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

APPROPRIATION/BUDGET ACTIVITY				R-1 ITEM NOMENCLATURE							
1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 2: <i>Applied Research</i>				PE 0602114N: <i>Power Proj Applied Research</i>							
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	79.762	98.150	104.804	-	104.804	106.752	105.973	113.806	125.106	Continuing	Continuing
0000: <i>Power Proj Applied Research</i>	57.793	98.150	104.804	-	104.804	106.752	105.973	113.806	125.106	Continuing	Continuing
4027: <i>Naval Innovative Science and Engineering</i>	0.300	-	-	-	-	-	-	-	-	0.000	0.300
9999: <i>Congressional Adds</i>	21.669	-	-	-	-	-	-	-	-	0.000	21.669

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 supports both advanced technology research and near to mid-term transition opportunities. The advanced research focus is primarily on High Energy Lasers (HEL), Electromagnetic railgun development, high speed weapon propulsion, and electro-optic/infrared (EO/IR) sensor technologies. The mid-term effort is focused on developing and demonstrating technologies supporting the Future Naval Capability (FNC) Program Enabling Capabilities (ECs) for Marine and Unmanned Vehicle Tactical Intelligence, Surveillance and Reconnaissance (ISR), Advanced Naval Fires Technology, Hostile Fire Detection and Response, Maritime Weapons of Mass Destruction Detection (MWMD-D), and Dynamic Target Engagement & Enhanced Sensor Capabilities. Within the Naval Transformation Roadmap, this investment will achieve two of four key transformational capabilities required by Sea Strike as well as technically enable the Littoral Sea Control key transformational capability within Sea Shield.

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

UNCLASSIFIED

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BA 2: <i>Applied Research</i>	

B. Program Change Summary (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	77.210	98.150	138.620	-	138.620
Current President's Budget	79.762	98.150	104.804	-	104.804
Total Adjustments	2.552	-	-33.816	-	-33.816
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	3.482	-			
• SBIR/STTR Transfer	-0.667	-			
• Program Adjustments	-	-	-33.445	-	-33.445
• Section 219 Reprogramming	-0.255	-	-	-	-
• Rate/Misc Adjustments	-	-	-0.371	-	-0.371
• Congressional General Reductions Adjustments	-0.008	-	-	-	-

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

Project: 9999: Congressional Adds

- Congressional Add: *Advanced Helicopter Landing Aid*
- Congressional Add: *Aging Military Aircraft Fleet Support*
- Congressional Add: *Combustion Light Gas Gun Projectile*
- Congressional Add: *Electronic Motion Actuation Systems*
- Congressional Add: *Enhanced EO/IR Sensors*
- Congressional Add: *Millimeter Wave Imaging*
- Congressional Add: *Multifunctional Materials, Devices, and Applications*
- Congressional Add: *Naval Advanced Electric Launcher System*
- Congressional Add: *Strike Weapon Propulsion*
- Congressional Add: *Guidance, Navigation, Control, and Targeting*

Congressional Add Subtotals for Project: 9999

	FY 2010	FY 2011
	0.797	-
	1.593	-
	3.983	-
	0.797	-
	2.390	-
	1.354	-
	1.593	-
	1.992	-
	3.187	-
	3.983	-
Congressional Add Subtotals for Project: 9999	21.669	-

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Navy	DATE: February 2011
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Congressional Add Details (\$ in Millions, and Includes General Reductions)		FY 2010	FY 2011
Congressional Add Totals for all Projects		21.669	-

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

UNCLASSIFIED

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

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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
0000: <i>Power Proj Applied Research</i>	57.793	98.150	104.804	-	104.804	106.752	105.973	113.806	125.106	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project addresses the technology issues involving the Navy's capability to project naval power on the broad seas and in the littoral regions.

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

	FY 2010	FY 2011	FY 2012
<p>Title: DIRECTED ENERGY</p> <p>Description: The goal of this activity is to develop Directed Energy (DE) technology for Navy applications. The DE program address the requirements of future Navy combatants to provide ship defense against the high speed, high maneuverability Cruise Missiles that are proliferating throughout the Navies of the world. The Directed Energy portion of this activity consists of two elements. The first element involves applied research and development of technologies supporting advanced accelerators with applications to directed energy weapons. This activity also includes the Free Electron Laser (FEL) Innovative Naval Prototype (INP) which if successful could be utilized for shipboard applications as a defensive weapon against advanced cruise missiles and asymmetric threats.</p> <p>FY10 to FY12 increase in funding is primarily due to the start of the second contractual phase of the FEL INP program. As a result of the Phase 1A competition, a single contractor was awarded the contract in late FY10 and in FY11 the selected contractor will begin the critical design, development and installation portion of the FEL INP 100kW test and demonstration program. In addition long lead item procurement for the 100 kW FEL will begin in FY11/12. These long lead items require approximately 15 to 18 months for manufacturing and delivery to the test facility. The other element influencing the funding increase is the additional S&T investment required to develop compact, high performance FEL components such as the high power injector (super conducting and normal conducting radio frequency), the mirror/optical components and oscillator system, and the high power amplifiers. Additional development of these components is extremely critical for operation at required INP power levels and also to minimize the FEL footprint in anticipation of eventual ship integration.</p> <p>FY 2010 Accomplishments: Directed Energy and Accelerator Research:</p> <ul style="list-style-type: none"> - Continued cryomodule and FEL component development at the FEL testing and integration facility. - Continued investigation into the application of FEL technology to other areas including advanced materials, optics, bioscience, medical, manufacturing, weaponization, and solid state physics. - Continued 1 micron filamentation, halo limitation, and short Rayleigh range studies. - Continued testing of Radio Frequency (RF) gun High Voltage Power Supply (HVPS) components 	28.893	41.797	60.418

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<p>which are required for the 100 kW high current injector.</p> <ul style="list-style-type: none"> - Continued applied directed energy and accelerator research in: Compton radiation scattering, multiple dielectric thin film coatings, bunch characteristics of electron beam emittance, high grade electromagnetic field generators, electron beam lattice configuration, novel electron beam generation, novel high flux subatomic particle emission, high gain photonic amplification, fundamental power efficiency conversion. - Continued the development of physics based models for: characterization of subatomic particle interaction and propagation and modeling for validation of photon control structures. - Continued Innovative Prototype (INP) program for the FEL. Held Preliminary Design Review (PDR) for both contractors who were selected to participate in Phase 1A of the FEL INP program. Review proposals from the Phase 1A contractors. Downselect and award a contract to a single contractor to proceed forward in Phase 1B and the Critical Design Review (CDR) to be held in FY11. <p>Applied Electromagnetics for High Power Weapons:</p> <ul style="list-style-type: none"> - Initiated a program to conduct applied research into applied electromagnetics as it relates to lasers, high power microwaves, and advanced sensors for Directed Energy Weapons. <p>FY 2011 Plans:</p> <p>Directed Energy and Accelerator Research:</p> <ul style="list-style-type: none"> - Continue detailed design efforts required for presentation at the CDR for Phase 1B of the FEL program, including preparation of design, materials and parts, analyses and trade study, safety and supportability reports, and initial orders for long lead item components. In addition some preliminary preparations will begin at the test facility selected for installation of the 100 kW FEL system. - Continue development of components required for the successful testing of the 100 kW FEL, to support the scale up of the 100 kW FEL into a megawatt class weapon, and to reduce the overall footprint of the system to support the eventual ship integration of the FEL, including normal conducting and super conducting RF electron beam injectors, advanced high power cathode technologies, high power compact amplifiers, and advanced mirrors, coatings and optical components capable of handling the significantly higher energies that are present in a 100 kW level FEL. <p>Applied Electromagnetics for High Power Weapons:</p> <ul style="list-style-type: none"> - Continue all efforts of FY 2010. <p>FY 2012 Plans:</p>				

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<p>- Complete execution of Phase 1B of 100 kW FEL demonstration program. Initiate Phase II of the 100 kW FEL program. Phase II will include the fabrication, integration, and acceptance testing of a 100 kW FEL prototype .</p> <p>- Continue S&T development of high power, compact components required for megawatt class FELs.</p> <p>- Conduct analysis, design, development and testing of photocathodes, thermionic cathodes, field emission array cathodes, Radio Frequency (RF) sources and input couplers, and cryomodules for Superconducting RF electron guns for high power FELs.</p> <p>Applied Electromagnetics for High Power Weapons:</p> <p>- Continue all efforts of FY 2011.</p>				
<p>Title: HIGH SPEED PROPULSION AND ADVANCED WEAPON TECHNOLOGIES</p> <p>Description: The high speed weapons work in this activity is focused on demonstrating propulsion and vehicle technologies for Mach3+ to Mach8 capable weapons. The solid rocket motor Integrated High Performance Rocket Propulsion Technology (IHPRPT) technology development activities will provide improved rocket based weapon performance. The rocket technologies apply to both air dominance and strike weapons and will provide both improved range and speed.</p> <p>This work includes technologies associated with high acceleration capable projectile structures, high temperature and high strength materials to enable projectiles to survive high speed launch environment, improved thermal prediction methodologies and test techniques, wide dynamic pressure adaptable projectile controls and non-explosively launched lethal mechanisms. The high speed projectile technologies are intended to support long range Naval Fire Support weapons. Increase from FY10 to FY11 is due to increased investment in the development of advanced guidance and control technologies for high speed weapons.</p> <p>FY 2010 Accomplishments: High Speed Projectile & Advanced Weapon Technologies (Formerly Asymmetric Threat & Laser Control Technologies):</p> <ul style="list-style-type: none"> - Continued high speed projectile technology development. - Completed IHPRPT program with final testing. <p>FY 2011 Plans: High Speed Projectile & Advanced Weapon Technologies (Formerly Asymmetric Threat & Laser Control Technologies):</p> <ul style="list-style-type: none"> - Continue high speed projectile technology development. - Initiate effort to develop advanced guidance and control technologies for high speed weapons. <p>FY 2012 Plans: High Speed Projectile & Advanced Weapons</p>		1.512	5.446	6.400

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<ul style="list-style-type: none"> - Initiate investigations into advanced material solutions to high speed airframes and air systems operating in maritime environments. Areas of research will include advanced lightweight structures, high thermal conductivity materials, corrosion resistant components and systems, and high temperature resistant materials and structures. - Initiate high speed propulsion and integrated airframe technology development to enhance system range, responsiveness and reliability. - Continue advanced guidance and control technology development. 				
<p>Title: NAVIGATION, ELECTRO OPTIC/INFRARED (EO/IR), AND SENSOR TECHNOLOGIES</p> <p>Description: This activity describes Navy Science and Technology (S&T) investments in the areas of EO/IR devices and advanced sensors and includes NRL investment/performance in the technology areas of Electronics, Electronic Warfare, and Communications.</p> <p>FY 2010 Accomplishments:</p> <p>Electro Optic/Infrared:</p> <ul style="list-style-type: none"> - Continued development of tunable narrowband infrared absorption technology. - Completed development of new processes/methodologies to enable construction of composite countermeasures that fit the engagement timeline while maintaining effectiveness against existing and emerging IR guided threats. <p>Autonomous Systems:</p> <ul style="list-style-type: none"> - Completed the development of a novel beam steering method in phased array radar using optical fiber based slow light techniques. - Completed the development of machine-vision algorithms and guidance strategies to enable the precision autonomous recovery of small sensor platforms on moving naval vessels. - Completed the development of an autonomous soaring capability and intelligent path planning for extracting energy from the environment thereby conserving onboard fuel stores of autonomous air vehicles. <p>Electronic Warfare:</p> <ul style="list-style-type: none"> - Continued development of ultra low noise uncooled nanotechnology infrared sensors. - Continued development nanoatomic sensor nonvolatile memories. - Continued development of electronic field of view and zoom imagers. - Continued the development of an active optics system that can survey a wide area and instantly, non-mechanically zoom-in on an area of interest for target tracking/identification. - Continued development of new processes/methodologies to enable construction of composite 		3.730	3.437	3.707

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<p>countermeasures that fit the engagement timeline while maintaining effectiveness against existing and emerging IR guided threats.</p> <ul style="list-style-type: none"> - Completed development of high power fiber lasers in mid-IR (2-5 micro-m) based upon highly nonlinear IR transmitting chalcogenide photonic crystal fibers. - Initiated effort to develop mid & long wave IR focal plane arrays using graded-bandgap W-type-II superlattices w/much higher detectivity than that of state-of-the-art HgCdTe (MCT). - Initiated development of tunable narrowband infrared absorption technology. <p>FY 2011 Plans: Electro Optic/Infrared: - Complete development of tunable narrowband infrared absorption technology.</p> <p>Electronic Warfare: - Continue all efforts of FY 2010 unless completed above. - Complete development of an ultra-lean combustor for recuperated gas turbines.</p> <p>FY 2012 Plans: Electronic Warfare: - Continue all efforts of FY 2011 unless completed above.</p>				
<p>Title: STRIKE AND LITTORAL COMBAT TECHNOLOGIES</p> <p>Description: The focus of this activity is on those technologies that will support Naval Precision Strike Operations and provide the Navy of the future the ability to quickly locate, target, and strike critical targets ashore.</p> <p>FY10 to FY12 increase is due to the initiation of Strike Accelerator Program and FNC new starts.</p> <p>FY 2010 Accomplishments: Increased Capability Against Moving and Stationary Targets: - Continued the Direct Attack Seeker Head (DASH) project by developing and testing of the radar sensor and procurement of the IIR sensor. - Continued the Multi-Mode Sensor/Seeker (MMSS) project.</p> <p>Enhanced Weapon Technologies:</p>		7.118	12.013	17.116

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2010	FY 2011	FY 2012
<p>- Continued three new products to expand current Counter Air / Counter Air Defense capabilities by providing improved range and end-game maneuverability while decreasing Time-of-Flight. Specific tasks to begin design and development phase are: Counter Air Advanced Medium-Range Air-to-Air Missile (AMRAAM) Improvements / Counter Air Defense Improvement / High Speed Components.</p> <p>- Continued development and apply emerging technologies that support delivery of Technology Oversight Group approved FNC enabling capabilities structured to close operational capability gaps in power projection; package emerging power projection technologies into deliverable FNC products and ECs that can be integrated into acquisition programs within a five year period; and mature power projection technologies that support naval requirements identified within the Sea Strike and FORCENet naval capability pillars.</p> <p>- Completed development of passive interferometric imaging system to detect millimeter wave RF anomalies within the background environment by using exotic signal processing techniques.</p> <p>FY 2011 Plans: Increased Capability Against Moving and Stationary Targets: - Continue the (DASH) and (MMSS) projects.</p> <p>Strike Accelerator: - Initiate Strike Accelerator program. This effort will provide an advanced airborne capability to accurately identify targets using Advanced Target Recognition (ATR). These capabilities utilizing the F/A-18 E/F, AESA (Active Electronically Scanned Array) Radar and ATFLIR (Advanced Targeting Forward Looking Infrared) sensors.</p> <p>Multi-Target Laser Designator: - Initiate research for advanced optical techniques to enable multiple simultaneous target designation in order to defeat multiple simultaneous targets or SWARM attacks.</p> <p>Selectable Output Weapon: - Initiate Selectable Output Weapon Sea Strike Project. This project will develop and integrate new technologies to enable real time selection of a munitions energetic output.</p> <p>Enhanced Weapon Technologies: - Continue all efforts of FY 2010, less those noted as completed above.</p>			

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<p>- Initiate development and apply emerging technologies that support delivery of Technology Oversight Group approved FNC enabling capabilities structured to close operational capability gaps in power projection.</p> <p>FY 2012 Plans: Increased Capability Against Moving and Stationary Targets: - Continue DASH and MMSS projects. Enhanced Weapon Technologies: - Continue Counter Air Advanced Medium-Range Air-to-Air Missile (AMRAAM) Improvements, Counter Air Defense Improvement, and High Speed Components efforts. Multi-Target Laser Designator: - Continue research for advanced optical techniques to defeat SWARM attacks. Selectable Output Weapon: - Continue Selectable Output Weapon Sea Strike Project Strike Accelerator program: - Continue Strike Accelerator Project</p> <p>High Energy Fiber Laser System: - Initiate development an advanced laser beam control, pointing mechanism and power subsystem to support an airborne laser weapon system. This system will provide the detection and defeat of current and future threats.</p> <p>- Continue development and apply emerging technologies that support delivery of Technology Oversight Group (TOG) approved FNC enabling capabilities structured to close operational capability gaps in power projection.</p>				
<p>Title: WMD DETECTION</p> <p>Description: The Chief of Naval Operations (CNO) in the Navy Strategic Plan (NSP) has directed that the Navy be able to combat Weapons of Mass Destruction (WMD) at sea and Maritime domain. This activity addresses the development of key technologies for standoff detection of WMD's and component nuclear materials on ships at sea. The program will develop and demonstrate technology for actively detecting fissile material and other weapons of mass destruction.</p> <p>FY10 to FY11 funding increase represent the ramping up of the program as continuing technological efforts evolve. The testing of the equipment in realistic maritime environments significantly increases the cost of testing. FY11 to FY12 funding decrease is due to the completion of the test exercises and re-alignment of funds for higher priority requirements. The Maritime WMD Detection program in FY11 is moving from limited scale laboratory and field experimentation, into more complex, large scale demonstrations</p>		9.611	24.953	6.215

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2010	FY 2011	FY 2012
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of Special Nuclear Material detection technologies. These tests must be conducted in a representative "Navy unique" maritime environment which include both over-water and in-water applications, and which require the expansion of required safety, environmental protocols simulation and evaluation of passive and active detection approaches. Additionally, severe shortages of helium-3 material required for neutron detection has forced an urgent technology development investment in alternative detection technologies.

FY 2010 Accomplishments:

Weapons Mass Destruction Detection:

- Continued using particle beam (neutrons, gamma rays, muons, and others) to perform standoff detection of fissile material.
- Continued investigations into the use of Free Electron Laser (FEL) accelerator technologies for the detection of WMD's and nuclear components & materials. Conducted experiments to determine the ability of the FEL to perform remote detection of nuclear material on surfaces, and chemical biological agents in aerosol clouds.
- Continued development of hand-held and portable radiation detector technology to support maritime interdiction operations.
- Continued modeling and simulation efforts to determine the ability to use neutron activation analysis to locate smuggled nuclear weapons and material through underwater detection.
- Continued planning for a maritime demonstration of standoff detection of fissile materials. This effort will involve formation of a team comprised of DoD, interagency, and international partners to support the demonstration.

FY 2011 Plans:

Weapons Mass Destruction Detection:

- Continue all efforts of FY 2010.
- Complete investigations of hand held and portable detector technology for maritime interdiction, transition to demonstrations of available technologies in prototypes and other suitable formats.
- Complete standoff detection of fissile materials with a demonstration in a maritime environment from a suitable Naval vessel or surrogate. Demonstration will involve a team from DoD, DoE, interagency, and academia partners to support the full demonstration.
- Initiate the technical development and testing of solid state high energy neutron detector without Helium 3.
- Initiate the development of technologies for remote real time imaging of suspected WMD in a maritime environment for both Passive Detection and Active Interrogation, including laboratory and field testing.
- Initiate a laboratory demonstration of short range active interrogation for WMD detection.
- Initiate the development of technology for and conduct "at sea" testing of in-water radiological WMD Detection from unmanned underwater vehicles (UUVs).
- Initiate the development and laboratory testing of a compact Neutron Generator without need for cryogenic cooling.
- Acquire WMD Special Nuclear Materials (SNM) simulator from DoE and conduct high fidelity field testing.

FY 2010	FY 2011	FY 2012

UNCLASSIFIED

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<ul style="list-style-type: none"> - Initiate the development of technology for and conduct radiological WMD Detection from Naval aviation platforms. - Examine system human dose limits and health effects of various Remote Stand Off Detection techniques. <p><i>FY 2012 Plans:</i></p> <ul style="list-style-type: none"> - Continue modeling and simulation efforts to determine the ability of proposed detection systems and operational concepts to detect and locate smuggled nuclear weapons and material in both above surface and in-water maritime environments. - Continue technology development of high energy neutron detector without Helium-3, real time imaging of WMD's, and lab demonstration of short range active interrogation. - Continue "at sea" UUV detection technology, development and laboratory testing of compact neutron generator, acquisition of SNM simulator, development of radiological detection from aviation platforms, and human dose limits of standoff detection techniques. 				
<p><i>Title:</i> ELECTROMAGNETIC GUNS</p> <p><i>Description:</i> This activity is the Electro Magnetic (EM) railgun program that is focused on developing the technology to launch a long range projectile from Navy ships. The requirement for the EM railgun is the result of a Naval Fire Support Requirements study in late 1990s that identified the need to provide Naval fire support ranges of up to 200 miles in order to support the increased transport range of the V-22 tiltrotor. This activity also includes NRL investment/performance in these research areas. FY10 to FY11 increase is due to increase in investment to support Phase II of the EM gun demonstration program.</p> <p><i>FY 2010 Accomplishments:</i></p> <ul style="list-style-type: none"> - Continued material, physics and thermal property research for both launchers and projectiles. - Continued launcher and projectile development. - Continued preliminary design and lethality studies of projectile, design of next generation pulse power systems, IPT and Bore Life Consortium collaborations. - Continued development of modeling and simulation capability to support bore life development and testing. <p><i>FY 2011 Plans:</i></p> <ul style="list-style-type: none"> - Continue material, physics and thermal property research for single shot launchers, pulsed power and projectiles for 32MJ muzzle energy launch. - Continue lethality studies of projectile, design of next generation pulse power systems, Integrated Product Team (IPT) and Bore Life Consortium collaborations for 32 MJ launchers. - Continue development of modeling and simulation capability to support bore life development and testing. - Continue analysis to verify the models and simulations correlate to results achieved in testing for launchers, 		6.929	10.504	10.948

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2010	FY 2011	FY 2012
pulsed power and projectiles at 32MJ launch.			
<i>FY 2012 Plans:</i>			
- Initiate material applications and component design assessments for next generation repetitive fires			
- Continue assessments of material, physics and thermal property research for single shot launchers, pulsed power and projectiles for 32MJ muzzle energy launch; and initiate assessments from next generation, rep rate, and operational environments.			
- Continue IPT and Bore Life Consortium collaborations for 32 MJ launchers.			
- Complete lethality studies of projectile, design studies of next generation pulse power systems,			
- Complete development of modeling and simulation capability to support bore life development and testing for single shot bore life assessments			
- Complete analysis to verify the models and simulations correlate to results achieved in single shot testing for launchers, pulsed power and projectiles at 32MJ launch.			
Accomplishments/Planned Programs Subtotals	57.793	98.150	104.804

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u> Base	<u>FY 2012</u> OCO	<u>FY 2012</u> Total	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• 0603114N: <i>POWER PROJECTION ADVANCED TECHNOLOGY</i>	23.240	10.759	15.228	0.000	15.228	20.172	19.299	15.568	7.555	0.000	111.821
• 0602131M: <i>MARINE CORPS LANDING FORCE TECHNOLOGY</i>	0.000	0.119	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.119

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

This PE develops early components technologies that if successful can be integrated into weapon systems that meet warfighter requirements. Most of the work in this PE can be classified between Technology Readiness Level (TRL) 2 (technology concept and/or application formulation) and TRL 4 (component and/or breadboard validation in laboratory environments). The metrics used to evaluate 6.2 programs are necessarily less precise than those used in 6.3 programs.

The metrics for this PE can be divided into two categories: technological and organizational/functional. Technological metrics address the success of the work performed. The primary technological metrics used in this PE involve laboratory experiments/tests demonstrating proof of the concept for the technology. This demonstration is frequently a hand-assembled functioning breadboard of the concept. The organizational/functional metrics applied to this PE include: transition of the

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 2: <i>Applied Research</i>	R-1 ITEM NOMENCLATURE PE 0602114N: <i>Power Proj Applied Research</i>	PROJECT 0000: <i>Power Proj Applied Research</i>
<p>technology to advanced development in a 6.3 PE and applicability of the technology to documented warfighter problems or requirements. Successful implementation of these categories would result in the application of a pass/fail metric and further evaluation for possible transition to a 6.3 development/demonstration program.</p>		

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

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 2: <i>Applied Research</i>				R-1 ITEM NOMENCLATURE PE 0602114N: <i>Power Proj Applied Research</i>				PROJECT 4027: <i>Naval Innovative Science and Engineering</i>			
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: <i>Naval Innovative Science and Engineering</i>	0.300	-	-	-	-	-	-	-	-	0.000	0.300

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	0.300	-	-
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:			
<ol style="list-style-type: none"> 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	0.300	-	-

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.

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

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 2: <i>Applied Research</i>	R-1 ITEM NOMENCLATURE PE 0602114N: <i>Power Proj Applied Research</i>	PROJECT 9999: <i>Congressional Adds</i>
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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
9999: <i>Congressional Adds</i>	21.669	-	-	-	-	-	-	-	-	0.000	21.669

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: Advanced Helicopter Landing Aid <i>FY 2010 Accomplishments:</i> This effort adapted existing software to develop and test novel 3D imaging technologies to help helicopters land during severe brownout conditions.	0.797	-
Congressional Add: Aging Military Aircraft Fleet Support <i>FY 2010 Accomplishments:</i> This effort provided a quantifiable, risk based assessment methodology for determining the capability for life extension in composite structures.	1.593	-
Congressional Add: Combustion Light Gas Gun Projectile <i>FY 2010 Accomplishments:</i> This effort provided applied research for the design and evaluation of a heavy projectile capable of launch and flight to 100+ km while carrying significant payloads. The final aspects of a rapid-fire propellant loading system using direct cold or cryogenic propellant loading were investigated and a transportable 155mm Combustion Light Gas Gun system capable of demonstrating projectile ranges in excess of 100 km was designed.	3.983	-
Congressional Add: Electronic Motion Actuation Systems <i>FY 2010 Accomplishments:</i> This effort further developed electric actuation systems for submarine use incorporating system integration issues.	0.797	-
Congressional Add: Enhanced EO/IR Sensors <i>FY 2010 Accomplishments:</i> This effort provided enhancement of high performance EO/IR sensors for both naval ship and ship-based unmanned aircraft in order give U.S. naval assets extended surveillance, situational awareness, and force protection. This capability will greatly enhance the ability of naval assets to detect and identify targets at significantly greater distances than the current system.	2.390	-
Congressional Add: Millimeter Wave Imaging	1.354	-

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy	DATE: February 2011
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APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 2: <i>Applied Research</i>	R-1 ITEM NOMENCLATURE PE 0602114N: <i>Power Proj Applied Research</i>	PROJECT 9999: <i>Congressional Adds</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2010	FY 2011
<i>FY 2010 Accomplishments:</i> This effort funded fabrication and demonstration of the operation of a traveling-wave optical phase-locked detector.		
<i>Congressional Add:</i> Multifunctional Materials, Devices, and Applications	1.593	-
<i>FY 2010 Accomplishments:</i> This effort supported development of materials growth technology for multi-functional oxides.		
<i>Congressional Add:</i> Naval Advanced Electric Launcher System	1.992	-
<i>FY 2010 Accomplishments:</i> This effort provided applied research on launcher-related technologies, including power generation, energy storage, high-current sliding contacts, high-temperature superconductors, plasma dynamics, payload guidance and control, and high-acceleration payload effects.		
<i>Congressional Add:</i> Strike Weapon Propulsion	3.187	-
<i>FY 2010 Accomplishments:</i> This effort supported Strike Weapon Propulsion research.		
<i>Congressional Add:</i> Guidance, Navigation, Control, and Targeting	3.983	-
<i>FY 2010 Accomplishments:</i> This effort supported the development system design and preliminary hardware and software design for a high performance GNC&T System with capability to guide a future Navy and Marine Corps projectile to within 1M of a maneuvering surface target in adverse weather conditions. GNC&T will be compatible with 155MM, 105MM, and 5" projectiles.		
Congressional Adds Subtotals	21.669	-

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

N/A

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

Congressional Add