Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy	Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	0.000	2.992	5.316	9.658	-	9.658	11.520	10.865	10.699	10.689	Continuing	Continuing
0706: *EMC & RF Mgmt*	0.000	2.992	5.316	9.658	-	9.658	11.520	10.865	10.699	10.689	Continuing	Continuing

Note

Increased budget from FY 2016 to FY 2017 is required to assemble components and field three (3) RTSO EDMs to US Navy Platforms/Activities. One RTSO Unit will be sent to a land based test site for continual testing and update, as modules are ready for testing. Two RTSO Units will be sent to deploying ships (one LANT and one PAC). Funding to support ship integration requirements (Ship Change Document, Information Assurance Accreditation, and Crew Training).

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.

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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	2.503	5.316	10.160	-	10.160
Current President's Budget	2.992	5.316	9.658	-	9.658
Total Adjustments	0.489	0.000	-0.502	-	-0.502
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.498	0.000			
• SBIR/STTR Transfer	-0.009	0.000			
• Program Adjustments	0.000	0.000	-0.160	-	-0.160
• Rate/Misc Adjustments	0.000	0.000	-0.342	-	-0.342

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Change Summary Explanation

Decrease in Navy Space & Electr Warfare Supt by $0.40M as required for the Department of the Navy to comply with the Bipartisan Budget Act of 2015.

The FY 2017 funding request was reduced by $0.160 million to account for Real Time Spectrum Capacity Reduction.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
0706: *EMC & RF Mgmt*	0.000	2.992	5.316	9.658	-	9.658	11.520	10.865	10.699	10.689	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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Afloat Electromagnetic Spectrum Operations Program (AESOP)	0.438	0.420	0.420	0.000	0.420
Articles:	-	-	-	-	-

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
FY 2015 Accomplishments: - Participated in the Joint Electromagnetic Spectrum Operations (JEMSO) working group and defined the architecture for DoD spectrum management. - Participated in the Joint Spectrum Data Repository (JSDR) working group and defined the requirements for spectrum data sharing. - Updated preliminary restrictions guidance for Commander, Fourth (4th) Fleet Area of Responsibility (AoR). - Updated restrictions guidance for the Commander, Fifth (5th) Fleet AOR to reflect spectrum use allowances. - Participated in the six (6) National Broadband Plan Meetings. - Supported development and final review of the 3.5 GHz National Broadband Analysis Report. - Supported development and final review of the 5.0 GHz National Broadband Analysis Report. - Reviewed and provided comments to the proposals for the National Broadband Plan - Technology Demonstrations.					
FY 2016 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. - 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 2017 Base Plans: - Identify new/modified military equipment and review their spectrum usage to provide capability to ships. - Perform analysis of these new/modified systems against existing Fleet equipment spectrum use, and develop potential scenarios for further testing and evaluation. - Update the common system database elements with equipment parameters, platform data, policy/littoral restrictions information. - Develop software modifications as needed to ensure interoperability and common analysis tools/techniques (e.g., propagation models). - Evaluate International, National, DoD and Navy spectrum processes that could impact Naval operations. - Assess potential changes and develop tests to evaluate potential updates to the fleet operational application.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
- Continue support for the National Broadband Plan and Commercial Spectrum Inventory Act. ***FY 2017 OCO Plans:*** N/A					
Title: Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP)	0.643	1.033	1.270	0.000	1.270
Articles:	-	-	-	-	-
FY 2015 Accomplishments: - Performed AN/SPQ-9B radar testing of the newest prototype transmit band-pass filter design on board the Self Defense Test Ship (SDTS). Use of a test target generator was needed to determine whether there were any decreases in the radar's performance. - Performed Radar Absorbing Material (RAM) testing of a new RAM material installed on USS Gerald Ford (CVN 78). - Completed Man Overboard Indicator (MOBI) EMI discovery testing aboard USS Bulkeley (DDG 84). - Conducted below-decks loopback testing aboard USS Mobile Bay (CG 53) and USS Somerset (LPD 25) at Naval Station in San Diego, CA. - Conducted emissions measurements on the Pandora Network and its subsystem components on board USS Fort Worth (LCS 3). - NSWCDD Q54 engineers conducted AN/SPY-1(D) to Scan Eagle EMI discovery testing aboard USS Bainbridge (DDG 96). ***FY 2016 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 2017 Base Plans:***					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
- 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 FY2017 the program will continue evaluation of 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 (CDL) Programs. - An additional focus area is the evaluation of Commercial Off the Shelf (COTS) systems/radars and the integration of Unmanned Aircraft Systems (UAS). - Develop and evaluate the effectiveness of proposed EMI solutions and coordinate with system program managers for proper integration of the final EMI solution. ***FY 2017 OCO Plans:*** N/A					
Title: Electromagnetic Pulse (EMP) Survivability	0.713	0.924	1.004	0.000	1.004
Articles:	-	-	-	-	-
FY 2015 Accomplishments: - Supported the EMP Maritime Standard for Surface Ships. Attended and participated in 16 meetings. - Performed review of the EMP Maritime Standard and developed a Comment Review Matrix (CRM) detailing recommended corrections to the standard. - Supported a Pulse Current Injection (PCI) Test aboard the USS INDEPENDENCE (LCS 2). Identified several shipboard connectors that needed repair. - NSWCDD EMP Group members completed review of the "Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment" with regards to Electromagnetic Pulse (EMP) and found no significant changes. - EMP Group has completed maintenance of the antenna array at the Naval Ordnance Transient Electromagnetic Simulator (NOTES) facility. - Updated the Pulse Current Injection (PCI) Database (DB) with measurements taken from the NOTES Facility and shipboard measurements. ***FY 2016 Plans:***					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
- 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 antenna systems. - Conduct test and evaluation of new materials and methods and develop approaches for EMP shielding of ship windows. ***FY 2017 Base Plans:*** - Investigate Modeling and Simulation (M&S) Verification, Validation, & Accreditation (VV&A) efforts in support of obtaining a higher confidence, low cost High Altitude Electromagnetic Pulse (HEMP) survivability assessment in lieu of full ship threat level testing. - Conduct HEMP survivability assessment using existing methods onboard an existing ship and compare measurements to multiple, independent M&S investigations leveraging different methodologies. - Continue support for the Naval NSWCDD Naval Ordinance Transient Electromagnetic Simulator (NOTES) EMP Facility (ashore test bed). ***FY 2017 OCO Plans:*** N/A					
Title: : Real-Time Spectrum Operations (RTSO)	1.198	2.939	6.964	0.000	6.964
Articles:	-	-	-	-	-
FY 2015 Accomplishments: - Real-Time Spectrum Operations (RTSO) personnel successfully conducted the first developmental RTSO land-based test event. The test validated the communications and interface between RTSO software and Specific Emitter Identification antenna of the Surface Electronic Warfare Improvement Program Block 1B2 system. - Completed integration of software module "SpecAn". - Completed an emission surveillance and validation field test. - Demonstrated the ability to capture and display spectrum traces from commercially off the shelf hardware and the ability to capture and display maximum hold data - Updated the user interface for RTSO to allow a user to customize emission control policies and allow a user input to customize/modify imported ship transit plan ***FY 2016 Plans:*** - The Navy selected the RTSO program as a key tenet and enabler of Navy's EMMW concept.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
- 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. - The increase in funding is due to development of an Engineering 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 2017 Base Plans:*** - Continue support for the Electromagnetic Maneuver Warfare (EMW) naval concept and Real-Time Spectrum Operations' (RTSO) role as a key tenet and enabler. -Continue development and enhancement of RTSO modules such as Electromagnetic (EM) Spectrum Awareness, EM Agility, Signature Control, and EM Engagement. - In FY 2017, efforts will focus on testing and validating a RTSO Engineering Design Model (EDM) in its ability to identify operational issues and provide/adjust operational conditions to support fleet operations and tactical feasibility. - Continue development on the fleet/user interface and the definition of recommended actions based on differing missions and operating areas. - Investigate and prioritize addition of new systems and platforms for inclusion into RTSO. - Develop and field an automated, networked exchange capability of electromagnetic spectrum data between shipboard systems. ***FY 2017 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	2.992	5.316	9.658	0.000	9.658

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

An acquisition strategy is not required.

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E. Performance Metrics

Performance metrics will consist of quarterly program reviews.

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