

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Navy**

**DATE:** February 2011

**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 2010	FY 2011	FY 2012	FY 2012	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Cost To	Total Cost
			Base	OCO	Total					Complete	
Total Program Element	154.170	107.448	156.901	-	156.901	156.391	146.367	146.023	133.105	Continuing	Continuing
0000: Force Protection Applied Res	88.359	107.448	156.901	-	156.901	156.391	146.367	146.023	133.105	Continuing	Continuing
4027: Naval Innovative Science and Engineering	9.748	-	-	-	-	-	-	-	-	0.000	9.748
9999: Congressional Adds	56.063	-	-	-	-	-	-	-	-	0.000	56.063

**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.

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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012 Base</b>	<b>FY 2012 OCO</b>	<b>FY 2012 Total</b>
Previous President's Budget	146,045	107,448	111,156	-	111,156
Current President's Budget	154,170	107,448	156,901	-	156,901
Total Adjustments	8,125	-	45,745	-	45,745
• Congressional General Reductions	-	-	-	-	-
• Congressional Directed Reductions	-	-	-	-	-
• Congressional Rescissions	-	-	-	-	-
• Congressional Adds	-	-	-	-	-
• Congressional Directed Transfers	-	-	-	-	-
• Reprogrammings	-0.028	-	-	-	-
• SBIR/STTR Transfer	-1.550	-	-	-	-
• Program Adjustments	-	-	46,714	-	46,714
• Section 219 Reprogramming	8,724	-	-	-	-
• Rate/Misc Adjustments	-	-	-0,969	-	-0,969
• Congressional General Reductions Adjustments	-0.021	-	-	-	-
• Congressional Add Adjustments	1,000	-	-	-	-

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

**Project: 9999: Congressional Adds**

- Congressional Add: Advanced Battery System for Military Avionics Power Systems
- Congressional Add: Advanced Composite Manufacturing for Composite High-Speed Boat Design
- Congressional Add: Advanced Energetics Initiative
- Congressional Add: Advanced Simulation Tools for Composite Aircraft Structures
- Congressional Add: Alternative Energy Research
- Congressional Add: Power Generation Carbon Comp Thin Films
- Congressional Add: Center for Autonomous Solar Power
- Congressional Add: Energetic Nano-Materials Agent Defeat Initiative
- Congressional Add: Fuel Efficient, High Specific Power Free Piston Engine for USSVs
- Congressional Add: Harbor Shield - Homeland Defense Port Security Initiative
- Congressional Add: Integration of Electro-Kinetic Weapons Into Next Generation Navy Ships

<b>FY 2010</b>	<b>FY 2011</b>
1.593	-
1.593	-
3.983	-
1.593	-
18.423	-
1.593	-
3.983	-
1.593	-
1.593	-
1.593	-
3.983	-

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<b>Congressional Add Details (\$ in Millions, and Includes General Reductions)</b>		<b>FY 2010</b>	<b>FY 2011</b>
Congressional Add: <i>Lithium Ion Storage Advancement for Aircraft Applications</i>		1.992	-
Congressional Add: <i>Magnetic Refrigeration Technology for Naval Applications</i>		3.983	-
Congressional Add: <i>Multi-Mission Unmanned Surface Vessel</i>		1.992	-
Congressional Add: <i>Non Traditional Ballistic Fiber and Fabric Weaving for Force Protection</i>		1.992	-
Congressional Add: <i>Hybrid Power Systems</i>		1.992	-
Congressional Add: <i>Proton Exchange Membrane Fuel Cell for Underwater Vehicles</i>		1.593	-
Congressional Add: <i>Joint Heavy-Lift Rotocraft Research</i>		0.996	-
Congressional Add Subtotals for Project: 9999		56.063	-
Congressional Add Totals for all Projects		56.063	-

**Change Summary Explanation**

Technical: Not applicable.

Schedule: Not applicable.

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy

DATE: February 2011

**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

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	Total Cost
										Complete	
9999: Congressional Adds	56.063	-	-	-	-	-	-	-	-	0.000	56.063

**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
<b>Congressional Add:</b> Advanced Battery System for Military Avionics Power Systems	1.593	-
<b>FY 2010 Accomplishments:</b> This effort provided for the study of safety and performance characteristics of lithium batteries in military avionics at the systems level in order to assess the use of advanced lithium battery technology for military aircraft.	1.593	-
<b>Congressional Add:</b> Advanced Composite Manufacturing for Composite High-Speed Boat Design	1.593	-
<b>FY 2010 Accomplishments:</b> This effort established a basic set of criteria for the design and specification of advanced composite high speed boats. When used, these criteria will allow engineers to better utilize advanced composites in high-speed boat design, resulting in lighter, more efficient, and more reliable high-speed craft.	3.983	-
<b>Congressional Add:</b> Advanced Energetics Initiative	1.593	-
<b>FY 2010 Accomplishments:</b> This effort provided for research into; energetic processes, conventional energetic materials to enhance blast from novel formulations and reactive casings, modulation of propellant reactions, and pursuit of novel smart and multifunctional materials that traditionally have non-energetic function to make them energetic.	3.983	-
<b>Congressional Add:</b> Advanced Simulation Tools for Composite Aircraft Structures	1.593	-
<b>FY 2010 Accomplishments:</b> This effort developed and validated advanced computational tools and guidelines for the simulation of the structural and strength responses of airframe components made of fiber-reinforced composites.	1.593	-
<b>Congressional Add:</b> Alternative Energy Research	18.423	-
<b>FY 2010 Accomplishments:</b> This effort provided for alternative energy research, specifically for participation in the 2010 International Methane Hydrate Expedition in the Arctic Ocean, to develop a thorough understanding of the properties and potential energy applications of oceanic methane hydrates through this joint international	18.423	-

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**PROJECT**  
 9999: Congressional Adds

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2010	FY 2011
program in order to develop improved models for the creation and disassociation of natural gas hydrates and to quantify the impact of these processes on the geophysical and geotechnical properties of marine sediments.		
<b>Congressional Add:</b> Power Generation Carbon Comp Thin Films	1.593	-
<b>FY 2010 Accomplishments:</b> This effort funded research leading to development of a wide variety of new nanomaterials (polymers/epoxy/resin and fillers) that will broaden capabilities in key areas of energy generation and storage. The potential use of organic nanomaterials in the proposed concentrator cells will result in lightweight plastic solar cells, new controlled high performance blades for harnessing wind energy and lightweight high efficiency batteries with high storage capabilities.		
<b>Congressional Add:</b> Center for Autonomous Solar Power	3.983	-
<b>FY 2010 Accomplishments:</b> This effort provided for research and development of large area, flexible, light weight solar cells to meet scientific challenges in reducing the cost of solar power and enhancing energy efficiency. Solar cells were integrated with novel high energy density supercapacitors for a complete collection and storage capability.		
<b>Congressional Add:</b> Energetic Nano-Materials Agent Defeat Initiative	1.593	-
<b>FY 2010 Accomplishments:</b> This effort provided applied research to develop technology to disable chemical and biological (CB) agent munitions stockpiles while minimizing dispersion of CB agents and increasing efficiency of CB agent defeat during a short time event.		
<b>Congressional Add:</b> Fuel Efficient, High Specific Power Free Piston Engine for USSVs	1.593	-
<b>FY 2010 Accomplishments:</b> This effort provided applied research to develop a free-piston engine. Operation at varying load and speed was studied to explore power, output range and capability, focusing on engine cooling system design and verification of operation in compression ignition mode with a heavy fuel.		
<b>Congressional Add:</b> Harbor Shield - Homeland Defense Port Security Initiative	1.593	-
<b>FY 2010 Accomplishments:</b> This effort provided applied research for design and manufacture of underwater components for a prototype ship hull scanning sonar system, mounting fixtures, cabling, and interfaces.		
<b>Congressional Add:</b> Integration of Electro-Kinetic Weapons Into Next Generation Navy Ships	3.983	-
<b>FY 2010 Accomplishments:</b> This effort investigated the energy delivery technologies for electro-kinetic weapons systems and the integration and interface issues of these weapons.		
<b>Congressional Add:</b> Lithium Ion Storage Advancement for Aircraft Applications	1.992	-

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**PROJECT**  
 9999: Congressional Adds

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2010</b>	<b>FY 2011</b>
<b>FY 2010 Accomplishments:</b> This effort supported lithium ion storage advancement for aircraft applications research.		
<b>Congressional Add:</b> Magnetic Refrigeration Technology for Naval Applications	3.983	-
<b>FY 2010 Accomplishments:</b> This effort studied the feasibility of materials and assisted in the development of a transition strategy for magnetic refrigeration technology for naval application. New amorphous magnetic alloys were designed, characterized, and optimized for use in magnetic refrigeration applications. Enhanced (Fe,Co,Mn)-based amorphous magnetocaloric materials were synthesized by rapid solidification processing and their structural and magnetic properties were characterized. The newly developed alloys will provide better magnetic entropy change and higher refrigeration capacity than conventional amorphous magnetocaloric effect materials near room temperature.		
<b>Congressional Add:</b> Multi-Mission Unmanned Surface Vessel	1.992	-
<b>FY 2010 Accomplishments:</b> This effort enabled testing and evaluation of the use and effectiveness of a large Unmanned Surface Vessel (USV) with multiple capabilities including surface warfare, persistent electronic surveillance for dull, dirty, dangerous missions typical of unmanned vessels. The first large, stealthy, attack USV with a combat suite was integrated into the US Navy enterprise network (FORCEnet), reducing risk to personnel conducting high risk, covert, intelligence/surveillance operations.		
<b>Congressional Add:</b> Non Traditional Ballistic Fiber and Fabric Weaving for Force Protection	1.992	-
<b>FY 2010 Accomplishments:</b> This effort evaluated non traditional weave designs of Aramid (ballistic) fiber coupled with new applications of microwave plasma treatments to enhance the strength of the fiber. The new technology may result in enhanced mobility, ease of medical access, reduced weight, increased ballistic protection, cost savings and weight reduction compared to current ballistic materials.		
<b>Congressional Add:</b> Hybrid Power Systems	1.992	-
<b>FY 2010 Accomplishments:</b> This effort investigated aluminum/seawater combustion systems using a balanced program that addresses technologies that can be inserted in UUV power plants in the near-, mid- and long-term time frames.		
<b>Congressional Add:</b> Proton Exchange Membrane Fuel Cell for Underwater Vehicles	1.593	-

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 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 Programs (\$ in Millions)**

**FY 2010 Accomplishments:** This effort provided for development of a proton exchange membrane fuel cell for underwater vehicles that assisted with the development of a hybrid fuel cell/lithium ion battery power system that combines the advantages of each to create an ideal solution for mobile power applications.

**Congressional Add:** Joint Heavy-Lift Rotorcraft Research

**FY 2010 Accomplishments:** This effort developed a comprehensive aeromechanics research program to support the development of efficient heavy-lift rotorcraft concepts. The work involved innovative rotor designs, variable rotor speed capability, swashplateless flight and active vibration control, lightweight airframe with body armor, condition-based maintenance of advanced flight control system, acoustic prediction with high-fidelity computational tools, and flight controls of mission adaptive rotors. This research program provided risk reduction guidance and design solutions as well as strategic directions for the next-generation of heavy-lift V/STOL systems.

**Congressional Adds Subtotals**

	FY 2010	FY 2011
	0.996	-
	56.063	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**D. Acquisition Strategy**

Not applicable.

**E. Performance Metrics**

Congressional Interest Items not included in other Projects.