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Exhibit R-2, PB 2010 Navy RDT&E Budget Item Justification **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY 1319 - Research, Development, Test & Evaluation, Navy/BA 3 - Advanced Technology Development (ATD)					R-1 ITEM NOMENCLATURE PE 0603114N POWER PROJECTION ADVANCED TECHNOLOGY					
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	94.020	81.675	107.969						Continuing	Continuing
2911: POWER PROJECTION ADVANCED TECHNOLOGY	57.943	59.934	107.969						Continuing	Continuing
9999: CONGRESSIONAL PLUS-UPS	36.077	21.741	0.000						Continuing	Continuing

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 (Jan 2007). 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 program develops and demonstrates advanced technologies, including Directed Energy, for naval weapon systems, and the Electric Warship. This Program Element (PE) includes elements of the following Future Naval Capabilities (FNCs); Time Critical Strike, and ForceNet. Within the Naval Transformation Roadmap, this investment will achieve one of four key transformational capabilities required by Sea Strike as well as technically enable elements of both Sea Shield and Force Net.

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

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B. Program Change Summary (\$ in Millions)

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>
Previous President's Budget	85.977	60.360	70.519	
Current BES/President's Budget	94.020	81.675	107.969	
Total Adjustments	8.043	21.315	37.450	
Congressional Program Reductions		-0.253		
Congressional Rescissions				
Total Congressional Increases		21.800		
Total Reprogrammings	9.250			
SBIR/STTR Transfer	-1.207			
Program Adjustments			37.381	
Rate/Misc Adjustments		-0.232	0.069	

Congressional Increase Details (\$ in Millions)

Project: 9999, ADVANCED MOTOR-PROPULSOR DEVELOPMENT AND TESTING

Project: 9999, ADVANCED SHIP SELF DEFENSE TECHNOLOGY TESTING

Project: 9999, COUNTERMINE LIDAR UAV-BASED SYSTEM

Project: 9999, DETECTION, TRACKING, AND IDENTIFICATION FOR ISRTE OF MOBILE AND ASYMMETRIC TARGETS

Project: 9999, EXCALIBUR

Project: 9999, EXPEDITIONARY CRAFT

Project: 9999, FLOW PATH ANALYSIS TOOL (FPAT)

Project: 9999, HIGH SPEED ANTI-RADIATION DEMONSTRATION (HSAD)

Project: 9999, LONG WAVELENGTH ARRAY

Project: 9999, QUIET DRIVE ADVANCED ROTARY ACTUATOR

Project: 9999, REALTIME HYPERSPECTRAL TARGETING SENSOR

Project: 9999, SMART INSTRUMENT DEVELOPMENT FOR MAGDALENA RIDGE OBSERVATORY (MRO)

	<u>FY 2008</u>	<u>FY 2009</u>
Project: 9999, ADVANCED MOTOR-PROPULSOR DEVELOPMENT AND TESTING	3.859	0.000
Project: 9999, ADVANCED SHIP SELF DEFENSE TECHNOLOGY TESTING	0.000	3.989
Project: 9999, COUNTERMINE LIDAR UAV-BASED SYSTEM	0.000	1.197
Project: 9999, DETECTION, TRACKING, AND IDENTIFICATION FOR ISRTE OF MOBILE AND ASYMMETRIC TARGETS	0.965	1.596
Project: 9999, EXCALIBUR	0.771	0.000
Project: 9999, EXPEDITIONARY CRAFT	19.322	0.000
Project: 9999, FLOW PATH ANALYSIS TOOL (FPAT)	0.971	0.000
Project: 9999, HIGH SPEED ANTI-RADIATION DEMONSTRATION (HSAD)	1.569	0.798
Project: 9999, LONG WAVELENGTH ARRAY	2.336	2.792
Project: 9999, QUIET DRIVE ADVANCED ROTARY ACTUATOR	0.000	1.995
Project: 9999, REALTIME HYPERSPECTRAL TARGETING SENSOR	0.000	2.394
Project: 9999, SMART INSTRUMENT DEVELOPMENT FOR MAGDALENA RIDGE OBSERVATORY (MRO)	6.284	6.980

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Exhibit R-2, PB 2010 Navy RDT&E Budget Item Justification **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY
1319 - Research, Development, Test & Evaluation, Navy/BA 3 - Advanced
Technology Development (ATD)

R-1 ITEM NOMENCLATURE
PE 0603114N POWER PROJECTION ADVANCED TECHNOLOGY

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

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Exhibit R-2a, PB 2010 Navy RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 1319 - Research, Development, Test & Evaluation, Navy/BA 3 - Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603114N POWER PROJECTION ADVANCED TECHNOLOGY					PROJECT NUMBER 2911	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
2911: POWER PROJECTION ADVANCED TECHNOLOGY	57.943	59.934	107.969						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports the Time Critical Strike (TCS) and ForceNet FNC components which address technological issues associated with the development of strike weapons to significantly decrease the launch to engagement timeline; provide the Navy of the future the ability to quickly locate, target, and strike critical targets; and enhance mission capabilities and operational utility of Naval forces by dramatically increasing the autonomy, performance, and affordability of Naval organic Unmanned Vehicle systems.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>PRECISION STRIKE TECHNOLOGY</p> <p>This activity focuses on the development of high speed (Mach 3 to Mach 4+) strike technologies which significantly decrease the engagement timeline from multiple sea surface and air launched platforms.</p> <p>The increase in funding between FY 2009 and FY 2010 is due to the significant increase in the 6.3 demonstration portion of the Electromagnetic (EM) Railgun Program and also is due to a cooperative Navy/DARPA Program for the Long Range Anti-Ship Missile (LRASM) Program.</p> <p><i>FY 2008 Accomplishments:</i></p> <p>RATTLRS:</p> <ul style="list-style-type: none"> - Initiated RATTLRS flight tests demonstrating high speed aero-propulsion integration. - Initiated data reduction of flight demonstrations and prepare final program report. <p>HyFly:</p> <ul style="list-style-type: none"> - Continued conducting final fully powered HyFly flight to demonstrate Hypersonic and long range flight performance. 	32.105	27.532	92.744	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>EM Gun:</p> <ul style="list-style-type: none"> - Continued procurement and installation of pulsed power modules for the Electromagnetic Launch Facility (EMLF) at NSWCDD. - Continued development and testing of barrel life components with EM lab launcher below 16 MJ of muzzle energy. - Continued development of industry advanced launcher prototypes including component hardware testing and preliminary design review. - Continued development and initiate testing of projectile component concepts including a unitary lethality demo. - Continued ship integration study efforts. - Continued INP Phase I program mid-way assessment. <p><i>FY 2009 Plans:</i></p> <p>EM Gun:</p> <ul style="list-style-type: none"> - Continue development and testing of barrel life components with EM lab launcher expanding to 16 MJ of muzzle energy. - Continue development of industry advanced launcher prototypes, completing the preliminary design review and initiating detail design activities and component hardware testing. - Continue development and testing of projectile component concepts, completing unitary lethality demo and initiating a dispense lethality demo. - Continue ship integration study efforts. - Complete INP Phase I program mid-way assessment. - Complete fabrication and installation of pulsed power modules for the Electromagnetic Launch Facility (EMLF) at NSWCDD. <p>RATTLRS:</p> <ul style="list-style-type: none"> - Complete RATTLRS flight test demonstration. - Complete data reduction of flight demonstration. <p>Above Threshold Reprogramming (ATR) for RATTLRS (\$18.789) was approved March 2009 and transferred from Program Element 0603236N (not reflected in current funding profile).</p>				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p><i>FY 2010 Plans:</i></p> <p>EM Gun:</p> <ul style="list-style-type: none"> - Continue development and testing of barrel life components with EM lab launcher expanding to 32 MJ of muzzle energy. - Continue development of industry advanced launcher prototypes, completing detail design activities and initiating detail design fabrication. - Continue development and testing of projectile component concepts, completing the dispense lethality demo and initiating 32 MJ muzzle energy tests. - Continue ship integration study efforts. - Initiate planning for FY 2011 final INP Phase I assessment. - Initiate next generation pulsed power concept design. <p>LRASM:</p> <ul style="list-style-type: none"> - New Start: DARPA initiated effort for development of missile preliminary designs and perform analysis demonstrating designs compliant with program requirements and that subsystem technologies development plans have acceptable risk, schedule and cost. - Initiate detailed hardware design. 				
<p>STRIKE AND LITTORAL COMBAT TECHNOLOGIES</p> <p>The focus of this activity is on those technologies that will support the Naval Precision Strike Operations and provide the Navy of the future the ability to quickly locate, target, and strike critical targets. This activity includes support to the following FNC Enabling Capabilities (ECs): Advanced Naval Fires Technology, Hostile Fire Detection and Response, Dynamic Target Engagement & Enhanced Sensor Capabilities, and Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets.</p>	25.838	32.402	15.225	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>The fluctuations in the funding profile from FY 2008 through FY 2010 are a combination of funding additional FNC projects while other FNC projects are completing. This Activity reflects the alignment of investments for the following ECs: Hostile Fire Detection and Response Spiral 2, Dynamic Target Engagement & Enhanced Sensor Capabilities, Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets and Enhanced Weapons Technologies. Increased Capability Against Moving and Stationary Targets, Counter Air Mid-Range Air-to-Air Missile (AMRAAM)/Defense/High Speed Improvements, Multi-Target Laser Designator and Selectable Output Components.</p> <p><i>FY 2008 Accomplishments:</i></p> <p>Hostile Fire Detection and Response:</p> <ul style="list-style-type: none"> - Completed Reconfigurable Surveillance UAV for Warfighters which developed EO/IR sensors and foliage penetration radars suitable for high resolution imaging of ground threats through rain, fog, and camouflage from small UAVs. <p>Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets:</p> <ul style="list-style-type: none"> - Continued Low Cost Imaging Terminal Seeker (LCITS) projects. - Initiated Weapons Data Link (WDL) project to develop a weapons data link terminal that will allow robust in-flight control of strike weapons at greater standoff ranges with reduced power/space/weight requirements, and improved protection against Electronic Counter Measures (ECM). <p>Dynamic Target Engagement & Enhanced Sensor Capabilities:</p> <ul style="list-style-type: none"> - Continued effort to provide a low-cost, single board radar system suitable for use on a long endurance UAV. - Continued effort to provide affordable, high endurance platform/propulsion with Commercial Off the Shelf (COTS) and modified COTS components for persistent Intelligence, Surveillance and Reconnaissance (ISR), targeting, Bomb Damage Assessment/Bomb Damage Indication (BDA/BDI), and weapon delivery. 				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<ul style="list-style-type: none"> - Continued development of Electro Optic/Infrared (EO/IR) sensors and foliage penetration radars suitable for high resolution imaging of ground threats through rain, fog, and camouflage from small UAVs. - Continued Ultra Endurance UAV project. - Completed GMTI Scout, and Remote Sensor Fusion Card efforts. - Initiated Decision Support for Dynamic Target Engagement. <p>Increased Capability Against Moving and Stationary Targets:</p> <ul style="list-style-type: none"> - Initiated Direct Attack Seeker Head (DASH) project to use active millimeter wave (mmW) radar and Imaging Infrared (IIR) seekers to develop and demonstrate a low cost multi-sensor array technology to engage moving targets in adverse weather battlefield conditions. The DASH common aperture architecture is applicable to a variety of weapon airframes such as Hellfire, High Speed Anti-Radiation Missile (HARM), Joint Direct Attack Munition (JDAM), and Harpoon. - Initiated Multi-Mode Sensor/Seeker (MMSS) project to develop a tri-mode sensor/seeker for use on surveillance platforms such as Fire Scout. MMSS will develop and demonstrate the capability to provide increased range target search, acquisition, identification, and tracking in both clear and adverse battlefield weather. <p><i>FY 2009 Plans:</i></p> <p>Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets:</p> <ul style="list-style-type: none"> - Continue WDL hardware and software demonstration of a weapons data link terminal that will allow robust in-flight control of strike weapons at greater standoff ranges with reduced power/space/weight requirements, and improved protection against ECM. - Complete LCITS project, including captive carry of the weapon integrated seeker and upgraded launcher and firing two guided rounds within a tactically relevant environment. <p>Dynamic Target Engagement & Enhanced Sensor Capabilities:</p> <ul style="list-style-type: none"> - Complete Decision Support for Dynamic Target Engagement, and Ultra Endurance UAV efforts. <p>Increased Capability Against Moving and Stationary Targets:</p>				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<ul style="list-style-type: none"> - Continue the DASH project to drive down seeker cost during the procurement and test of the infrared imaging seeker components. - Continue MMSS project to conduct a Concept Design Review (CDR) and initiate the build of a common aperture Laser Radar (LADAR) and infrared sensor system. <p>Enhanced Weapons Technologies: Maintain development of advanced technologies that support delivery of Navy approved FNC ECs structured to close operational capability gaps in power projection. Package advanced power projection technologies into deliverable FNC products and ECs that can be integrated into acquisition programs within a five year period. Mature power projection technologies that support naval requirements identified within the Sea Strike and FORCEnet naval capability pillars.</p> <ul style="list-style-type: none"> - Initiate three new products to address short-falls in current Counter Air (CA) and Counter Air Defense (CAD) capabilities by providing improved range and end-game maneuverability while decreasing Time-of-Flight. - Initiate definition and documentation of system level requirements for airframe, thrust level, insensitive-munitions and safety/reliability for CA Advanced Mid-Range Air-to-Air Missile (AMRAAM) Improvements. - Initiate definition and documentation of system level requirements for CAD. - Initiate definition and documentation of system level requirements for High Speed Components. <p><i>FY 2010 Plans:</i> Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets:</p> <ul style="list-style-type: none"> - Continue Weapon Data Link project by demonstrate the performance capability of the system and the architecture develop under the project. <p>Increased Capability Against Moving and Stationary Targets:</p> <ul style="list-style-type: none"> - Continue all efforts of FY 2009. - Initiate research for advanced optical techniques to enable multiple simultaneous target designation in order to defeat multiple simultaneous targets or SWARM attacks. <p>Enhanced Weapon Technologies:</p>				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>- Continue all efforts of FY 2009.</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>				

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C. Other Program Funding Summary (\$ in Millions)										
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	Cost To Complete	Total Cost
PE 0305204N/Tactical Unmanned Aerial Vehicles									Continuing	Continuing
PE 0601153N/Defense Research Sciences									Continuing	Continuing
PE 0602114N/Power Projection Applied Research									Continuing	Continuing
PE 0602131M/Marine Corps Landing Force Technology									Continuing	Continuing
PE 0602203F/Aerospace Propulsion									Continuing	Continuing
PE 0602236N/Warfighter Sustainment Applied Research									Continuing	Continuing
PE 0603123N/Force Protection Advanced Technology									Continuing	Continuing
PE 0603236N/Warfighter Sustainment Advanced Technology									Continuing	Continuing
PE 0603502N/Surface and Shallow Water Mine Countermeasures									Continuing	Continuing
PE 0603654N/Joint Service Explosive Ordnance Development									Continuing	Continuing

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PE 0603709D8Z/Joint Robotics Program			Continuing Continuing
PE 0603782N/Mine and Expeditionary Warfare Advanced Technology			Continuing Continuing
PE 0603790N/ NATO Research and Development			Continuing Continuing
PE 0604709D8Z/Joint Robotics Program			Continuing Continuing
<u>D. Acquisition Strategy</u> Not applicable.			
<u>E. Performance Metrics</u> The metrics used are programmatic milestones and technical milestones such as flight test and testing of projectile concepts for technical demonstration programs; Technology Transition Agreements (TTAs) which are agreements between the Office of Naval Research and an acquisition program office to transition FNC 6.3 technologies into an acquisition program.			

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COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
9999: CONGRESSIONAL PLUS-UPS	36.077	21.741	0.000						Continuing	Continuing
A. Mission Description and Budget Item Justification N/A										
C. Other Program Funding Summary (\$ in Millions) N/A										
D. Acquisition Strategy N/A										
E. Performance Metrics N/A										

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