*	16.173	20.165	19.997	-	19.997	20.869	21.221	21.698	22.162	Continuing	Continuing
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	3.281	2.692	0.736	-	0.736	0.723	0.691	0.704	0.718	Continuing	Continuing

Remarks

D. Acquisition Strategy

Acquisition and contracting strategies are to support engineering and manufacturing development of specialized, high resolution instrumentation systems and measurement techniques for obtaining near real-time in-situ Meteorological and Oceanographic (METOC) data in denied or remote areas by providing funds to miscellaneous performers.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604218N / *Air/Ocean Equipment Engineering*	**Project (Number/Name)** 2346 / *METOC Sensor Engineering*

E. Performance Metrics

Goal: Develop and engineer unique sensors to acquire METOC data in order to improve the accuracy of global and regional scale meteorological and oceanographic forecast models. Metric: Tasks will address no less than 75% of applicable capability gaps and requirements, as identified by Resource Sponsor and Type Commander(s). No less than 75% of sensor engineering initiatives will be informed by an Analysis of Alternatives or market study to assess the state of the technology.