Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Navy										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602123N: *Force Protection Applied Res*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**FY 2011 Base Estimate**	**FY 2011 OCO Estimate**	**FY 2011 Total Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	186.628	146.045	107.448	0.000	107.448	111.156	111.669	114.490	122.526	Continuing	Continuing
0000: *Force Protection Applied Res*	131.478	90.978	107.448	0.000	107.448	111.156	111.669	114.490	122.526	Continuing	Continuing
9999: *Congressional Adds*	55.150	55.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	241.702

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.

This PE addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. It supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. The goal is to provide the ability to win or avoid engagements with other platforms or weapons and, in the event of engagement, to resist and control damage while preserving operational capability. Within the Naval Transformational Roadmap, this investment directly supports the Theater Air and Missile Defense transformational capability required by Sea Shield and the Ship to Objective Maneuver key transformational capability. This is accomplished by improvements in platform offensive performance, stealth, and self defense. This PE supports the Future Naval Capabilities (FNC) Program in the areas of Sea Shield, Sea Strike, Cross Pillar Enablers and Enterprise and Platform Enablers (EPE).

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 2011 Navy	DATE: February 2010
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B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	186.750	91.400	0.000	0.000	0.000
Current President's Budget	186.628	146.045	107.448	0.000	107.448
Total Adjustments	-0.122	54.645	107.448	0.000	107.448
• Congressional General Reductions		-0.612			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.043			
• Congressional Adds		55.300			
• Congressional Directed Transfers		0.000			
• Reprogrammings	4.012	0.000			
• SBIR/STTR Transfer	-3.335	0.000			
• Program Adjustments	0.000	0.000	107.448	0.000	107.448
• Rate/Misc Adjustments	-0.001	0.000	0.000	0.000	0.000
• Congressional Recision Adjustments	0.002	0.000	0.000	0.000	0.000
• Congressional Add Adjustments	-0.800	0.000	0.000	0.000	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Project: 9999: *Congressional Adds*		
Congressional Add: *Advanced Battery System For Military Avionics Power Systems*	0.000	1.593
Congressional Add: *Advanced Composite Manufacturing For Composite High-Speed Boat Design*	0.000	1.593
Congressional Add: *Advanced Energetics Initiative*	0.000	3.983
Congressional Add: *Carbon Composite Thin Films For Power Generation And Energy Storage*	0.000	1.593
Congressional Add: *Center For Autonomous Solar Power-Supercapacitors For Integrated Power Storage*	0.000	3.983
Congressional Add: *Energetic Nano-Materials Agent Defeat Initiative*	0.000	1.593
Congressional Add: *Fuel Efficient, High Specific Power Free Piston Engine For Ussvs*	0.000	1.593
Congressional Add: *Lithium Ion Storage Advancement For Aircraft Applications*	0.000	1.992
Congressional Add: *Multi-Mission Unmanned Surface Vessel*	0.000	1.992

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Navy	DATE: February 2010
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Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Congressional Add: *Non-Traditional Ballistic Fiber And Fabric Weaving Application For Force Protection*	0.000	1.992
Congressional Add: *Hybrid Power Systems*	0.000	1.992
Congressional Add: *Proton Exchange Membrane Fuel Cell For Underwater Vehicles*	0.000	1.593
Congressional Add: *Advanced Simulation Tools for Aircraft Structures Made of Composite Materials*	1.197	1.593
Congressional Add: *Alternative Energy Research*	19.945	18.423
Congressional Add: *Deputee-High Powered Microwave Non-Lethal Vehicle/Vessel Engine Disabling*	1.596	0.000
Congressional Add: *Harbor Shield-Homeland Defense Port Security Initiative*	3.490	1.593
Congressional Add: *High Speed ACRC & Composites Sea Lion Craft Development*	1.995	0.000
Congressional Add: *High Power Density Propulsion and Power for USSVs*	1.596	0.000
Congressional Add: *High Strength Welded Structures*	0.798	0.000
Congressional Add: *Integration of Electro-Kinetic Weapons into Next Generation of Navy Ships*	4.487	3.983
Congressional Add: *Lithium Batteries*	1.596	0.000
Congressional Add: *Lithium-Ion Cell Development with Electro Nano Materials*	3.988	0.000
Congressional Add: *Lithium-Sulfur Chemistry Validation for Sonobuoy Application*	1.596	0.000
Congressional Add: *Magnetic Refrigeration Technology*	2.394	3.983
Congressional Add: *Mk V.1 MAKO for Improved Signature and Weight Performance*	1.995	0.000
Congressional Add: *Naval Special Warfare 11m RIB Replacement Craft Design*	0.798	0.000
Congressional Add: *PMRF Force Protection Lab*	1.995	0.000
Congressional Add: *Planar Solid Oxide Fuel Cell System Demonstration at UTC SimCenter*	3.490	0.000
Congressional Add: *Shipboard Production of Synthetic Aviation Fuel*	0.997	0.000
Congressional Add: *Standoff Explosive Detection System (SEDS)*	1.197	0.000
Congressional Add Subtotals for Project: 9999	55.150	55.067

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Navy	DATE: February 2010
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Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Congressional Add Totals for all Projects	55.150	55.067

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

FY11 from previous President's Budget is shown as zero because no FY11-15 data was presented in President's Budget 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602123N: *Force Protection Applied Res*	PROJECT 0000: *Force Protection Applied Res*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
0000: *Force Protection Applied Res*	131.478	90.978	107.448	0.000	107.448	111.156	111.669	114.490	122.526	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. It supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. The goal is to provide the ability to win or avoid engagements with other platforms or weapons and, in the event of engagement, to resist and control damage while preserving operational capability. Within the Naval Transformational Roadmap, this investment directly supports the Theater Air and Missile Defense transformational capability required by Sea Shield and the Ship to Objective Maneuver key transformational capability by virtue of improvements in platform offensive performance, stealth, and self defense. This effort supports the FNC in the areas of Sea Shield, Cross Pillar Enablers, and Enterprise and Platform Enablers (EPE).

This project reflects the alignment of Future Naval Capability (FNC)program investments for the following Enabling Capabilities (ECs): Fortified Position Security, Over-the-Horizon Missile Defense, Anti-Ship Missile Defense Technologies, Two-Torpedo Salvo Defense, Defense of Harbor and Near-Shore Naval Infrastructure Against Asymmetric Threats, Sea Based Missile Defense of Ships & Littoral Installations, Aircraft Integrated Self-Protection Suites, Advanced Threat Aircraft Countermeasures, Helicopter Low-Level Operation, Four Torpedo Salvo Defense, Shipboard Force Protection in Port and Restricted Waters - Detection and Classification, Underwater Total Ship Survivability, Compact Power Conversion Technologies, Affordable Submarine Propulsion and Control Actuation, and Advanced Electronic Sensor Systems for Missile Defense.

Decrease in FY10 is due to the completion of a Power and Energy initiative. Increase in FY 2011 is due to large scale demonstrations of the Large Vessel Stopper systems and emphasis in the Power and Energy arena.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
ADVANCED ENERGETICS	4.196	2.116	2.120	0.000	2.120
Advanced Energetics efforts address technology development to provide substantial improvements in energetic material systems and subsystems, primarily in terms of performance, but also addressing					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
safety, reliability, and affordability concerns. Goals include: advanced energetic materials for warheads, propellants, and reactive material based subsystems for both defensive and offensive applications. Efforts include: development of new fuels, oxidizers, explosive ingredients and formulations; and reliable simulation tools and diagnostics to develop and design superior-performance, and/or reduced-vulnerability systems tailored to specific warfighter missions. Decreased funding in FY 2010 is due to the conclusion and transition of Advanced Energetics efforts in the areas of enhanced performance formulations, insensitive explosives, detonation merging techniques, and reactive materials. Remaining funding will be used to complete transition efforts and to develop next generation concepts as described below. *FY 2009 Accomplishments:* - Continued Advanced Energetics research in technology development for the next generation reactive material warhead concepts (formulations, material properties, target interaction, lethality models, and experiments) for highly reactive materials, high density reactive materials and novel reactive structural materials. - Continued Advanced Energetics research in development and evaluation of advanced explosive/ propellant/reactive ingredients and formulations for next generation higher performing systems. - Continued Advanced Energetics research in development of advanced directed hydro-reactive material warhead concepts to enhance performance of undersea warheads. - Continued proof of concept efforts to develop insensitive explosives, propellants, and munitions without compromising performance. This work involves development of high quality, small particle energetic ingredients, novel processing techniques, and advanced energy conversion concepts; and involves both theoretical and experimental efforts. - Continued Advanced Energetics research in advanced multiphase blast concepts employing dense metalized explosives to enhance performance of air and underwater blast warheads. - Continued Advanced Energetics research in development and diagnostics of novel energy conversion concepts to enhance performance, more efficiently exploit available energy, and more					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
effectively couple energy to target for air, surface, and underwater warhead application- Continued research in technology development for the next generation reactive material warhead concepts (formulations, material properties, and energy release experiments) for highly reactive materials, high density reactive materials and novel reactive structural materials. Transition application specific target interaction, lethality modeling and ordnance specific experiments and demonstrations to Electro-magnetic Rail Gun, PE 0603114N. - Continued development of novel energy conversion concepts to enhance performance, more efficiently exploit available energy, and more effectively couple energy to target. Limit efforts to analytical and laboratory scale proof of concept experimental efforts. - Continued development and evaluation of energetic ingredients and formulations for next generation higher performance applications. Conclude scale-up development and testing. Transition to Integrated High Payoff Rocket Propellant Program, PE 0602114N. - Completed proof of concept efforts to develop insensitive explosives, propellants, and munitions without compromising performance. Transition to Future Naval Capabilities Program. - Completed development of and transition directed hydro-reactive material warhead concepts to Undersea Warheads Program, PE 0602747N. - Completed research in advanced multiphase blast concepts employing dense metalized explosives to enhance performance of air and underwater blast warheads. *FY 2010 Plans:* - Continue all efforts of FY 2009, less those noted as completed above. *FY 2011 Base Plans:* - Continue all efforts of FY 2010. - Complete efforts associated with Energetics Applied Research.					
AIRCRAFT TECHNOLOGY	14.969	12.767	12.903	0.000	12.903

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
The Aircraft Technology activity develops technologies for survivability and reduced observability, metrics are classified. It also develops new Naval air vehicle concepts and high impact, scaleable naval air vehicle technologies, such as - autonomous air vehicle command and control, helicopter and tiltrotor rotor and drive systems, aerodynamics, structures and flight controls for future and legacy air vehicles, which significantly increase the naval warfighter's capabilities, effectiveness, readiness, and safety, while reducing life cycle cost. This activity directly supports the Naval Aviation Enterprise Science and Technology Objectives and the Naval Science and Technology Strategic Plan, principally in the Platform Mobility Focus Area. The FY 2009 to FY 2010 decrease is due to the completion of several advanced concept and automonous system studies. *FY 2009 Accomplishments:* - Continued development of survivability/reduced observables technology. Metrics are classified. - Continued development of flight control, intelligent autonomy, command & control, and multi-vehicle cooperation technologies for Unmanned Air Vehicle (UAV). - Continued development of a Computational Fluid Dynamics (CFD) based integration system to maximize operational capability of autonomous aircraft by choosing optimal flight pattern for any environmental condition including low speed operations and brownout. - Continued vertical lift technology investments. - Initiated research in fixed wing aircraft/vertical lift/rotorcraft technology areas such as aeromechanics, propulsion, active rotor control for enhanced ship board operations, structural concepts compatible with shipboard operations, autonomous operations in the shipboard and austere environment, and innovative vehicle concepts for naval application. *FY 2010 Plans:* - Continue all efforts of FY 2009.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Initiate research in vertical lift aircraft /rotorcraft technology areas such as aeromechanics, propulsion, active rotor control for enhanced ship board operations, structural concepts compatible with shipboard operations, autonomous operations in the shipboard and austere environment, and innovative vehicle concepts for naval application. *FY 2011 Base Plans:* - Continue all efforts of FY 2010.					
FLEET FORCE PROTECTION AND DEFENSE AGAINST UNDERSEA THREATS Fleet Force Protection and Defense against Undersea Threats efforts include applied research for complementary sensor and processing technologies for platform protection and shipboard technologies to increase the survivability of surface ship and submarine platforms against torpedo threats and to develop the capability to interdict underwater asymmetric threats to ships and infrastructure in harbors. Current small platforms (both surface and airborne) have little to no situational awareness (SA) or self-protection against air, surface, and asymmetric threats. (Asymmetric threat efforts are co-funded by PE 0602131M.) A goal of this activity is to provide these platforms with effective self-protection. The technology areas specific to platform protection will develop individual, multispectral electro-optical (EO), infrared (IR), radio frequency (RF), electro-magnetic (EM), visual and acoustic or chemical sensors/biosensors and associated processing. To defend platforms from current and advanced threats in at-sea littoral environments and in port, these technologies must improve multispectral detection and distribution of specific threat information. Another goal of this activity is to develop a torpedo defense capability to fill Sea Shield Warfighting Capability Gap/Enabling Capability: Platform Defense against Undersea Threats, including Four Torpedo Salvo Defense. This provides a capability to prevent any of the torpedoes, in up to four-torpedo salvos fired at high value units, from hitting those units.	13.118	11.392	11.723	0.000	11.723

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
This activity supports the Fleet and Force Protection FNC and includes support to Sea Shield and Sea Strike Pillars and FNC Enabling Capabilities for: Aircraft Integrated Self-protection Suite; Fortified Position Security; Advanced Electronic Sensor Systems for Missile Defense; and Shipboard Force Protection in Port and Restricted Waters - Detection and Classification. Budget Activity 2 sensor efforts are co-funded by PEs 0602235N and 0602271N. *FY 2009 Accomplishments:* Sensors & Associated Processing - Continued efforts in biomimetic sonar systems for operation in air and aquatic environments based on bat echolocation neurophysiology and information processing algorithms. - Completed design and fabrication of microfluidic nucleic acid extraction and enrichment methods and obtained funding for technology transfer. - Continued efforts in biomimetic signal processing: panoramic periscope for submarines and temporal pattern recognition for Systems for Security Breaching Noise Detection. - Continued efforts in bioinspired quiet, efficient and maneuverable self-propelled line array using high-lift propulsors based on insect biomechanics. - Completed the development of low-cost, lightweight radar absorbing material (RAM) based on metallized cellulose in the form of fibers, fabric and paper. - Completed design and testing of on-chip nucleic acid amplification and transfer technology. - Continued studies to develop catalytic activity profile of bioactive coatings against chemical agents. Designed and initiated fabrication of coatings to degrade both, chemical and biological agents. - Continued advanced concept development to integrate object recognition and tracking algorithms, machine vision, multiple networked video streams into different classes of EO/IR sensors within the Intelligent Video Surveillance FNC product (transferred from PE 0602131M). - Completed the design and fabrication of self-reporting coatings for system failure detection. - Continued FNC EC Shipboard Force Protection in Port and Restricted Waters - Detection and Classification. This project will develop mission specific electro-optic/infrared sensors to detect,					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
classify, and determine the intent of potential terrorist and special operations force threats to ships and craft import and transiting restricted waters. - Transferred biomimetic signal processing efforts, including panoramic periscope and temporal pattern recognition for security breaching noise detection to PE 0602236N. - Transferred efforts in bioinspired quiet, and maneuverable self-propelled line array using high-lift propulsors based on insect biomechanics to PE 0602236N. - Transferred efforts in biomimetic sonar systems for operation in air and aquatic environments based on bat echolocation neurophysiology and information processing algorithms to PE 0602236N. - Completed the development of low-cost, lightweight RAM based on metallized cellulose in the form of fibers, fabric and paper. - Initiated the Countermeasures for Advanced Imaging Infrared (IIR) Guided Missiles FNC effort by initiating IIR threat model development. - Initiated the Countermeasures for Millimeter Wave Guided Missiles FNC effort by initiating requirements analysis. - Initiated the Multifunction Capabilities for Missile Warning Sensors FNC effort by commencing data collection and analysis. - Initiated efforts to design microfabricated system for 3-color fluorescence measurements using integrated waveguides. - Initiated effort to develop new, highly selective, preferential oxidation catalysts for the generation of power from the reformate gas purification process. - Initiated effort to develop aspheric gradient index optics. - Initiated the Helicopter Laser-Based Landing Aids FNC effort by commencing experimentation, data collection and analysis. Underwater Platform Self-Defense - Continued development of low-cost, light weight swimmer detection and localization technologies.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continued development of software encoded algorithms for the Anti-Torpedo Torpedo (ATT) sensor and controller that will enable ATT's to successfully engage torpedo salvoes of up to four attacking units. *FY 2010 Plans:* Sensors & Associated Processing - Continue all efforts of FY 2009, less those noted as completed above. Underwater Platform Self-Defense - Continue all efforts of FY 2009 *FY 2011 Base Plans:* Sensors & Associated Processing - Continue all efforts of FY 2010. - Complete FNC EC Shipboard Force Protection in Port and Restricted Waters - Detection and Classification. This project develops mission specific electro-optic/infrared sensors to detect, classify, and determine the intent of potential terrorist and special operations force threats to ships and craft in port and transiting restricted waters. Underwater Platform Self-Defense - Continue all efforts of FY 2010. In support of FNC (Force Projection Applied Research), perform the following efforts: - Initiate the development and application of emerging technologies that support delivery of Navy approved FNC enabling capabilities structured to close operational capability gaps in force projection. - Initiate the packaging of emerging force projection technologies into deliverable FNC products and ECs that can be integrated into acquisition programs within a five year period.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Initiate the development of force projection technologies that support naval requirements identified within the Sea Shield and Sea Strike naval capability pillars as well as those applicable to specific naval platforms and those that apply across the naval enterprise.					
MISSILE DEFENSE (MD)	12.872	11.166	9.898	0.000	9.898
This activity describes Missile Defense S&T projects of the Sea Shield FNC program, and non-FNC-related Navy research. - Advanced Area Defense Interceptor (AADI) S&T planning effort for Navy - Marine Corps Air Directed Surface to Air Missile (ADSAM) live firing demonstration at White Sands Missile Range. Completed in FY 2009 with funding in PE 0603123N, the metric for AADI was execution of an ADSAM demonstration by the Navy and Marine Corps that establishes the basis for further development of an operational Naval Integrated Fire Control/Counter-Air (NIFC-CA) capability. - Naval Interceptor Improvements (NII) technology upgrades for STANDARD Missile (SM) future fleet air defense missile. Metrics will be to achieve SM performance requirements in specified tactical rain environments and achieve SM performance requirements in all specified electronic countermeasures environments. - Extended Distributed Weapons Coordination (EDWC) algorithms to extend DWC Automated Battle Management Aids (ABMA) functionality to include coordination of passive defense measures (emission control, use of decoys, maneuvering). Metric will be improved probability of negation (Pneg) against advanced ballistic & cruise missile anti-ship threats that may be susceptible to decoys and jamming. - Positive Control of Naval Weapons (PCNW) - additional technology upgrades for SM to enable forward relay, remote launch & potentially forward pass engagements. Metrics are classified. - Midcourse and Terminal Algorithms (MTA) for interceptor and associated weapon system enhancements to defeat advanced anti-ship missile threats with high confidence. Specific metrics are classified. - Enhanced Lethality Guidance Algorithms (ELGA) to increase probability of kill versus an expanded threat set including ASBMs and advanced ASCMs. Metrics for this project will be classified.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Enhanced Maneuverability Missile Airframe (EMMA) technology for Navy shipboard missile systems to intercept highly agile maneuvering ASCMs and ASBMs. Metrics for this project will be classified. - Integrated Active & Electronic Defense (IAED) technology basis for response combinations of active and electronic weapons & systems to optimize Pneg against ASBMs and ASCMs, including potential interactions. Metrics will be classified. - Non-FNC-related investigation of effects of charged particle layers on UHF to S-Band radars used to track space vehicles and initiate development of advanced electromagnetic decoy launchers and payloads. The FY 2009 through FY 2011 decrease represents the phased movement of EDWC, PCNW, and NII projects from Applied Research (6.2) to Advanced (6.3) Research as the technologies mature and prepare for acquisition. *FY 2009 Accomplishments:* - Completed program to investigate effects of charged particle layers on UHF to S-Band radars used to track space vehicles. - Continued NII project. - Continued EDWC and PCNW efforts. - Initiated MTA project efforts. - Initiated development of advanced electromagnetic decoy launchers and payloads. *FY 2010 Plans:* - Continue all efforts of FY 2009. - Complete EDWC, NII and PCNW development efforts that will be tested/demonstrated. - Initiate ELGA and EMMA project efforts. *FY 2011 Base Plans:* - Continue all efforts of FY 2010. - Initiate IAED project effort.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
STOPPAGE OF LARGE SURFACE VESSELS AT SEA	7.570	7.638	14.870	0.000	14.870

The Chief of Naval Operations (CNO) in the Navy Strategic Plan (NSP) has specified that the Navy must combat Weapons of Mass Destruction (WMD) at sea and ashore. To support this requirement, the Navy must be able to temporarily stop ships that are suspected of carrying WMDs or their component materials. This activity addresses the development of key technologies that will enable the Navy to use non-lethal methods for temporarily stopping and delaying non-cooperative large, greater than 20 meters or 300 gross tons, vessels at sea that will not comply with voice commands or warning devices. The technologies will be deployable by ship or aircraft and should be capable of disabling the vessel at safe distances from high-valued assets and infrastructures.

Funding increase from FY 2009 - FY 2011 is due to large-scale demonstrations of various stages of the systems.

FY 2009 Accomplishments:
- Completed evaluation of potential propeller entanglement device materials.
- Completed propulsion drive-train damage predictions.
- Completed assessment of delivery options for a large linear propeller entanglement device.
- Completed component level proof-of-concept demonstration for externally inhibiting seawater cooling flow to ship propulsion equipment.
- Completed the identification and assessment of potential commercial maritime vessel electronic vulnerabilities within representative propulsion and maneuvering control systems.
- Completed scaled component level proof-of-concept testing for large vessel momentum reduction concept.
- Initiated prototype development and fabrication for a full-scale propeller entanglement device.
- Initiated design and fabrication of device and emplacement system to externally inhibit seawater cooling flow to ship propulsion equipment.
- Initiated the evaluation of technologies capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems.

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Initiated the design and evaluation of a full-scale large vessel momentum reduction device and delivery system. - Initiated tactical system engineering and define the operational parameters for a large vessel momentum reduction device. - Initiated analysis and modeling of hydrodynamic forces generated between a large vessel and much smaller intercept craft or Unmanned Surface Vehicle (USV). *FY 2010 Plans:* - Continue all efforts of FY 2009, less those noted as completed above. - Complete prototype development and fabrication for a full-scale propeller entanglement device. - Complete design and fabrication of device and emplacement system to externally inhibit seawater cooling flow to ship propulsion equipment. - Complete the evaluation of technologies capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems. - Complete the design and evaluation of a full-scale large vessel momentum reduction device and delivery system. - Complete tactical system engineering and define the operational parameters for a large vessel momentum reduction device. - Initiate full-scale demonstration of propeller entanglement prototype. - Initiate development of a USV delivery capability for a device emplacement package to externally inhibit seawater cooling flow to ship propulsion equipment. - Initiate development of an autonomous delivery and deployment capability for a device emplacement package to externally inhibit seawater cooling flow to ship propulsion equipment. - Initiate test and evaluation of delivery systems for technologies capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems. - Initiate design and fabrication of a full-scale system capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Initiate fabrication of a full-scale demonstration system for a large vessel momentum reduction device. *FY 2011 Base Plans:* - Continue all efforts of FY 2010, less those noted as completed above. - Complete full-scale demonstration of propeller entanglement prototype. - Complete development of a USV delivery capability for a device emplacement package to externally inhibit seawater cooling flow to ship propulsion equipment. - Complete development of an autonomous delivery and deployment capability for a device emplacement package to externally inhibit seawater cooling flow to ship propulsion equipment. - Complete test and evaluation of delivery systems for technologies capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems. - Complete design and fabrication of a full-scale system capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems. - Complete fabrication of a full-scale demonstration system for a large vessel momentum reduction device. - Complete analysis and modeling of hydrodynamic forces generated between a large vessel and much smaller intercept craft or Unmanned Surface Vehicle (USV). - Initiate a full-scale demonstration of USV delivery and autonomous deployment of a device to externally inhibit seawater cooling flow to ship propulsion equipment. - Initiate a full-scale dynamic demonstration of a system capable of remotely exploiting the electronic vulnerabilities identified within critical propulsion and steering systems. - Initiate demonstration of a full-scale system for a large vessel momentum reduction device.					
SURFACE SHIP & SUBMARINE HULL MECHANIC & ELECTRICAL (HM&E) Efforts include: signature reduction, hull life assurance, hydromechanics, distributed control for automated survivability (includes damage control), and advanced electrical power systems. Signature reduction addresses electromagnetic, infrared, and acoustic signature tailoring, both topside and	78.753	45.899	55.934	0.000	55.934

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
underwater. Hull life assurance addresses development of new structural system approaches for surface ships and submarines, including the management of weapons effects to control structural damage and the improvement of structural materials. Hydromechanics addresses hydrodynamic technologies, including the signature aspects of the hull-propulsor interface and maneuvering. Distributed intelligence for automated survivability addresses both the basic technology of automating damage control systems, as well as, distributed control of systems utilizing self-healing capability. Advanced electrical power systems efforts address electrical and auxiliary system and component technology to provide improvement in energy and power density, operating efficiency and recoverability from casualties. Advanced Naval Power efforts include: Compact Power Conversion Technologies that reduce the cost of high power conversion equipment required to enable more-electric and all-electric ships. This activity also supports the Overseas Contingency Operations (OCO) Counter IED - Extramural activity which supports applied research for force protection of Naval platforms. Technologies are being developed that focus on prediction, prevention, detection, neutralization, and mitigation of improvised explosive devices in the maritime/littoral environment. The funding decrease from FY 2009 to FY 2010 is due to the completion of the energy and power technology initiative that accelerated research in the following Energy and Power efforts: Distribution/ Control and Alternative Energy efforts, Energy Storage and Power Generation efforts and the Medium Voltage Direct Current (MVDC) architecture efforts in support of the Next Generation Integrated Power System (NGIPS) Roadmap efforts. The decrease also represents the phased movement of Future Naval Capability Enabling Capabilities Compact Power Conversion Technologies from Applied (6.2) to Advanced (6.3) Research as the technologies mature and prepare for transition to acquisition. The funding increase from FY 2010 to FY 2011 is due to the start up and initiation of modeling of hydroacoustics of turbulence-propulsor interaction; the effort on exploitation of polymers for the deflection of dissipation of shock wave impact on ship and submarine hull structures; transition of small scale hardware-in-the-loop demonstrator to the academic community for challenge problem formulation					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
and demonstrations of developed model based reasoning control algorithms on full scale hardware test beds. *FY 2009 Accomplishments:* Survivable Platforms - Reduced Signatures - Continued advanced numerical acoustic codes (and gridding methods for those codes) for submarines. - Continued mmWave Signatures measurement to identify key signature characteristics. - Continued Alternating Current (AC) propagation experiments. - Continued the next generation Infrared Electro-Optic Visual (IR/EO/VIS) model for surface ships by development of mitigation strategy supporting low observable infrared platforms, development of supporting physics, and prototype measurement techniques. - Continued development of quiet control surface design tool based on control surface flow noise studies. - Continued IR and radar detectability prediction capability. - Continued surface ship super-conductive degaussing with laboratory demonstration loop for Electromagnetic (EM) field accuracy measurements and control methods. - Continued testing on Advanced Electric Ship Demonstrator (AESD) to assess energy propagation and acoustic radiation mechanisms and to develop mitigation concepts for surface ships. - Continued IR assessment of two advanced treatments. - Continued first of a series of IR validation experiments and critical sensitivity analysis. - Continued Improved Corrosion Related Magnetic (CRM) Field Prediction Model to design compensation systems to reduce ship's CRM signature. - Continued assessment of ship biostatic Radar Cross Section (RCS). - Continued large-scale tests on AESD to develop signature prediction and design tools for surface ship incorporating a variety of propulsion technologies including external podded propulsion. - Continued experimental effort to characterize electric drive motor signature mechanisms and verify modeling and simulation approaches for signature prediction.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continued development of modeling methods and noise control concepts for modular/reconfigurable submarine architectures. - Continued investigation into hull treatment concepts for acoustic signature/vibration control for surface ships. - Continued development of advanced RF metamaterials for platform signature control. - Continued development of LPI technologies for surface ship emissions including communication, navigation, electronic warfare, and combat systems. - Continued development of modeling methods and noise control concepts for modular/reconfigurable submarine architectures. - Continued investigation into hull treatment concepts for acoustic signature/vibration control for surface ships. - Continued development of advanced RF metamaterials for platform signature control. - Continued development of LPI technologies for surface ship emissions including communication, navigation, electronic warfare, and combat systems. - Completed testing on AESD to assess energy propagation and acoustic radiation mechanisms and to develop hull treatment concepts for surface ships. - Completed experimental effort to characterize electric drive motor signature mechanisms and verify modeling and simulation approaches for signature prediction. - Completed CRM Field Prediction Model with final validation by measurement of full scale ship to verify CRM Field Prediction against actual Impressed Current Cathodic Protection (ICCP) system layout for measured ship and magnetic/electric fields measured at Navy Magnetic Silencing Range Facility. - Initiated development of signature modeling approaches for electric actuation and alternate electric drive system architectures. - Initiated development of Low probability Intercept (LPI) technologies for surface ship emissions including communication, navigation, electronic warfare, and combat systems. Survivable Platforms - Hull Life Assurance					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continued development of global surface wave measurement capability for ship models. - Continued Dynamic Behavior of Composite Ship Structures (DYCOSS) (joint effort with Dutch Navy). - Continued development of structural analysis codes describing failure mechanism of sandwich composites. - Continued Explosion Resistant Coatings (ERC) effort, providing US input to trilateral agreement with UK and Australia. - Continued Joint US/Japan Advanced Hull Materials & Structures Technology (AHM&ST) addressing hybrid hull concept and hybrid (steel/composite) joints in ship construction. - Continued composite and composite-metal hull performance characterization and testing including structural loading, thermal stress and signatures. - Continued effort on an advanced class of polymers as a follow-on to current ERC for application against advanced threats, Overseas Contingency Operations (OCO). - Continued Payload Implosion and Platform Damage Avoidance efforts. - Continued development of reliability-based recoverability methods for assessing damaged ship structures. Survivable Platforms - Distributed Intelligence for Automated Survivability - Continued development of modeling and simulation methods for robust design and virtual testing of integration of shipboard auxiliary systems including their control systems. - Continued research into advanced HM&E system reconfiguration approaches, including agent-based control systems and algorithms, and model-based reasoning. - Initiated Second Generation distributed systems model development. - Initiated demonstration of real-time modeling of multiple distributed systems - utilizing small scale demonstrator. - Initiated demonstration of Genetic Algorithm(s) for determining optimal distributed system control strategy. - Initiated development of a hardware in-the-loop small scale demonstrator for fluid/thermal/electrical distributed systems.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Initiated development of Survivability Analysis Algorithms Operable on a Total Ship Modeling Environment. Advanced Platforms - Advanced Platform Concepts and Designs - Continued validation of asymmetric hull forms with experimental data. - Continued development of analytical models to further define submarine modular hull concepts. - Continued development of reliability based design and structural analysis code development. - Continued development design tools for integrated antenna and composite topside. - Continued circulation control analysis for three-dimensional flow effects. - Continued aperstructures microwave communication system. - Continued concept for Ultra High Frequency (UHF)/Very High Frequency (VHF) aperstructures opportunistic array (Advanced Hull-form Inshore Demonstrator - AHFID). - Continued development of methods for determining reliability and vulnerability of aluminum ship structures. Advanced Platforms - Hydromechanics - Continued experimental database/computational tools development for extreme submarine maneuvers (e.g., crashback). - Continued the validation of circulation control and advanced control surfaces with experiments. - Continued to investigate improved maneuvering simulation capability for submarines. - Continued validation of Reynolds Average Navier-Stokes (RANS) code for advanced waterjet propulsor performance predictions. - Continued development of two-phase flow waterjet concept, Detached Eddy Simulation (DES) method for crashback prediction and numerical prediction method(s) of waterjet cavitation. - Continued modeling of turbulent flow interaction with propeller Leading Edge (LE) and Trailing Edge (TE) and modeling and simulation of rough-wall boundary layer noise. - Continued development of podded propulsor design/analysis tools. - Continued prediction and validation of damaged stability and capsize.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continued non-body-of-revolution tool development for advanced submarine configurations. - Continued the multi-platform interaction analysis and tool development. - Completed development of two-phase flow waterjet concept. - Completed prediction and validation of unconstrained capsize using advanced codes. Advanced Naval Power Systems - Continued demonstration of dynamic stability of an advanced intelligent, reconfigurable, solid-state-based, zonal-electrical power system that reconfigures within 10 milliseconds. - Continued designing software for the system manager for the Universal Control Architecture (UCA). - Continued development of thermal management technology for shipboard power distribution. - Continued investigation of potential applications of silicon-carbide in future high voltage and high power applications. - Continued improvements in electrical component and device technology allowing a reduction in motor propulsion and motor controllers weight and volume. - Continued development of technologies to support dynamic reconfiguration of shipboard systems under conditions of stressing scenarios and/or system degradation. - Continued multi-year program to directly convert thermal energy to electricity. Such a capability would allow elimination of the steam cycle on an electric warship. - Continued studies of alternative cooling systems for future shipboard radar systems. - Continued development of structural macroscopic 3-dimensional battery. - Continued development of pulsed power technologies to include pulsed alternators and capacitors. - Continued electromechanical actuator noise source characterization activities. - Continued torque measurements on reduced scale models in support of electromechanical actuators. - Continued control surface actuator project focused on the technologies needed to define the design space for control surface actuators supporting submarines. - Continued development of automated HVAC system architectures for future Naval platforms. - Continued development of common universal stator design to accommodate varying rotor topologies to improve affordability of motor design and development.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continued ship service fuel cell development. - Continued development of shipboard waste heat driven chiller systems. - Continued program to develop and demonstrate 3 - 50 kW class solid oxide fuel cell onboard mobile power generation capabilities having compatibility with future logistics fuels to enable rapid recharge of batteries and direct power for C4ISR equipment. - Continued analytical model and reduced scale component development of power conversion technologies for multi-function motor drives, bi-directional power conversion modules, and power management controllers focusing on closing technology gaps associated with Alternative Integrated Power System (IPS) Architectures. (Transitioned from PE 0602236N/Cost Reduction Technologies) - Completed demonstrations of improvements in electrical component and device enabling technology allowing a reduction in motor propulsion and motor controllers weight and volume. - Completed demonstration of Ship and Submarine Electric Actuator basic technology. - Completed studies of alternative cooling systems for future shipboard radar systems. - Completed multi-year program to directly convert thermal energy to electricity. - Completed development of structural macroscopic 3-dimensional battery. - Completed development of pulsed power technologies to include pulsed alternators and capacitors. - Completed energy storage, thermal management, electromechanical machines program under the Energy-Power Technology Initiative. - Initiated preliminary designs of control surface actuator systems. - Initiated studies of advanced heating, ventilation, and air-conditioning architectures, including studies of alternative (non-vapor-compression) refrigeration systems and concepts for waste heat reuse, to enhance ship cooling and provide thermal energy storage. - Initiated research into the development of fuel chemistries, materials, and energy conversion technologies for optimal performance in Naval power systems. Surface Ship & Submarine HM&E Applied Research - Completed technology development for alternate approaches to high voltage fast turn off switches. - Continued development of heterojunction power switching devices.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continued the computational design, synthesis and evaluation of new, high capacity, high-rate anode materials for Li-ion batteries. Acquisition Workforce Fund: - Funded DoD Acquisition Workforce Fund. *FY 2010 Plans:* Survivable Platforms - Reduced Signatures - Continue all efforts of FY 2009, less those noted as completed above. - Complete mmWave Signatures assessments to identify key signature characteristics. - Complete IR validation experiments and critical sensitivity analysis. - Complete testing on AESD to develop hull treatment coverage prediction capability for surface ships. - Initiate development of advanced special materials for hemispherical signature control. - Initiate scientific study of advanced passive EM signature control technologies. - Initiate development of next generation of evolving threat sensor systems. Survivable Platforms - Hull Life Assurance - Continue all efforts of FY 2009. Survivable Platforms - Distributed Intelligence for Automated Survivability - Continue all efforts of FY 2009. - Complete development of a hardware in-the-loop small scale demonstrator for fluid/thermal/electrical distributed systems. Advanced Platforms - Advanced Platform Concepts and Designs - Continue all efforts of FY 2009. Advanced Platforms - Hydromechanics					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Continue all efforts of FY 2009, less those noted as completed above. - Initiate full-scale circulation control bow planes design and construction for at-sea test. - Initiate prediction and validation of damaged stability and capsize for advanced hulls and codes. Advanced Naval Power Systems - Continue all efforts of FY 2009, less those noted as completed above. - Complete preliminary designs of control surface actuator systems. - Complete common universal stator design to accommodate varying rotor topologies to improve affordability of motor design and development. - Initiate detailed design and breadboard demonstration of control surface actuator systems. Surface Ship & Submarine HM&E Applied Research - Continue all efforts of FY 2009. - Complete development of heterojunction power switching devices. - Complete the computational design, synthesis and evaluation of new, high capacity, high-rate anode materials for Li-ion batteries. *FY 2011 Base Plans:* Survivable Platforms - Reduced Signatures - Continue all efforts of FY 2010, less those noted as completed above. - Initiate advanced EM modeling tools development and validation. - Initiate next generation deckhouse integration technology development. - Initiate modeling of hydroacoustics of turbulence-propulsor interaction. Survivable Platforms - Hull Life Assurance - Continue all efforts of FY 2010. - Initiate effort on exploitation of polymers for the deflection and dissipation of shock wave impact on ship and submarine hull structures.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Survivable Platforms - Distributed Intelligence for Automated Survivability - Continue all efforts of FY 2010. - Complete initial demonstration of real-time modeling of multiple distributed systems - utilizing the small scale demonstrator. - Complete development of a hardware in-the-loop small scale demonstrator for fluid/thermal/electrical distributed systems. - Complete Second Generation distributed systems model development. - Initiate the transition of the small scale hardware-in-the-loop demonstrator to the academic community for challenge problem formulation. - Initiate demonstration of the developed model based reasoning control algorithms on full scale hardware test beds. Advanced Platforms - Advanced Platform Concepts and Designs - Continue all efforts of FY 2010. Advanced Platforms - Hydromechanics - Continue all efforts of FY 2010. - Complete optimization for waterjet-hull interaction. - Complete tip-vortex cavitation inception and scaling modeling. - Complete modeling of shock performance on composite propeller. - Initiate modeling of performance of composite propellers in extreme maneuvers. Advanced Naval Power Systems - Continue all efforts of FY 2010, less those noted as completed above. - Complete detailed design and breadboard demonstration of control surface actuator systems. - Complete electromechanical actuator noise source characterization activities. - Complete torque measurements on reduced scale models in support of electromechanical actuators.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
- Initiate fabrication of scaled control surface actuator systems under the Future Naval Capabilities (FNC) program. Surface Ship & Submarine HM&E Applied Research - Continue all efforts of FY 2010, less those noted as completed above.					
Accomplishments/Planned Programs Subtotals	131.478	90.978	107.448	0.000	107.448

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• 0603123N: *FORCE PROTECTION ADVANCED TECHNOLOGY*	32.668	44.995	40.818	0.000	40.818	36.487	24.714	6.843	0.000	0.000	186.525

D. Acquisition Strategy

N/A

E. Performance Metrics

This PE supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial and air) and the protection of those platforms. Each PE Activity has unique goals and metrics, some of which include classified quantitative measurements. Overall metric goals are focused on achieving sufficient improvement in component or system capability such that the 6.2 applied research projects meet the need of or produce a demand for inclusion in advanced technology that may lead to incorporation into acquisition programs or industry products available to acquisition programs.

Specific examples of metrics under this PE include:
- Increase the hydrodynamic efficiency of current hull designs by 5% by FY 2010.
- Reduce electromagnetic vulnerability of ship hulls by 50% by FY 2011.
- Torpedo defense thresholds will be validated by modeling and simulation to satisfy the overall system performance specification of a Probability of Survival (PS) of the US Navy platform as specified in the draft Capabilities Development Document (CDD) for Surface Ship Torpedo Defense.

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- Additional metrics are included within the Missile Defense Activity description.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
9999: *Congressional Adds*	55.150	55.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	241.702

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Advanced Battery System For Military Avionics Power Systems *FY 2010 Plans:* This effort supports Advanced Battery System for Military Avionics Power Systems research.	0.000	1.593
Congressional Add: Advanced Composite Manufacturing For Composite High-Speed Boat Design *FY 2010 Plans:* This effort supports Advanced Composite Manufacturing for Composite High-Speed Boat Design research.	0.000	1.593
Congressional Add: Advanced Energetics Initiative *FY 2010 Plans:* This effort supports Advanced Energetics Initiative research.	0.000	3.983
Congressional Add: Carbon Composite Thin Films For Power Generation And Energy Storage	0.000	1.593

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: This effort supports Carbon Composite Thin Films for Power Generation and Energy Storage research.		
Congressional Add: Center For Autonomous Solar Power-Supercapacitors For Integrated Power Storage *FY 2010 Plans:* This effort supports Center for Autonomous Solar Power-Supercapacitors for Integrated Power Storage research.	0.000	3.983
Congressional Add: Energetic Nano-Materials Agent Defeat Initiative *FY 2010 Plans:* This effort supports Energetic Nano-Materials Agent Defeat Initiative research.	0.000	1.593
Congressional Add: Fuel Efficient, High Specific Power Free Piston Engine For Ussvs *FY 2010 Plans:* This effort supports Fuel Efficient, High Specific Power Free Piston Engine for USSVs research.	0.000	1.593
Congressional Add: Lithium Ion Storage Advancement For Aircraft Applications *FY 2010 Plans:* This effort supports Lithium Ion Storage Advancement for Aircraft Applications research.	0.000	1.992
Congressional Add: Multi-Mission Unmanned Surface Vessel	0.000	1.992

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: This effort supports Multi-Mission Unmanned Surface Vessel research.		
Congressional Add: Non-Traditional Ballistic Fiber And Fabric Weaving Application For Force Protection *FY 2010 Plans:* This effort supports Non-Traditional Ballistic Fiber and Fabric Weaving Application for Force Protection research.	0.000	1.992
Congressional Add: Hybrid Power Systems *FY 2010 Plans:* This effort supports Hybrid Power Systems research.	0.000	1.992
Congressional Add: Proton Exchange Membrane Fuel Cell For Underwater Vehicles *FY 2010 Plans:* This effort supports Proton Exchange Membrane Fuel Cell for Underwater Vehicles research.	0.000	1.593
Congressional Add: Advanced Simulation Tools for Aircraft Structures Made of Composite Materials *FY 2009 Accomplishments:* This effort supported the development and validation of tools and guidelines for the simulation of the structural and strength responses of airframe components made of fiber-reinforced composites, an area where the use of advanced computer-aided engineering technology is particularly important.	1.197	1.593

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: Continue this effort to support the continuation of Advanced Simulation Tools for Composite Aircraft Structures research.		
Congressional Add: Alternative Energy Research *FY 2009 Accomplishments:* This effort supported research into the potential for this effort to develop alternative energy sources for military applications and to analyze the effects of alternative fuels on military engines and equipments. *FY 2010 Plans:* Continue this effort to support the continuation of Alternative Energy Research.	19.945	18.423
Congressional Add: Deputee-High Powered Microwave Non-Lethal Vehicle/Vessel Engine Disabling *FY 2009 Accomplishments:* This effort supported the demonstration of the capability to counter, in an effective, non-lethal fashion, marine vessel and ground vehicle threats.	1.596	0.000
Congressional Add: Harbor Shield-Homeland Defense Port Security Initiative *FY 2009 Accomplishments:* This effort supported the improvement of the defense of harbors against asymmetric attack by detecting threats at safe standoff distances. *FY 2010 Plans:* Continue this effort to support the continuation of Harbor Shield - Homeland Defense Port Security Initiative research.	3.490	1.593

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: High Speed ACRC & Composites Sea Lion Craft Development *FY 2009 Accomplishments:* This effort supported the validation of potential weight savings from the previous aluminum craft currently being demonstrated by NSWC Combatant Craft and from the integrated low observable antennas.	1.995	0.000
Congressional Add: High Power Density Propulsion and Power for USSVs *FY 2009 Accomplishments:* This effort supported the demonstration of a heavy fuel engine with significant increase in power-to-weight ratio and improvement in specific fuel consumption.	1.596	0.000
Congressional Add: High Strength Welded Structures *FY 2009 Accomplishments:* This effort supported the development of a lighter and less expensive metal to be used for ship hulls.	0.798	0.000
Congressional Add: Integration of Electro-Kinetic Weapons into Next Generation of Navy Ships *FY 2009 Accomplishments:* This effort supported the development of ships' electrical systems architecture and technologies to support the integrations of electro-kinetic weapons systems into naval ships. *FY 2010 Plans:* Continue this effort to support the continuation of Integration of Electro-Kinetic Weapons Into Next Generation Navy Ships research.	4.487	3.983
	1.596	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602123N: *Force Protection Applied Res*	PROJECT 9999: *Congressional Adds*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Lithium Batteries *FY 2009 Accomplishments:* This effort supported research into the potential to replace existing aircraft batteries with lithium ion batteries exhibiting lighter weight, smaller volume, and enhanced performance.		
Congressional Add: Lithium-Ion Cell Development with Electro Nano Materials *FY 2009 Accomplishments:* This effort supported the use of nanomaterials to develop and demonstrate lithium ion batteries exhibiting lighter weight, smaller volume, and enhanced performance compared with current battery technologies.	3.988	0.000
Congressional Add: Lithium-Sulfur Chemistry Validation for Sonobuoy Application *FY 2009 Accomplishments:* This effort supported research into the development of replacement Lithium/Sulfur Dioxide batteries at a lighter weight, taking up less space with extended shelf-life.	1.596	0.000
Congressional Add: Magnetic Refrigeration Technology *FY 2009 Accomplishments:* This effort supported research development of magnetic refrigeration that could enable improved thermal management of the complex, temperature sensitive electrical and electronic systems increasingly installed onboard Naval sea, air and ground platforms. *FY 2010 Plans:* Continue this effort to support the continuation of Magnetic Refrigeration Technology for Naval Applications research.	2.394	3.983

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Mk V.1 MAKO for Improved Signature and Weight Performance *FY 2009 Accomplishments:* This effort supported research into the potential of reducing the Mk V.1 structural weight and improving signature characteristics through the use of lightweight composite materials.	1.995	0.000
Congressional Add: Naval Special Warfare 11m RIB Replacement Craft Design *FY 2009 Accomplishments:* This effort supported the development of technologies to design high speed planing craft that minimize the wave slap shock on passengers and crew, enabling SOF forces to be more physically conditioned to execute their mission following a transit over rough waters.	0.798	0.000
Congressional Add: PMRF Force Protection Lab *FY 2009 Accomplishments:* This effort supported the development, integration, and evaluation of force protection and security technologies at the Pacific Missile Range Facility (PMRF). The effort includes integration of advanced sensor systems, novel sensor and data fusion processes, behavior modeling and analysis, and data mining and knowledge extraction techniques.	1.995	0.000
Congressional Add: Planar Solid Oxide Fuel Cell System Demonstration at UTC SimCenter *FY 2009 Accomplishments:* This effort supported the development of modeling and simulation capabilities to describe solid oxide fuel cells to improve performance for future military applications.	3.490	0.000
	0.997	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Navy		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602123N: *Force Protection Applied Res*	**PROJECT** 9999: *Congressional Adds*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Shipboard Production of Synthetic Aviation Fuel *FY 2009 Accomplishments:* This effort supported the development of a shipboard logistics or aviation fuel production capability that is proven to be more economical and safer than the existing land based fueling capabilities. In addition, shipboard production of synthetic fuel will lessen dependency on petroleum-based resources.		
Congressional Add: Standoff Explosive Detection System (SEDS) *FY 2009 Accomplishments:* This effort supported the development of a scanning laser sensor for real-time, standoff, remote detection of trace particle contamination of all types of explosives (military, commercial and improvised) on vehicles, personnel and suspicious objects.	1.197	0.000
Congressional Adds Subtotals	55.150	55.067

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.