Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Navy											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*					R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	125.675	54.858	56.179	-	56.179	71.268	23.400	18.514	12.130	Continuing	Continuing
2913: *Electromagnetic Systems Advanced Technology*	0.000	105.675	54.858	56.179	-	56.179	71.268	23.400	18.514	12.130	Continuing	Continuing
9999: *Congressional Adds*	0.000	20.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	20.000

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

Note

FY 2013 funding and associated Future Naval Capability (FNC) efforts addressed in this Program Element (PE) are transferring to a new PE titled Future Naval Capabilities Advanced Technology Development (PE 0603673N). This is to enhance the visibility of the FNC Program by providing an easily navigable and consolidated overview of all 6.3 FNC investments in a single PE.

A. Mission Description and Budget Item Justification

The efforts described in this Program Element (PE) are based on investment directions as defined in the Naval S&T Strategic Plan approved by the S&T Corporate Board (Sep 2011). This strategy is based on needs and capabilities from Navy and Marine Corps guidance and input from the Naval Research Enterprise (NRE) stakeholders (including the Naval enterprises, the combatant commands, the Chief of Naval Operations (CNO), and Headquarters Marine Corps). It provides the vision and key objectives for the essential science and technology efforts that will enable the continued supremacy of U.S. Naval forces in the 21st century. The Strategy focuses and aligns Naval S&T with Naval missions and future capability needs that address the complex challenges presented by both rising peer competitors and irregular/asymmetric warfare.

Activities and efforts in this Program Element (PE) address technologies critical to enabling the transformation of discrete functions to network centric warfare capabilities, which simultaneously perform Radar, Electronic Warfare (EW), and Communications and Network functions across platforms through multiple, simultaneous and continuous communications/data links. The Electromagnetic Systems Advanced Technology program addresses Radio Frequency (RF) technology for Surface and Aerospace Surveillance sensors and systems, EW sensors and systems, RF Communication Systems, Multi-Function sensor systems, and Position, Navigation and Timing (PNT) capabilities. Within the Naval Transformational Roadmap, this investment offers affordable options for the transformational capabilities required by the Sea Shield (Theater Air and Missile Defense), Sea Strike (Persistent Intelligence, Surveillance, and Reconnaissance), and ForceNet (Communications and Networking) SeaPower 21 Naval Warfighting Pillars.

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Navy	DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603271N: *Electromagnetic Systems Advanced Technology*

B. Program Change Summary ($ in Millions)	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	122.458	54.858	57.749	-	57.749
Current President's Budget	125.675	54.858	56.179	-	56.179
Total Adjustments	3.217	0.000	-1.570	-	-1.570
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	6.734	0.000			
• SBIR/STTR Transfer	-3.517	0.000			
• Program Adjustments	0.000	0.000	-3.370	-	-3.370
• Rate/Misc Adjustments	0.000	0.000	1.800	-	1.800

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2012	FY 2013
Project: 9999: *Congressional Adds*		
Congressional Add: *Adv Radar Innovation Fund - S&T (Cong)*	20.000	-
Congressional Add Subtotals for Project: 9999	20.000	0.000
Congressional Add Totals for all Projects	20.000	0.000

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
2913: *Electromagnetic Systems Advanced Technology*	0.000	105.675	54.858	56.179	-	56.179	71.268	23.400	18.514	12.130	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This project emphasizes near to mid-term transition opportunities by developing and demonstrating technologies which enable affordable options for transformational capabilities required by the Sea Shield, Sea Strike, and ForceNet pillars. Work in this project addresses cost-effective RF technology for Surface and Aerospace Surveillance sensors and systems, EW sensors and systems, RF Communication Systems, Multi-Function sensor systems, and Position, Navigation and Timing (PNT) capabilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: ELECTRONIC AND ELECTROMAGNETIC SYSTEMS	39.046	1.583	4.227
Description: The overarching objective of this activity is to develop, test, and demonstrate communications, electronic attack (EA), electronic surveillance (ES), electronic warfare (EW), and radar functions. This activity also includes development of affordable wideband, high performance Advanced Multifunction Radio Frequency (AMRF) apertures. A portion of this PE is devoted to mid-term technology development in close concert with acquisition programs of record. The products of these efforts are expected to transition at the end of their schedule into the associated acquisition program of record. In this PE, these Future Naval Capability (FNC) Enabling Capabilities (ECs) span across Electronics, EW, Radar, and Communications technology areas. This activity also appears in PE 0602271N. For ECs receiving funding from both PEs, the PE 0602271N portion is generally focused on component design and development while the funding from this PE is focused on integration and demonstration. The Navy assumed responsibility for Joint Counter Radio Controlled Improvised Explosive Device Electronic Warfare (JCREW) 3.3 S&T by Congressional Mandate. In FY 2012, JCREW EC program will support JCREW 3.3 Acquisition Program Increment 2 Blocks 1 and 2 and will develop an advanced multi-function communications and EW architecture with supporting component technologies to support prototype development. The major objectives of this activity are: a) Affordable Common Radar Architecture (ACRA) - Develop a scalable, open radar architecture that addresses affordability challenges for 5 different radars.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
b) SATCOM Vulnerability Mitigation - Develop a diverse, multi-tier communications networking capability for Naval strike forces. c) Long Range Detection and Tracking - Ability to detect, track and identify (ID) future anti-ship ballistic missiles, advanced cruise missiles, aircraft and Unmanned Air Vehicles (UAVs). d) Affordable Electronically Scanned Array Technology for Next Generation Naval Platforms - Develop and demonstrate affordable components in beamforming element chains for efficient S- and X-Band radar, and EA using highly efficient digital solid state electronics components covering the RF and microwave frequencies. e) Countermeasure Technologies for Anti-Ship Missile Defense (ASMD) - Improve ship survivability by disrupting the terminal engagement phase of hostile Anti-Ship Cruise Missiles/ Anti-Ship Ballistic Missiles (ASCM/ASBM), including improvements to both onboard Surface Electronic Warfare Improvement Program (SEWIP) and offboard Nulka RF EA systems. f) Next Generation Countermeasure Technologies for Ship Missile Defense - Develop and demonstrate the fundamental technologies required to conduct next generation, persistent EW in support of ship, sea base, and littoral force missile defense operations in a distributed, coordinated manner across the entire battlespace. g) Next Generation Airborne Electronic Attack - Develop and demonstrate advanced capability Airborne Electronic Attack (AEA) sub-systems (e.g., broadband exciters, power amplifiers, and transmit arrays) that provide Suppression of Enemy Air Defenses (SEAD), deliver Non-Kinetic Fires, counter Integrated Air Defense Systems (IADS), and provide suppression of Command, Control & Communications (C3) links and data networks. h) Data Exfiltration Nanosatellite Innovative Space Enabler (DENISE)(formerly known as Global Applications for Data Exfiltration(GLADEX)) - Develop a capability for monitoring and relay of unattended sensor data for global situational awareness. Benefits include security through encryption, reduced dependence on commercial systems, and reduced collection needs by manned and unmanned in-area assets. It addresses a shortfall to monitor shipping in territorial waters and the open ocean to combat terrorism, and, enforce criminal law. i) Radar Electronic Attack Protection (REAP) - Develop single platform precision passive Electronic Support Measure (ESM) and Electronic Protection (EP) techniques and technology to counter hostile use of modern Electronic Attack (EA) self protection jammers. j) Joint Counter Radio Controlled Improvised Explosive Device Electronic Warfare (JCREW) 3.3 - Develop integrated RF communications and RF jammer capability that addresses the electromagnetic interference (EMI) issue to enable interoperability.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014

k) Submarine Survivability- Electronic Warfare - Develop and demonstrate technologies that will provide submarines an EA capability against surveillance radar systems through EW payloads integrated with submarine masts, as well as networked offboard platforms. These capabilities will improve the submarine's survivability in a hostile RF environment by providing a non-kinetic strike capability against enemy Intelligence, Surveillance and Reconnaissance (ISR) sensors.

l) Electronic Warfare (EW) Roadmap - Develop classified advanced electronic warfare technology in support of current and predicted capability requirements.

Decrease in funding from FY 2012 to FY 2013 is due to transfer of FNC efforts addressed in this PE to a new PE titled Future Naval Capabilities Advanced Technology Development (PE 0603673N). This is to enhance the visibility of the FNC Program by providing an easily navigable and consolidated overview of all 6.3 FNC investments in a single PE.

The following are non-inclusive examples of accomplishments and plans for projects funded in this activity.

FY 2012 Accomplishments:
Affordable Common Radar Architecture (ACRA):
- Continued the ACRA effort by defining interface specifications. This effort is developing a radar architecture which moves the digital conversions as close to the antenna as possible for substantial performance and supportability improvements.

SATCOM Vulnerability Mitigation:
- Continued development of hardware and software appliques that implement waveforms, protocols, and techniques to significantly increase the data throughput on High Frequency (HF) communications channels.
- Continued development of multi-link, UHF, millimeter wave, air-to-air, air to ground and SATCOM terminals for networking airborne platforms with other airborne assets.

Long Range Detection and Tracking:
- Completed FNC EC Long Range Detection and Tracking. Capture and extend the prototype development that occurred under Advanced Electronic Sensor Systems for Missile Defense. This project delivers an affordable, open-architecture DAR single face ADM. This effort demonstrates the ability to perform simultaneous full volume radar coverage of contacts at long ranges and in dense contact environments.

Affordable Electronically Scanned Array Technology for Next Generation Naval Platforms:

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Completed development and demonstration of affordable components in beamforming element chains for efficient S-and X-Band radar, and EA using highly efficient digital solid state electronics components covering the RF and microwave frequencies. Countermeasure Technologies for Anti-Ship Missile Defense (ASMD): - Continued the Enhanced Surface Electronic Warfare Improvement Program (SEWIP) Transmitter FNC effort by starting system architecture design and Low Voltage Gallium Arsenide (GaAs) High Power Amplifier (HPA) Monolithic Microwave Integrated Circuit (MMIC) purchases. This effort develops affordable and reliable solid state transmitter technologies to engage anti-ship cruise and ballistic missile RF seekers. - Completed the Enhanced Nulka Payload FNC effort. This effort developed an affordable and extremely compact RF payload for the Nulka offboard decoy with an Electronically Scanned Array (ESA) transmitter, compact receiver chain, and advanced isolation materials. Next Generation Countermeasure Technologies for Ship Missile Defense: - Continued the development of technologies to demonstrate effective EW countermeasures for ship missile defense operations in a distributed coordinated manner across the entire battlespace. Next Generation Airborne Electronic Attack: - Continued the Next Generation Airborne Electronic Attack FNC effort by demonstrating critical subsystems operating in the RF low- and mid-bands. This effort develops and demonstrates advanced capability Airborne Electronic Attack (AEA) sub-systems (e.g., broadband exciters, power amplifiers, and transmit arrays) that provide suppression of enemy air defenses (SEAD), deliver non-kinetic fires, counter integrated air defense systems (IADS), and provide suppression of C3 links and data networks. Data Exfiltration Nanosatellite Innovative Space Enabler (DENISE): - Continued development of a nano-satellite bus. This effort provides for the development, integration, and demonstration of a nano-sat satellite bus with all its requisite structural, power, thermal, control, and separation subsystems. - Continued development of a nano-satellite compatible payload and transportable ground terminal. This effort will provide for development, integration, and demonstration of a nano-sat compatible payload and ground terminal for monitoring and relay of unattended sensor data for global situational awareness. Radar Electronic Attack Protection (REAP): - Initiated Identification and Defeat of Electronic Attack Systems (IDEAS) FNC effort by developing single platform precision passive electronic support measure (ESM) and electronic protection (EP) techniques and technology to counter hostile use of modern EA self protection jammers.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Joint Counter Radio Controlled Improvised Explosive Device Electronic Warfare (JCREW) 3.3: - Initiated and completed JCREW 3.3 architecture analysis and design and component development. - Initiated and completed development of the Distributed Counter-RCIED effort through algorithm development and assessment. - Initiated and completed the Integrated Counter-RCIED EW (ICEW) effort component design and integration plans. Submarine Survivability - Electronic Warfare: - Initiated Distributed Coherent Electronic Attack for Submarines (CEAS) FNC effort by commencing development of the compact EA payload and techniques for the multi-mission mast (MMM). - Initiated Distributed Coherent Electronic Attack for Submarines (D-CEAS) FNC effort by commencing an assessment of current capabilities. Electronic Warfare (EW) Roadmap: - Continued development of classified advanced electronic warfare technology in support of current and predicted capability requirements. ***FY 2013 Plans:*** Electronic Warfare (EW) Roadmap: - Continue all efforts of FY 2012. ***FY 2014 Plans:*** Electronic Warfare (EW) Roadmap: - Continue all efforts of FY 2013.			
Title: GLOBAL POSITIONING SYSTEM (GPS) & NAVIGATION TECHNOLOGY	3.858	4.311	2.263
Description: The overarching objective of this activity is to develop technologies that enable the development of affordable, effective and robust Position, Navigation and Timing (PNT) capabilities using either GPS systems, non-GPS navigation devices, or atomic clocks. This activity will increase the operational effectiveness of U.S. Naval units. The focus is on the mitigation of GPS electronic threats, the development of atomic clocks that possess unique long-term stability and precision, and the development of compact, low-cost, Inertial Navigation Systems (INS). The major objectives of this activity are: a) GPS Anti-Jam Antennas and Receivers - Integrate and demonstrate anti-jam antennas and antenna electronics for Navy platforms for the purpose of providing precision navigation capabilities in the presence of electronic threats; to integrate and			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
demonstrate anti-spoofer/anti-jam processors for the purpose of providing precision navigation capabilities in the presence of emergent threats. b) Precision Time and Time Transfer - Integrate and demonstrate tactical grade atomic clocks that possess unique long-term stability and precision for the purpose of providing GPS-independent precision time; to integrate and demonstrate the capability of transferring GPS-derived time via radio frequency links for the purpose of providing GPS-independent precision time. c) Non-GPS Navigation Technology - To integrate and demonstrate inertial navigation systems for the purpose of providing an alternative means of providing precision navigation for those Naval platforms which may not have GPS navigation capabilities and/or loss of GPS signals; to integrate and demonstrate a correlation navigation technique using earth maps of high precision (including bathymetric, magnetic and gravimetric data) for navigation for those Naval platforms which may not have GPS navigation capabilities and/or loss of GPS signals. The increase in funding from FY 2012 to FY 2013 is due to restoration of previously programmed funding level for GPS and Navigation Technologies research. FY 2012 GPS research was reduced to fund critical related work in Gallium Nitride (GaN) High Electron Mobility Transistors (HEMTs) supporting Electronic and Electromagnetic Research program objectives. The decrease in funding from FY 2013 to FY 2014 is due to the reduced investment in Advanced Technology efforts for GPS and Navigation, and planned increase in Applied Research investment in the Navigation Technology activity in PE 0602271N. The following are non-inclusive examples for projects funded in this activity. ***FY 2012 Accomplishments:*** GPS Anti-Jam Antennas and Receivers: - Continued development of Small Antenna Based Anti-spoofing project. - Continued development of Advanced Spoofer Tracking. - Continued development of Next Generation Global Positioning Satellite System - Situational Awareness (XGPSS-SA) Challenged Environment. - Initiated Modernized Receiver for RF Challenged Environments. - Initiated development of the Simulation of GPS Signals in a Stressed Environment. - Initiated development of Self Calibrating GPS AJ Antennas for Electronic Support. - Initiated and completed Accurate Cooperative Geolocation System.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Precision Time and Time Transfer: - Continued the development of algorithms for distributed time scaling; developed architectures necessary to establish a Navy Global Coordinated Time Scale; tested the algorithms via both simulation and using actual clock data provided by the U.S. Naval Observatory (USNO). - Continued developing and Distributing Time-frequency Device. - Continued development of Rb 3-cc Tactical Grade Atomic Clock (TGAC). Non-GPS Navigation Technology: - Continued the Optically Transduced MEMS Inertial Navigation System project. - Continued the Sub-harmonic Lateral Mode MEMS Inertial Navigation System project. - Continued the Two-Axis Gyro-compass Fiber Optic Inertial Navigation System project. - Continued developing Wavewinds project. - Continued development of Small Unmanned Underwater Vehicle - Sonar Aided Inertial Navigation Technology (UUV-SAINT) project. - Continued developing Portable PCNS project. - Completed the development of a small, lightweight Micro-Electro-Mechanical Systems (MEMS) Accelerometer for navigation systems; and fabricated an Electro-Optic Accelerometer. - Initiated development of Superconducting Magnetometer On-Board Navigation (SIMON) System. - Initiated development of Alternative Navigation Over Unstructured or Featureless Terrain.			
FY 2013 Plans: GPS Anti-Jam Antennas and Receivers: - Continue all efforts of FY 2012. - Initiated the Application of National Airspace Air Traffic Control (ATC) Automatic Dependant Surveillance Broadcast (ADS-B) project. - Initiated Cognitive Modernized GPS User Equipment (MGUE) for GPS-Denied Environments project. Precision Time and Time Transfer: - Continue all efforts of FY 2012. - Initiated the Ultra-Precise Timing Using GPS (UPTUG) Project. Non-GPS Navigation Technology: - Continue all efforts of FY 2012 less those noted as complete.			
FY 2014 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
GPS Anti-Jam Antennas and Receivers: - Continue all efforts of FY 2012 less those noted as completed. - Complete the Application of National Airspace Air Traffic Control (ATC) Automatic Dependant Surveillance Broadcast (ADS-B) project. - Initiate GPS Antenna System for Enhanced EP, ES and Precise Navigation. Precision Time and Time Transfer: - Continue all efforts of FY 2012 less those noted as completed. - Complete the Ultra-Precise Timing Using GPS (UPTUG) Project. - Initiate DoD master clock time transfer via optical fibers. Non-GPS Navigation Technology: - Continue all efforts of FY 2012 less those noted as completed. - Complete Modernized Integrated Spoofer Tracking (MIST) Prototype. - Complete the Hollow-core Fiber Optic Inertial Navigation System. - Initiate Two-Axis Fiber Optic Inertial Navigation System Phase II project. - Initiate Mechanical System (MEMS) Inertial Navigation System (INS) Phase II project. - Initiate Angle-Only Infra Red Celestial Navigation System.			
Title: INTEGRATED TOPSIDE (INTOP) INNOVATIVE NAVAL PROTOTYPE (INP)	62.771	48.964	49.689
Description: The overarching objective of the INTOP INP is to develop and demonstrate a set of prototypes that integrate RF functionality (EW, Radar, Communications, Navigation) into a common set of multi-function apertures electronics and software through an architecture that is modular, scalable across all platforms, and open at the RF as well as computer and software level. The apertures are capable of providing multiple simultaneous, independent beams which can together perform any of the above functions. The major objectives of this activity are: a) Submarine SATCOM Array - Develop wide-band SATCOM array capable of supporting EW for submarines. b) Electronic Warfare (EW)/Information Operations (IO)/Line of Sight (LOS) Communications (Comms) for Surface Combatants - Develop wide-band array to support EW capability and other functions, including but not limited to IO and LOS Comms, for surface combatants with potential application to other platforms.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
c) Architecture, Standards and Devices - Develop architecture and standards for wide-band multi-beam, multi-band arrays and below deck systems and the technology and electronic devices needed to make integrated array systems affordable. d) Surface Combatant Communication Array - Develop wide-band surface combatant communication array capable of supporting other RF functions. e) Resource Allocation Manager - Develop enterprise common Resource Allocation Manager. f) Digital Radar - Develop an all digital radar to demonstrate advanced concepts for coherent radar networking and control, which will increase radar coverage and provide new levels of electronic protection (EP), while maximizing radar resources and reducing cost. g) Low Band Communications, IO and EW - Develop low band technology development and concept studies leading to development of an Advanced Development Model (ADM). The decrease in funding from FY 2012 to FY 2013 is due to completion of the SATCOM Array prototype build during FY 2013. The following are non-inclusive examples of accomplishments and plans for projects funded in this activity. ***FY 2012 Accomplishments:*** Submarine SATCOM Array: - Continued development of prototype build. - Completed prototype array development. - Initiated integration and test program. EW/IO/Comms for Surface Combatants: - Continued developing prototype capability. - Completed design of EW/IO/Comms for Surface Combatants. - Initiated development of the EW/IO/COMMS prototype. Architecture, Standards and Devices: - Continued IDAARS, a multi-function RF topside aperture prototype covering approximately 200MHz to 22 GHz and providing the appropriate control and synergy of the functionality, such that the RF functions automatically support one another, providing improved operational capability. Additionally, demonstrate reductions in size, weight, and power as well as cost (both acquisition			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
and life cycle) by reducing the number of topside apertures needed for communication, electronic warfare, and some radar functions. A critical tenet of the prototype will be the demonstration of an open architecture so that not only can different companies supply the major components, such as a given receive or transmit aperture, but even down to the subarray and lower component level throughout the life cycle, to ensure continuing competition for maintenance and replacement parts. - Continued development of architecture and interfaces and their application to wide-band SATCOM arrays for submarines. - Continued development of deckhouse and platform integration strategies and concepts. Surface Combatants Communications Array: - Initiated design effort. Resource Allocation Manager: - Continued development of functional queue management software. - Continued development of control interface software for the resource allocation manager. Digital Radar: - Completed concept studies. - Initiated design effort.			
FY 2013 Plans: Submarine SATCOM Array: - Continue all efforts of FY 2012 less those noted as complete above. - Complete prototype build. EW/IO/Comms for Surface Combatants: - Continue all efforts of FY 2012 less those noted as complete above. Architecture, Standards and Devices: - Continue all efforts of FY 2012. Surface Combatants Communications Array: - Continue all efforts of FY 2012. Resource Allocation Manager: - Continue all efforts of FY 2012.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Digital Radar: - Continue all efforts of FY 2012 less those noted as complete above. ***FY 2014 Plans:*** Submarine SATCOM Array: - Continue all efforts of FY 2013 less those noted as complete above. EW/IO/Comms for Surface Combatants: - Continue all efforts of FY 2013. - Initiate integration and test of ADM. Architecture, Standards and Devices: - Continue all efforts of FY 2013. Surface Combatants Satellite Communications Array: - Continue all efforts of FY 2013. Resource Allocation Manager: - Continue all efforts of FY 2013. Digital Radar: - Continue all efforts of FY 2013. - Initiate system build (front-end and back-end). Low Band Communications, IO and EW: - Initiate development of low band COMMS/IO/EW technology and concept studies leading to ADM build.			
Accomplishments/Planned Programs Subtotals	105.675	54.858	56.179

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 2913: *Electromagnetic Systems Advanced Technology*

D. Acquisition Strategy

N/A

E. Performance Metrics

Advanced Electronic Sensor Systems for Missile Defense and Long Range Detection and Tracking ECs are aligned to the Navy's Advanced Cruiser (CG(X)) plans and closely coordinated with Naval Sea Systems Command Integrated Warfare Systems (PEO IWS 2.0). Other performance metrics are discussed within the R-2a.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603271N: *Electromagnetic Systems Advanced Technology*	PROJECT 9999: *Congressional Adds*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	20.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	20.000

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013
Congressional Add: Adv Radar Innovation Fund - S&T (Cong)	20.000	-
FY 2012 Accomplishments: Accelerate future capabilities for innovative technologies that show promise for capability enhancements and affordability to enhance current sensor platforms and prepare for future technological advances in a manner that is affordable and flexible.		
Congressional Adds Subtotals	20.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Congressional Interest Items not included in other Projects.