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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 3: <i>Advanced Technology Development (ATD)</i>				PE 0603114N: <i>Power Projection Advanced Technology</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	114.524	117.908	114.270	-	114.270	56.247	61.449	61.102	56.596	Continuing	Continuing
2911: <i>Power Proj Adv Tech</i>	94.468	117.908	114.270	-	114.270	56.247	61.449	61.102	56.596	Continuing	Continuing
4027: <i>Naval Innovative Science and Engineering</i>	1.414	-	-	-	-	-	-	-	-	0.000	1.414
9999: <i>Congressional Adds</i>	18.642	-	-	-	-	-	-	-	-	0.000	18.642

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 program develops and demonstrates advanced technologies, including Em Rail Gun for naval weapon systems. 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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BA 3: Advanced Technology Development (ATD)						
B. Program Change Summary (\$ in Millions)		FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget		116.191	117.908	91.301	-	91.301
Current President's Budget		114.524	117.908	114.270	-	114.270
Total Adjustments		-1.667	-	22.969	-	22.969
• Congressional General Reductions			-			
• Congressional Directed Reductions			-			
• Congressional Rescissions		-	-			
• Congressional Adds			-			
• Congressional Directed Transfers			-			
• Reprogrammings		-	-			
• SBIR/STTR Transfer		-2.800	-			
• Program Adjustments		-	-	23.238	-	23.238
• Section 219 Reprogramming		1.141	-	-	-	-
• Rate/Misc Adjustments		-	-	-0.269	-	-0.269
• Congressional General Reductions		-0.008	-	-	-	-
Adjustments						
Congressional Add Details (\$ in Millions, and Includes General Reductions)						
Project: 9999: Congressional Adds						
Congressional Add: AARGM Counter Air Defense Future Capabilities						
Congressional Add: Flow Path Analysis Tool						
Congressional Add: Moving Target Indicator Scout Radar						
Congressional Add: X-49A Envelope Expansion Modifications						
Congressional Add: High Speed Anti-Raditation Demonstration (HSAD)						
Congressional Add: Information Sharing For ISR Targeting & Engagement						
Congressional Add: Smart Instrument Development For The Magdalena Rid						
Congressional Add: Countermine LIDAR UAV-based System						
Congressional Add: Quiet Drive Advanced Rotary Actuator						
Congressional Add Subtotals for Project: 9999						
Congressional Add Totals for all Projects						

	FY 2010	FY 2011
	1.992	-
	1.593	-
	0.797	-
	3.585	-
	1.514	-
	1.992	-
	3.983	-
	1.593	-
	1.593	-
	18.642	-
	18.642	-

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<u>Change Summary Explanation</u> 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 3: Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603114N: Power Projection Advanced Technology				PROJECT 2911: Power Proj Adv Tech			
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
2911: Power Proj Adv Tech	94.468	117.908	114.270	-	114.270	56.247	61.449	61.102	56.596	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 Programs (\$ in Millions)								FY 2010	FY 2011	FY 2012
Title: STRIKE AND LITTORAL COMBAT TECHNOLOGIES Description: 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. FY10 is a combination of funding additional FNC projects while other FNC projects are completing. This Activity reflects the alignment of investments for the following ECs: 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 and High Energy Fiber Laser System. FY11 to FY12 funding increase is due to the initiation of High Energy Fiber Laser System and due to increases in multiple FNC Demonstration Program investments. FY 2010 Accomplishments: Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets: - Continued Weapon Data Link project by demonstrating the performance capability of the system and the architecture developed under the project. Increased Capability Against Moving and Stationary Targets: - Continued the Direct Attack Seeker Head (DASH) project to drive down seeker cost during the procurement and test of the infrared imaging seeker components.								16.311	17.405	20.640

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
- Continued Multi-Mode Sensor/Seeker (MMSS) project to conduct a Critical Design Review (CDR) and initiate the build of a common aperture Laser Radar (LADAR) and infrared sensor system. Enhanced Weapon Technologies: - Continued 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. - Continued 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. - Continued definition and documentation of system level requirements for CAD. - Continued definition and documentation of system level requirements for High Speed Components. - Completed Ultra Endurance UAV efforts. FY 2011 Plans: Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets: - Complete Weapon Data Link project by demonstrating the performance capability of the system and the architecture develop under the project. Increased Capability Against Moving and Stationary Targets: - Continue all efforts of FY 2010. - Initiate research for advanced optical techniques to enable multiple simultaneous target designation in order to defeat multiple simultaneous targets or SWARM attacks. - 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 will enable Strike Aircraft to quickly ID and Target maritime threats. 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. Enhanced Weapon Technologies: - Continue all efforts of FY 2010. - Initiate development of advanced technologies that support delivery of Navy approved FNC enabling			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
capabilities structured to close operational capability gaps in power projection. - Initiate package advanced power projection technologies into deliverable FNC products and ECs that can be integrated into acquisition programs within a five year period. - Initiate mature power projection technologies that support naval requirements identified within the Sea Strike and FORCEnet naval capability pillars. FY 2012 Plans: Increased Capability Against Moving and Stationary Targets: - Continue all efforts of FY 2011. Enhanced Weapon Technologies: - Continue all efforts of FY 2011. Selectable Output Weapon: - Continue all efforts of FY 2011. Strike Accelerator: - Continue all efforts of FY 2011. Multi-Target Laser Designator: - Continue all efforts of FY 2011. High Energy Fiber Laser System: - Initiate development of an advanced laser weapon subsystem for demonstration on an air-borne platform. This system will provide the detection and defeat of current and future threats. - Initiate development of advanced technologies that support delivery of Navy approved FNC enabling capabilities structured to close operational capability gaps in power projection.			
Title: PRECISION STRIKE TECHNOLOGY Description: 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.		78.157	100.503
		57.130	

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B. Accomplishments/Planned Programs (\$ in Millions)				
FY 2010 to FY 2011 increase is due to the significant increase in the 6.3 demonstration portion of the Electromagnetic (EM) Railgun Program and cooperative Navy/DARPA Program for the Long Range Anti-Ship Missile (LRASM) Program. FY2011 to FY2012 reduction is due to the completion of LRASM detailed hardware design, test component and subsystem functionality and fit FY 2010 Accomplishments: EM Gun: - Continued development and testing of barrel life components with EM lab launcher expanding to 32 MJ of muzzle energy. - Continued development of industry advanced launcher prototypes, completing detail design activities and initiating detail design fabrication. - Continued development and testing of projectile component concepts, completing the dispense lethality demo and initiating 32 MJ muzzle energy tests. - Continued ship integration study efforts. - Initiated planning for FY 2011 final INP Phase I assessment. - Initiated next generation pulsed power concept design. LRASM:- 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. - Initiated detailed hardware design. FY 2011 Plans: EM Gun: - Continue ship integration study efforts. - Continue next generation pulsed power concept design. - Continue development and testing of single shot barrel life components with EM lab launcher at 32 MJ of muzzle energy including a 100 shot demo. - Continue development of industry advanced launcher prototypes including delivery and installation at Electromagnetic Launch Facility (EMLF) for government test and evaluation with 100 shot demo and 3 shot burst assessment. - Continue development and testing of projectile component at 32 MJ muzzle energy. - Complete final INP Phase I assessment. LRASM:		FY 2010	FY 2011	FY 2012

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
- Complete detailed hardware design. - Initiate/Complete and test component and subsystem functionality and fit. - Initiate flight hardware fabrication. Weapons System Improvement: - Initiate kill-chain studies to identify and recommend engineering trades to enable weapon system interoperability and data fusion alternatives. These studies will assess engineering feasibility of various kill-chain options and assess the capability provided. FY 2012 Plans: EM Gun: - Continue ship integration study efforts. - Continue development and testing of single shot barrel life components with EM lab launcher at 32 MJ of muzzle energy including a 100 shot demo. - Complete next generation single shot pulsed power concept design. - Complete development of industry advanced launcher prototypes including delivery and installation at EMLF facility for government test and evaluation with 100 shot demo. - Complete final INP Phase I assessment of industry advanced launcher prototypes assessments. - Initiate next generation rep rate launcher development and test planning. - Initiate next generation rep rate pulsed power fabrication in support of future rep rate launcher testing. LRASM: - Complete fabrication of flight hardware. - Complete launch canister expulsion tests. - Complete booster separation flight tests. - Complete integrated flight tests. Weapons System Improvement: - Continue all efforts of FY 2011.			
Title: DATA DECISION TOOLS Description: This is a new effort for FY12. The Navy is furthering Decision Making Tools in the following areas:		-	-
			17.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
1) Data to Decision: The Navy is performing a series of limited technology experiments (LTE) identifying issues to enable the integration of combat systems and C2 systems to enable rapid, accurate decision making. These experiments are integrating S&T capabilities directly into current combat systems and SOA C2 systems. This is a joint series of experiments with the AF and Army including Navy PEO IWS and PEO C4I which will lead to transition directly into the Advanced Capability Builds 12 - 16 for the IWS POR and into CANES for PEO C4I POR. In FY2012, Navy will continue work associated with the LTEs and perform integrated prototype testing in a more operational environment. 2) Autonomy and Data to Decision: This Navy effort involves integrated reverie and land scenarios. The objective is to develop autonomous networked sensor systems (disparate platforms and sensors) that significantly reduce (objective eliminate) human system management and analysis to enable small forces such as Navy reverie expeditionary teams to focus on the execution of missions with significant sensor support. Currently mission execution is limited by the number of people that have to be engaged in sensor management and analysis. Autonomous Data to Decision capability is also adaptable to autonomous sensor networks in support of FOB protection. More funds in the first year would enable a much richer diversity of sensors, platforms, and automated analysis techniques. FY 2012 Plans: -Initiate and complete an integrated prototype testing in a operational environment for the integration of combat systems and C2 systems to enable rapid, accurate decision making. -Initiate and complete futhering diversity of sensors, platforms and automated analysis techniques.			
Title: CYBER SECURITY ARCHITECTURE Description: This is a new effort for FY12. The Cyber Security Architecture effort will establish a prototype environment that be used to integrate the results of numerous ongoing S&T efforts to build a cyber security architecture of ever increasing capability There are a number of strategies that have been taken to help mitigate cyber attacks. This effort is aimed at developing an integrated approach that draws on these different strategies and enables new concepts to be brought into the integrated approach. The key is developing a highly flexible architecture. The overarching approach is to providing integrated and modularized cyber defense platform with built-in multiple levels of intelligence for controlling and acting against known and new cyber attacks. The platform encompasses all levels of hierarchy and abstraction of cyber infrastructure, and allows for all cyber defense techniques to efficiently and synergistically co-exist, providing maximum collective coverage against cyber attacks and enhancing mission assurance.		-	6.000

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B. Accomplishments/Planned Programs (\$ in Millions)										FY 2010	FY 2011	FY 2012
FY 2012 Plans: -Initiate and complete a Cyber Security Architecture prototype environment												
Title: EW/EP MODELING Description: This is a new effort for FY 2012. Electronic Warfare/Electronic Protection (EW/EP) Technology Development, Modeling and Implementation: Research in this activity addresses EW battle space management. Project goal is to develop technology that will utilize EW for platform / task force protection through the integration of EW into a networked coherent structure to provide better fleet defense, and develop techniques to deny the enemy the effective use of their sensors to do battle space awareness and targeting by creating a distorted battle space picture. This effort also continues EP modeling and implementation improvements by funding upgrades to hardware and software required for the characterization of platforms, contribute to modeling and simulation of implementable solutions, and technology validation through flight demonstrations of those solutions. EP upgrades scheduled for transition to the platform program offices in FY 2013 and FY 2014. FY 2012 Plans: -Initiate integration of EW into a networked coherent structure to provide better fleet defense -Initiate development of EP techniques to deny enemy battlespace awareness -Initiate upgrades for improved EP modeling and simulation and for EP technology validation and transition .										-	-	13.500
Accomplishments/Planned Programs Subtotals										94.468	117.908	114.270
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost	
• 0602114N: <i>POWER PROJECTION APPLIED RESEARCH</i>	7.923	6.765	10.651	0.000	10.651	14.433	10.088	5.248	1.458	0.000	56.566	
D. Acquisition Strategy Not applicable.												

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E. Performance Metrics

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 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>	1.414	-	-	-	-	-	-	-	-	0.000	1.414

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.

<u>B. Accomplishments/Planned Programs (\$ in Millions)</u>	FY 2010	FY 2011	FY 2012
<i>Title:</i> Naval Innovative Science and Engineering <i>Description:</i> Funding supports research and development efforts as directed under Section 219 of the fiscal year 2009 Duncan Hunter National Defense Authorization Act. <i>FY 2010 Accomplishments:</i> Section 219 (Naval Innovative Science and Engineering) included in the FY 2009 Duncan Hunter National Defense Authorization Act, established mechanisms whereby the director of a naval laboratory may utilize up to three percent of all funds available to the laboratory to sponsor individual projects for: 1. Innovative basic and applied research that is conducted at the laboratory and supports military missions; 2. Development programs that support the transition of technologies developed by the defense laboratory into operational use; 3. Development activities that improve the capacity of the defense laboratory to recruit and retain personnel with needed scientific and engineering expertise; and 4. The revitalization and recapitalization of the laboratories.	1.414	-	-
Accomplishments/Planned Programs Subtotals	1.414	-	-

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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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
9999: Congressional Adds	18.642	-	-	-	-	-	-	-	-	0.000	18.642

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: AARGM Counter Air Defense Future Capabilities FY 2010 Accomplishments: This effort advanced the technology necessary to demonstrate propulsion system improvements and associated system changes (i.e., improved flight profiles, guidance and control system modifications) needed to field the longer range Advanced Anti-Radiation Guided Missile (AARGM) capability. This effort enabled system range and time of flight improvements and eventual fielding of a critical standoff capability to the warfighter.	1.992	-
Congressional Add: Flow Path Analysis Tool FY 2010 Accomplishments: This effort analyzed and predicted performance characteristics of future weapon systems that use ramjet / scramjet hypersonic engine technology (e.g. operate at Mach 4 through Mach 8) by integrating state-of-the art computational fluid dynamics technology into a unified analysis tool to predict flow behavior and performance in propulsion system components, and verified the results by comparison to actual data and evaluated new technologies to improve the efficiency and accuracy of the analysis.	1.593	-
Congressional Add: Moving Target Indicator Scout Radar FY 2010 Accomplishments: This effort developed, integrated and tested a "Move Stop Move" mode software to an existing unmanned air vehicle mounted active electronically scanned array radar.	0.797	-
Congressional Add: X-49A Envelope Expansion Modifications FY 2010 Accomplishments: This effort provided for modification of the X-49A vectored thrust ducted propeller compound helicopter technology demonstrator to integrate the adaptive digital automated pilot technology, and supplementary power unit systems to enable flight validation of the technology's potential to significantly increase speed, range, hover payload, ceiling, maneuverability, and survivability beyond that of conventional helicopters.	3.585	-
Congressional Add: High Speed Anti-Raditation Demonstration (HSAD)	1.514	-

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2010	FY 2011
<i>FY 2010 Accomplishments:</i> This effort supported transition of HSAD designs into a tactical configuration allowing progression of demonstration work on advanced rocket propulsion systems that can provide either twice the distance or half the time to target over solid propellant rocket motors.		
<i>Congressional Add:</i> Information Sharing For ISR Targeting & Engagement <i>FY 2010 Accomplishments:</i> This effort supported development of components to support multiple, simultaneous detections, tracking, identification and targeting of asymmetric and mobile threats in ISRTE operations.	1.992	-
<i>Congressional Add:</i> Smart Instrument Development For The Magdalena Rid <i>FY 2010 Accomplishments:</i> This effort supported smart instrument development for the Magdalena Ridge Observatory Interferometer concentrating on testing the first 1.4 meter unit telescope for the array. Testing included the verification of performances both at the factory and in situ.	3.983	-
<i>Congressional Add:</i> Countermine LIDAR UAV-based System <i>FY 2010 Accomplishments:</i> This effort developed a unique software program that combines multi-sensor airborne data to produce seafloor images and 3D models of the littorals, beach exit zone, and riverine environments. CLUBS employs novel data fusion algorithms to produce seafloor classification images for use in anti-mine warfare applications and contributes contributes to 4 focus areas of the Office of Naval Research's Science and Technology Strategic Plan: Operational Environments; Maritime Domain Awareness; Asymmetric and Irregular Warfare; and Assure Access and Hold at Risk.	1.593	-
<i>Congressional Add:</i> Quiet Drive Advanced Rotary Actuator <i>FY 2010 Accomplishments:</i> This effort supported quiet drive advanced rotary actuator research.	1.593	-
Congressional Adds Subtotals	18.642	-

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

D. Acquisition Strategy
Not applicable.

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E. Performance Metrics

Congressional Interest Items not included in other Projects.