Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Navy										DATE: February 2011	
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)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	77.612	96.243	102.535	-	102.535	102.498	109.998	102.384	103.854	Continuing	Continuing
2913: *Electromagnetic Systems Advanced Technology*	60.493	82.143	102.535	-	102.535	102.498	109.998	102.384	103.854	Continuing	Continuing
2933: *Wide Focal Planar Array Camera S&T*	-	14.100	-	-	-	-	-	-	-	0.000	14.100
4027: *Naval Innovative Science and Engineering*	0.190	-	-	-	-	-	-	-	-	0.000	0.190
9999: *Congressional Adds*	16.929	-	-	-	-	-	-	-	-	0.000	16.929

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 (Feb 2009). 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.

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B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	75.506	82.143	101.071	-	101.071
Current President's Budget	77.612	96.243	102.535	-	102.535
Total Adjustments	2.106	14.100	1.464	-	1.464
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	4.128	-			
• SBIR/STTR Transfer	-2.006	-			
• Program Adjustments	-	14.100	1.482	-	1.482
• Section 219 Reprogramming	-0.013	-	-	-	-
• Rate/Misc Adjustments	-	-	-0.018	-	-0.018
• Congressional General Reductions Adjustments	-0.003	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)

	FY 2010	FY 2011
Project: 9999: *Congressional Adds*		
Congressional Add: *Pacific Airborne Surveillance & Testing*	16.929	-
Congressional Add Subtotals for Project: 9999	16.929	-
Congressional Add Totals for all Projects	16.929	-

Change Summary Explanation

Technical: FY 2010 reflects the realignment of the Global Positioning System (GPS) & Navigation Technology Activity from PE 0603235N because the technology development efforts are directly related to the current mission of this Program Element.

Schedule: Not applicable.

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COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
2913: *Electromagnetic Systems Advanced Technology*	60.493	82.143	102.535	-	102.535	102.498	109.998	102.384	103.854	Continuing	Continuing

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 2010	FY 2011	FY 2012
Title: ELECTRONIC AND ELECTROMAGNETIC SYSTEMS	36.334	39.124	41.413

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.

Effective FY 2010, resources and budget justification associated with the FNC ECs, formerly identified with the ADVANCED MULTI-FUNCTION RF TECHNOLOGY activity, are realigned into this activity. This realignment serves to better describe the full electromagnetic spectrum nature of the research initiatives and improve the tracking and justification of FNC initiatives within the budget submission.

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:

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
a) Affordable Common Radar Architecture (ACRA) - Develop a scalable, open radar architecture that addresses affordability challenges for 5 different radars. b) Low Cost Over The Horizon (OTH) Communication, SATCOM and Line Of Sight (LOS) Apertures - Provide apertures, link electronics and programmable terminal components that are suitable for multiple platforms. c) SATCOM Vulnerability Mitigation - Develop a diverse, multi-tier communications networking capability for Naval strike forces. d) 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). e) 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. f) 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. g) 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. h) 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. i) 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			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012

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.

j) 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.

k) 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.

l) 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.

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

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

FY 2010 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.

Low Cost Over The Horizon (OTH) Communication, Satellite Communication (SATCOM) and Line Of Sight (LOS) Apertures:
- Continued H-60 Tactical Common Data Link (TCDL) project. This effort develops a scalable, low cost, light weight, low drag multichannel Jam Resistant (JR) Tactical Common Data Link (TCDL) relay and networking terminal.
- Continued Low cost SATCOM-on-the-Move array for Marine Corps. This effort develops a low cost, scalable SATCOM on-the-move communication system for both High Data Rate (HDR) and Low Data Rate (LDR) Marine Corps vehicular communications.
- Continued nested, coplanar array/Modular Integrated Link Electronics System (MILES) design and integration. This effort develops a communications array which will provide Ultra High Frequency (UHF) LOS functionality and Ku-Band communications for Naval Tactical Networking (NTN).

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
SATCOM Vulnerability Mitigation: - Initiated development of hardware and software appliques that implement waveforms, protocols, and techniques to significantly increase the data throughput on High Frequency (HF) communications channels. - Initiated 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: - Continued 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 Digital Array Radar (DAR) single face Advanced Development Model (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: - Continued to 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. Countermeasure Technologies for Anti-Ship Missile Defense (ASMD): - Continued the Enhanced Nulka Payload FNC effort by starting system architecture design. This effort develops 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. - 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. 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			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
(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. ***FY 2011 Plans:*** Affordable Common Radar Architecture (ACRA): - Continue all efforts of FY 2010. Low Cost Over The Horizon (OTH) Communication, SATCOM and Line Of Sight (LOS) Apertures: - Complete all efforts of FY 2010. SATCOM Vulnerability Mitigation: - Continue all efforts of FY 2010. Long Range Detection and Tracking: - Continue all efforts of FY 2010. Affordable Electronically Scanned Array Technology for Next Generation Naval Platforms: - Continue all efforts of FY 2010. Countermeasure Technologies for Anti-Ship Missile Defense (ASMD): - Continue all efforts of FY 2010. Next Generation Countermeasure Technologies for Ship Missile Defense: - Continue all efforts of FY 2010. Next Generation Airborne Electronic Attack: - Continue all efforts of FY 2010. Data Exfiltration Nanosatellite Innovative Space Enabler (DENISE): - Initiate the 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.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
- Initiate the 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): - Initiate the 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. Joint Counter Radio Controlled Improvised Explosive Device Electronic Warfare (JCREW) 3.3: - Initiate JCREW 3.3 component development. ***FY 2012 Plans:*** Affordable Common Radar Architecture (ACRA): - Continue all efforts of FY 2011. SATCOM Vulnerability Mitigation: - Continue all efforts of FY 2011. Long Range Detection and Tracking: - Complete 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: - Complete 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): - Continue all efforts of FY 2011. - Complete the Enhanced Nulka Payload FNC effort.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Next Generation Countermeasure Technologies for Ship Missile Defense: - Continue all efforts of FY 2011. Next Generation Airborne Electronic Attack: - Complete the Next Generation Airborne Electronic Attack FNC effort. Data Exfiltration Nanosatellite Innovative Space Enabler (DENISE): - Continue all efforts of FY 2011 Radar Electronic Attack Protection (REAP): - Continue all efforts of FY 2011 Joint Counter Radio Controlled Improvised Explosive Device Electronic Warfare (JCREW) 3.3: - Continue all efforts of FY 2011. - Initiate the Distributed Counter-RCIED FNC effort through algorithm development and assessment. - Initiate the Integrated Counter-RCIED EW (ICEW) FNC effort by starting component design and integration plans. Submarine Survivability - Electronic Warfare: - Initiate the Coherent Electronic Attack for Submarines (CEAS) FNC effort by commencing development of the compact EA payload and techniques for the multi-mission mast (MMM). - Initiate the Distributed Coherent Electronic Attack for Submarines (D-CEAS) FNC effort by commencing an assessment of current capabilities. Electronic Warfare (EW) Roadmap: - Initiate development of classified advanced electronic warfare technology in support of current and predicted capability requirements.			
Title: GLOBAL POSITIONING SYSTEM (GPS) & NAVIGATION TECHNOLOGY ***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).	4.198	4.601	4.442

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Efforts identified in this R2 activity transfer from PE 0603235N in FY 2010. 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 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 following are non-inclusive examples for projects funded in this activity. ***FY 2010 Accomplishments:*** GPS Anti-Jam Antennas and Receivers: - Continued the Adaptive Temporal Suppression of GPS Structured Interference project. - Continued the GPS anti-spoofer antenna electronics effort using Electronic Support Measures (ESM) and tracking/location-based system. 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).			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Non-GPS Navigation Technology: - Continued the development of a small, lightweight Micro-Electro-Mechanical Systems (MEMS) Accelerometer for navigation systems; and fabricated an Electro-Optic Accelerometer. - Continued the 5-cc accelerometer with the Embedded GPS Inertial (EGI) System for aircraft avionics applications. - Continued the MEMS Gyro-cluster INS for Tactical Platforms project. - Continued the Precision Celestial Navigation System (PCNS) project. - Continued the Dead Reckoning Advanced Tight Coupling (DRATC) project. - Continued the navigation grade Inertial Navigation System (INS) using fiber optic/MEMS gyros and electro-optic accelerometers. - Continued the development of the Sonar Aided Bathymetric 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.			
FY 2011 Plans: GPS Anti-Jam Antennas and Receivers: - Complete Adaptive Temporal Suppression of Structured Interference. - Complete Anti-spoof Antenna Electronics using ESM and tracking. - Initiate Small Antenna Based Anti-spoofing project. - Initiate Advanced Spoofer Tracking. - Initiate Next Generation Global Positioning Satellite System - Situational Awareness (XGPSS-SA) Challenged Environment. Precision Time and Time Transfer: - Continue all efforts of FY 2010. - Initiate Distributed Time-frequency Device. - Initiate Tactical Grade Atomic Clock. Non-GPS Navigation Technology: - Continue all efforts of FY 2010. - Complete 5-cc Accelerometer with EGI System. - Complete MEMS Gyro-cluster. - Complete PCNS project. - Complete DRATC project. - Complete navigation grade INS using MEMS gyro project.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
- Complete Sonar Bathymetric Navigation. - Initiate Wavewinds project. - Initiate Small Unmanned Underwater Vehicle - Sonar Aided Inertial Navigation Technology (UUV-SAINT) project. - Initiate Portable PCNS project. ***FY 2012 Plans:*** GPS Anti-Jam Antennas and Receivers: - Continue all efforts of FY 2011 less those noted as complete. - Initiate Modernized Receiver for RF Challenged Environments. - Initiate Simulation of GPS Signals in a Stressed Environment. - Initiate Accurate Cooperative Geolocation System. - Initiate Self Calibrating GPS AJ Antennas for Electronic Support. Precision Time and Time Transfer: - Continue all efforts of FY 2011. Non-GPS Navigation Technology: - Complete the development of a small, lightweight Micro-Electro-Mechanical Systems (MEMS) Accelerometer for navigation systems; and fabricated an Electro-Optic Accelerometer. - Complete the 5-cc accelerometer with the Embedded GPS Inertial (EGI) System for aircraft avionics applications. - Complete the Dead Reckoning Advanced Tight Coupling (DRATC) project. - Initiate Superconducting Magnetometer On-Board Navigation (SIMON) System. - Initiate Alternative Navigation Over Unstructured or Featureless Terrain.			
Title: INTEGRATED TOPSIDE (INTOP) INNOVATIVE NAVAL PROTOTYPE (INP) ***Description:*** The overarching objective of the INTOP INP is to develop and demonstrate a prototype that integrates RF functions (EW, Radar, Communications, Navigation) into a common set of multi-function apertures 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. Effective FY 2010, resources and budget justification associated with Integrated Topside (INTOP) formerly referred to as Integrated Digital Apertures and Array Radar System (IDAARS) effort are realigned from the activity titled ADVANCED MULTI-	19.961	38.418	56.680

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FUNCTION RF TECHNOLOGY. This realignment allows for improved description of the critical and unique application of technology, program technical initiatives, and associated resources within the INP program. IDAARS commenced in FY 2009. The major objectives of this activity are: a) Submarine SATCOM Array - Develop wide-band SATCOM array capable of supporting EW for submarines. b) Electronic Attack (EA) for Surface Combatants - Develop wide-band transmit array to support EA capability and other functions, including but not limited to Information Operations (IO) and Line of Sight (LOS) Communications, for surface combatants with potential application to other platforms. 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. The increase from FY 2010 to FY 2011 is due to increased investment required for the initiation of the development of prototype capability for EA for Surface Combatants. The increase from FY 2011 to FY 2012 is due to the majority of the Surface EW/IO/Communications System build will take place starting in FY 2012. The following are non-inclusive examples of accomplishments and plans for projects funded in this activity. ***FY 2010 Accomplishments:*** Submarine SATCOM Array: - Continued SATCOM Array technical designs. - Completed technical studies of enabling radio frequency (RF) components for submarine SATCOM arrays. - Initiated prototype array development.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Electronic Attack (EA) for Surface Combatants: - Completed studies for EA design as follow-on to Multi-Function Electronic Warfare (MFEW) capability for forward-fit and back-fit. - Initiated design of EA capability. Architecture, Standards and Devices: - Continued IDAARS, a multi-function RF topside aperture prototype covering approximately 200MHz to 22 GHz and provide 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 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. - Initiated development of deckhouse and platform integration strategies and concepts. Surface Combatants Communications Array: - Initiated studies of array concepts. Resource Allocation Manager: - Continued development of functional queue management software. - Continued development of control interface software for the resource allocation manager. ***FY 2011 Plans:*** Submarine SATCOM Array: - Continue all efforts of FY 2010, less those noted as completed above. - Complete SATCOM Array technical designs. Electronic Attack for Surface Combatants: - Continue all efforts of FY 2010, less those noted as completed above. - Initiate development of prototype capability. Architecture, Standards and Devices: - Continue all efforts of FY 2010.			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
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 2010	FY 2011	FY 2012
Surface Combatant Communication Array: - Complete studies of array concepts. Resource Allocation Manager: - Continue all efforts of FY 2010. ***FY 2012 Plans:*** Submarine SATCOM Array: - Complete prototype array development. - Initiate integration and test program. Electronic Attack for Surface Combatants: - Continue all efforts of FY 2011, less those noted as completed above. - Initiate integration and test program. Architecture, Standards and Devices: - Continue all efforts of FY 2011. Surface Combatants Communications Array: - Initiate design effort. Resource Allocation Manager: - Continue all efforts of FY 2011.			
Accomplishments/Planned Programs Subtotals	60.493	82.143	102.535

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
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*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• 0602271N: *ELECTROMAGNETIC SYSTEMS APPLIED RESEARCH*	14.673	19.469	28.829	0.000	28.829	24.803	11.936	5.151	1.303	0.000	106.164

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 2012 Navy			DATE: February 2011
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 2933: *Wide Focal Planar Array Camera S&T*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
2933: *Wide Focal Planar Array Camera S&T*	-	14.100	-	-	-	-	-	-	-	0.000	14.100

Note

This is a new Overseas Contingency Operations (OCO) project.

A. Mission Description and Budget Item Justification

This effort develops technology to support the maturation and demonstration of sensing and analysis capabilities that can enhance wide area tactical situational awareness and generate actionable intelligence.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Wide Focal Planar Array Camera S&T	-	14.100	-
Description: This effort develops technology to support the maturation and demonstration of sensing and analysis capabilities that can enhance wide area tactical situational awareness and generate actionable intelligence. The major objectives of this activity are: A) Wide Focal Plane Array Camera (WFPAC) sensor - Develop an airborne sensor payload for a Group two-third form factor and procurement of a limited quantity of payloads in support of Unmanned Aerial Vehicle (UAV) integration and field user evaluation. Effort will also develop an advanced Mid Wavelength Infrared (MWIR) focal plane array in order to enable a night Group two-third wide area airborne payload and support Navy UAV integration effort as required. ***FY 2011 Plans:*** N/A FY 2011 OCO Plans: - Initiate and Complete effort to complete development, testing, integration and initial procurement of a Wide Focal Plane Array Camera (WFPAC) sensor for the RQ-7 "Shadow" Unmanned Aerial System (UAS), also referred to as the Marine Corps Tactical Unmanned Aerial System (MCTUAS), in support of OEF-Afghanistan. - Initiate and Complete development of a 59 megapixel WAAS payload in a shadow form factor by maturing the data link, adding color and a dual field of view for the purposes of field user technology and CONOPs evaluation, fabricate a limited number of sensors (4).			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
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** 2933: *Wide Focal Planar Array Camera S&T*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
- Initiate and Complete maturation for the design of a 64 megapixel mid range IR focal plan array.			
Accomplishments/Planned Programs Subtotals	-	14.100	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Successful development of a sensor to provide a 16 square kilometers persistent field of view with a .5m resolution at 10 frames per second (fps), which would allow real time for up to 10 local Common Data Link transceivers while also being stored for post-mission exploitation and forensics at two fps.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy			DATE: February 2011
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 4027: *Naval Innovative Science and Engineering*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
4027: *Naval Innovative Science and Engineering*	0.190	-	-	-	-	-	-	-	-	0.000	0.190

A. Mission Description and Budget Item Justification

Funding supports research and development efforts as directed under Section 219 of the fiscal year 2009 Duncan Hunter National Defense Authorization Act.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Naval Innovative Science and Engineering	0.190	-	-
Description: Funding supports research and development efforts as directed under Section 219 of the fiscal year 2009 Duncan Hunter National Defense Authorization Act. ***FY 2010 Accomplishments:*** Section 219 (Naval Innovative Science and Engineering) included in the FY 2009 Duncan Hunter National Defense Authorization Act, established mechanisms whereby the director of a naval laboratory may utilize up to three percent of all funds available to the laboratory to sponsor individual projects for: 1. Innovative basic and applied research that is conducted at the laboratory and supports military missions; 2. Development programs that support the transition of technologies developed by the defense laboratory into operational use; 3. Development activities that improve the capacity of the defense laboratory to recruit and retain personnel with needed scientific and engineering expertise; and 4. The revitalization and recapitalization of the laboratories.			
Accomplishments/Planned Programs Subtotals	0.190	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

The overall metrics of Section 219 is to increase retention and recruitment; number of advanced degrees, patent awards, and technical papers; successful technology transition to the warfighter; and laboratory ability to conduct innovative research.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy			DATE: February 2011
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)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
9999: *Congressional Adds*	16.929	-	-	-	-	-	-	-	-	0.000	16.929

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011
Congressional Add: Pacific Airborne Surveillance & Testing	16.929	-
FY 2010 Accomplishments: This effort developed a state-of-the-art Omnidirectional Synthetic Aperture Radar (OSAR) and demonstrated advances made in the dark target identification application in support of Pacific airborne surveillance and testing research.		
Congressional Adds Subtotals	16.929	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Congressional Interest Items not included in other Projects.