Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Navy											Date: February 2015	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 6: *RDT&E Management Support*					R-1 Program Element (Number/Name) PE 0605866N *I Navy Space & Electr Warfare Supt*							
COST ($ in Millions)	**Prior Years**	**FY 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	3.885	2.503	5.316	-	5.316	10.160	11.730	11.070	10.928	Continuing	Continuing
0706: *EMC & RF Mgmt*	0.000	3.547	2.503	5.316	-	5.316	10.160	11.730	11.070	10.928	Continuing	Continuing
0739: *Navy C2 Top Level*	0.000	0.338	-	-	-	-	-	-	-	-	-	0.338

A. Mission Description and Budget Item Justification

Project 0706, Electromagnetic Compatibility (EMC) and Radio Frequency (RF) Management Program: Develops advanced technology to identify and eliminate Electromagnetic Interference (EMI) sources from Navy systems. Supports research and development technology efforts, develops top-level plans, and supports systems in the Space and Electronic Warfare (SEW) mission area. This program is resourced by OPNAV N2N6.

Project 0739, Navy Command, Control, Communications, Computers, and Intelligence (C4I) Top Level Requirements - This project provides analysis of both Fleet requirements and research and development technology to develop top-level plans and space systems in the Space and Electronic Warfare (SEW) mission area. The Space and Electronic Warfare Studies and Analysis Program (SEWSAP) supports analyses of fleet requirements and research and development technology to develop top-level plans for operating Navy Command, Control, Communications, Intelligence, Surveillance and Reconnaissance (C4ISR) and space systems in the SEW mission area.

B. Program Change Summary ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Previous President's Budget	3.264	2.505	2.712	-	2.712
Current President's Budget	3.885	2.503	5.316	-	5.316
Total Adjustments	0.621	-0.002	2.604	-	2.604
• Congressional General Reductions	-	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.647	-			
• SBIR/STTR Transfer	-0.026	-			
• Program Adjustments	-	-	16.358	-	16.358
• Rate/Misc Adjustments	-	-	-13.754	-	-13.754

Change Summary Explanation

The FY 2016 funding request was reduced by $0.3 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 6	R-1 Program Element (Number/Name) PE 0605866N / *Navy Space & Electr Warfare Supt*	Project (Number/Name) 0706 / *EMC & RF Mgmt*	

COST ($ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
0706: *EMC & RF Mgmt*	-	3.547	2.503	5.316	-	5.316	10.160	11.730	11.070	10.928	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Electromagnetic Compatibility (EMC) and Radio Frequency (RF) Management Program. This project develops tools, processes, and algorithms to identify and mitigate EMI sources for Navy systems and platforms.

(a) It will support the Afloat Electromagnetic Spectrum Operations Program (AESOP), an automated spectrum Fleet operational capability. The application will be enhanced to comply with fleet operational requirements and streamline Strike Force frequency management processes. It will provide automated Spectrum Management (SM) tools for development of operational task communication and radar/weapon plans to support fleet deployments, exercises, and contingency operations. It will provide identification and mitigation of EMI in Navy, North Atlantic Treaty Organization (NATO), Allied, Ashore and Joint Combat Operations. It will provide analysis related to spectrum reallocation proposals to assess impacts on Navy operations and systems.

(b) It will support the Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP) to identify, engineer, and evaluate effectiveness of potential EMI corrections. The program also characterizes and quantifies the operational impact of EMI problems on system's mission performance.

(c) It will support the Nuclear Electromagnetic Pulse (EMP) Survivability Program. The program assesses the EMP survivability of all mission critical systems and funds development of a hardness assurance and maintenance program. It will develop improved modeling capability to reduce hardness validation costs at delivery and over the lifetime of the system/platform. The program develops new and updated design criteria, test methodology, test limits, and survivability validation procedures for all Navy systems, ships, submarines and shore facilities.

(d) It will support the Real-Time Spectrum Operations Program. The program investigates Electromagnetic (EM) Environmental effects between shipboard transmitters/ receivers and develops EM and spectrum techniques with Commercial off the shelf (COTS) technologies to provide the ability to monitor EM spectrum usage and system EM degradation on all ships in a given strike group. The program will investigate technologies to build an EM Spectrum Common Operational Picture (COP) to detect and assess operational capabilities in real-time. Additional investigations will be performed to develop processes and procedures to predict the EM environment for planning purposes. In the out-years, these capabilities will be used to build the next generation combat system with inherent spectrum agility and self-awareness capability, further enhancing the Navy's ability to perform Command and Control (C2) of the EM Spectrum warfighting domain.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Afloat Electromagnetic Spectrum Operations Program (AESOP)	0.648	0.447	0.420	-	0.420
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 6	**R-1 Program Element (Number/Name)** PE 0605866N / *Navy Space & Electr Warfare Supt*	**Project (Number/Name)** 0706 / *EMC & RF Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
FY 2014 Accomplishments: Supported requirements as specified in the CNO's Navigation Plan for FY13-FY17, Net-centric warfare requirements, and the Joint Vision 2020. Researched, evaluated and updated Afloat Electromagnetic Spectrum Operations Program (AESOP) software in accordance with fleet operations, spectrum engineering advances, open architecture, extensible mark-up language (XML) standards, and Navy and Joint standards / interfaces. Designed, developed, and fielded an interface between Navy automated spectrum planning software and DoD-level Spectrum XXI, using the Military Communications Electronic Board (MCEB) Publication #8 XML format. Planned and conducted analyses/tests of new and modified Navy equipment (i.e., new communications waveforms) and calculated the electromagnetic compatibility criteria; documented new/updated criteria and parameters in Naval Sea (NAVSEA) Publication S9407-AA-GYD-010/(S) OP-3840 "Electromagnetic Compatibility (EMC) Criteria for Navy Systems" and test reports. Completed testing, evaluation, and Certification and Accreditation of AESOP version 3.1 and fielded software to all Fleet units (both ashore and afloat).					
FY 2015 Plans: Investigate evolving fleet operations procedures and protocols, identify new military equipment spectrum usage (e.g., multi-function, dual-band radars and communications, unmanned systems), spectrum engineering advances, automated data exchange standards, and Navy and Joint standards / interfaces for incorporation into AESOP's baseline architecture. Investigate and evaluate International, National, DoD and Navy spectrum processes. Provide engineering and analysis in support for DoD/DoN response to President's National Broadband Plan and Spectrum Inventory Act, and their associated impacts on Navy systems. Perform power density analyses and make recommendations for spectrum sharing, interference susceptibilities, required stand-off distances for compatibility, and impact assessments from any military concessions on spectrum use. Conduct technical and regulatory analyses for "comparable spectrum" targeted for potential migration by Navy systems that are displaced through spectrum reallocation. Research host nations' spectrum use in Navy deployment areas and develop recommendations for littoral radiation restrictions which honor host nation spectrum regulations while simultaneously maximizing US Navy capabilities.					
FY 2016 Base Plans: Identify new military equipment and review their spectrum usage. Perform analysis of these new systems against existing Fleet equipment, and develop potential scenarios for further testing and evaluation. Maintain awareness of International, National, DoD and Navy spectrum processes that could impact Naval operations.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 6	**R-1 Program Element (Number/Name)** PE 0605866N / *Navy Space & Electr Warfare Supt*	**Project (Number/Name)** 0706 / *EMC & RF Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Assess potential changes and develop tests to evaluate potential updates to the AESOP fleet operational application. Support the National Broadband Plan and Commercial Spectrum Inventory Act. ***FY 2016 OCO Plans:*** N/A					
Title: EMC Systems Engineering (SEMCIP)	1.144	0.643	1.033	-	1.033
Articles:	-	-	-	-	-
FY 2014 Accomplishments: Identified and characterized EMI which can debilitate the combat capability of strike force capability and operational readiness. During FY2014, engineering teams focused their efforts on the development of EMI solutions that supports the Enhanced Forward Error Correction for Television Direct to Sailor, SPY-3 Radar, Navy Multiband Terminal, Commercial Broadband Satellite Program, Ku-Band Common Data Link and Close-in Weapon System programs. Evaluated the effectiveness of proposed EMI solutions and coordinated with system program managers for proper integration of the final EMI solution.					
FY 2015 Plans: As new problems are identified, perform EMI Problem Characterization and Quantification to identify level of problem severity. EMI problems with a high severity level can debilitate the combat capability of strike force capability and operational readiness will be added to the priority list for evaluating potential EMI solutions. In FY2015 the major focus area will be on the Navy's Next Generation Radar(s), new Electronic Warfare systems and Satellite Communication programs. Evaluate the effectiveness of proposed EMI solutions and coordinate with system program managers for proper integration of the final EMI solution.					
FY 2016 Base Plans: As new problems are identified, perform EMI Problem Characterization and Quantification to identify level of problem severity. EMI problems with a high severity level can debilitate the combat capability of strike force capability and operational readiness will be added to the priority list for evaluating potential EMI solutions. In FY2016 it is anticipated that the major focus area will be on the Navy's Next Generation: Radars (i.e., Multi-Band and Dual Band Radars), Electronic Warfare Systems (i.e., Ships Signal Exploitation Equipment Increment F), Satellite Communication (i.e., the Navy Multi-Band Terminal and the Commercial Broadband Satellite Program), and Common Data Link Programs. Evaluate the effectiveness of proposed EMI solutions and coordinate with system program managers for proper integration of the final EMI solution.					
FY 2016 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 6	**R-1 Program Element (Number/Name)** PE 0605866N / *Navy Space & Electr Warfare Supt*	**Project (Number/Name)** 0706 / *EMC & RF Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
N/A					
Title: Electromagnetic Pulse (EMP) Survivability	0.931	0.713	0.924	-	0.924
Articles:	-	-	-	-	-

FY 2014 Accomplishments:
Completed EMP coupling experiments on the ex-USCGC MONHEGAN (an RDT&E test bed) to develop testing protocols including mobile EMP testing capability. The Final test report was issued on 30 May 2014. Received patent (US Patent No. 8562361 B2) for a new Cable Shield Ground Adapter (CSGA), completed a series of qualification testing and developed installation procedures for use on Navy Ships. Initiated a Transient Protection Device (TPD) project to research the life span and performance associated with EMP TPDs used in all Shipboard High Frequency (HF) systems. These are the only High-Altitude Electromagnetic Pulse (HEMP) protection method/device used to protect HF systems. The Navy does not have life cycle performance data on TPD's. Progress in the CSGA and TPD's support the requirement to develop Navy Hardness Maintenance and Hardness Surveillance techniques. These techniques supported the development of the new Maritime Standard for EMP (MIL-STD- 4023).

FY 2015 Plans:
Conduct follow-on EMP coupling experiments and modeling on the ex-USCGC MONHEGAN to develop a ship centric EMP threat relatable illumination method. Investigate and develop new testing techniques for ashore and afloat pulse current injection testing that will support the new Maritime EMP Standard (MIL-STD-4023). Develop streamlined testing capability to support grounding effectiveness testing, that will increase repeatability, verification of test results, while reducing total cost of ownership. Develop new testing capabilities/revised software capabilities at the Naval NSWCDD Naval Ordinance Transient Electromagnetic Simulator (NOTES) EMP Facility (ashore test bed) to meet MIL-STD-2169C threat levels. Conduct analysis and test & evaluation on a statistically valid sample of Transient Protection Device (TPD) to establish performance/degradation criteria. Develop in-situ methods for determining TPD performance that can result in development of new Maintenance Requirement Cards (MRCs) to be implemented by the Fleet. Current MRC's do not specify when TPD's should be replaced.

FY 2016 Base Plans:
Develop methods and tools for instrumenting and collecting data during EMP full threat simulator testing conducted on Navy ships. Investigate and develop new testing techniques for ashore and afloat pulse current injection testing. Evaluate and develop shore based EMP test protocols for use with planned installation of

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 6	**R-1 Program Element (Number/Name)** PE 0605866N / *Navy Space & Electr Warfare Supt*	**Project (Number/Name)** 0706 / *EMC & RF Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
antenna systems. Conduct test and evaluation of new materials and methods and develop approaches for EMP shielding of ship windows. ***FY 2016 OCO Plans:*** N/A					
Title: Real-Time Spectrum Operations	0.824	0.700	2.939	-	2.939
Articles:	-	-	-	-	-
FY 2014 Accomplishments: Supported operational concepts from the CNO's Electromagnetic Maneuver Warfare (EMMW) Roadmap. During FY2014, completed two (2) Lab demonstrations of the Real-Time Spectrum Operations (RTSO) Electromagnetic Interference (EMI) Detection and the Mission Planner capability (modules). The Lab demonstrations were provided to senior OPNAV N2N6 leadership, other Navy stakeholders, technical and programmatic personnel. Developed RTSO applications to provide the ability to monitor EM spectrum usage on ships in a strike group for a planned demonstration in FY2015/2016. Enhanced the EM Spectrum Common Operational Picture (COP) with initial prototype-like Graphical User Interface (GUI) displays to provide layers of spectrum terrain data for varying levels of command. Published version 2.0 of the US Navy's Information Dominance Roadmap for Electromagnetic Spectrum Usage, detailing accomplishments to date, and refined the action plan to identify top level Navy investments that will enable a leap-forward to provide Real-Time Spectrum Operations. ***FY 2015 Plans:*** Enhance the EM Spectrum COP to provide predictive layers of data displays for varying levels of command. Investigate the acquisition processes, procedures, and architecture protocols to support spectrum agility within new systems and equipment. Investigate technology to enhance system and equipment future operations, allowing full EM spectrum control (i.e., emissions control (EMCON), de-confliction to preclude EMI, advanced agility capabilities). Develop, test, and evaluate RTSO Applications and system connections to monitor spectrum usage. ***FY 2016 Base Plans:*** The CNO has requested funding for direct support and development of EMMW during POM-16. OPNAV N2N6 selected the Navy's RTSO program as a key tenet and enabler of Navy's EMMW concept. RTSO provides Electromagnetic Spectrum Awareness, EM Agility, Signature Control, and EM Engagement opportunities. It will enhance combat effects through effective coordination and control of the electromagnetic spectrum. POM-16 ALPHA and BRAVO aligned RTSO funding to enable fielding of initial Fleet capabilities in FY16.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 6	**R-1 Program Element (Number/Name)** PE 0605866N / *Navy Space & Electr Warfare Supt*	**Project (Number/Name)** 0706 / *EMC & RF Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
The increase in funding is due to development of an Enginnering Design Model (EDM). The RTSO EDM will interface with a number of shipboard systems and provide the Fleet a visual display of the spectrum terrain and Electromagnetic Interference (EMI), both friendly and hostile. RTSO will offer recommended actions to Fleet operators to mitigate these EMI problems, issues, and threats. ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	3.547	2.503	5.316	-	5.316

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

An acquisition strategy is not required.

E. Performance Metrics

Performance metrics will consist of quarterly program reviews.

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 6	R-1 Program Element (Number/Name) PE 0605866N / *Navy Space & Electr Warfare Supt*	Project (Number/Name) 0739 / *Navy C2 Top Level*	

COST ($ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
0739: *Navy C2 Top Level*	-	0.338	-	-	-	-	-	-	-	-	-	0.338
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides analysis of both Fleet requirements and research and development technology, to develop top-level plans and space systems in the Space and Electronic Warfare (SEW) mission area. The Space and Electronic Warfare Studies and Analysis Program (SEWSAP) supports analyses of fleet requirements and research and development technology to develop top-level plans for operating Navy Command, Control, Communications, Intelligence, Surveillance and Reconnaissance (C4ISR) and space systems in the SEW mission area. Supports Navy Information Dominance.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Navy C2 Top Level	0.338	-	-	-	-
Articles:	-	-	-	-	-
FY 2014 Accomplishments: - Completed studies supporting resource and requirement decisions in the PPBE System. Conducedt FORCEnet/Information Dominance Fleet experiments; FORCEnet/Information Dominance Architecture selection; evaluation of TTP and Research, Development, Test, and Evaluation (RDT&E) efforts with FORCEnet/ Information Dominance requirements. - Completed evaluation of M&S tools and scenarios.					
FY 2015 Plans: N/A					
FY 2016 Base Plans: N/A					
FY 2016 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	0.338	-	-	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
Appropriation/Budget Activity 1319 / 6	**R-1 Program Element (Number/Name)** PE 0605866N / *Navy Space & Electr Warfare Supt*	**Project (Number/Name)** 0739 / *Navy C2 Top Level*

D. Acquisition Strategy

An acquisition strategy is not required.

E. Performance Metrics

Conduct studies and report plans and analysis of Fleet requirements for operating Navy C4ISR and space systems in the space, electronic warfare, and information dominance mission areas.