

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2017 Navy	<b>Date:</b> February 2016
---	----------------------------

<b>Appropriation/Budget Activity</b>	<b>R-1 Program Element (Number/Name)</b>											
1319: <i>Research, Development, Test &amp; Evaluation, Navy I BA 2: Applied Research</i>	PE 0602750N I (U) <i>Future Naval Capabilities Applied Research</i>											
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	0.000	171.991	179.538	165.103	-	165.103	175.233	175.258	176.250	183.188	Continuing	Continuing
0000: (U) <i>Future Naval Capabilities Applied Research</i>	0.000	166.866	179.538	165.103	-	165.103	175.233	175.258	176.250	183.188	Continuing	Continuing
3346: <i>Future Naval Capabilities Adv Tech Dev</i>	0.000	5.125	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.125

**A. Mission Description and Budget Item Justification**

The efforts described in this Program Element (PE) address the Applied Research associated with the Future Naval Capabilities (FNC) Program. The FNC Program represents the requirements-driven, delivery-oriented portion of the Navy Science and Technology (S&T) portfolio. FNC investments respond to Naval S&T Gaps that are identified by the Navy and Marine Corps after receiving input from Naval Research Enterprise (NRE) stakeholders. The Enabling Capabilities (ECs) and associated technology product investments of the FNC Program are competitively selected by a 3-star Technology Oversight Group (TOG), chartered by the S&T Corporate Board and representing the requirements, acquisition, research and fleet/forces communities of the Navy and the Marine Corps.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
Previous President's Budget	175.924	179.686	178.954	-	178.954
Current President's Budget	171.991	179.538	165.103	-	165.103
Total Adjustments	-3.933	-0.148	-13.851	-	-13.851
• Congressional General Reductions	-	-0.148			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.932	0.000			
• Program Adjustments	0.000	0.000	-3.808	-	-3.808
• Rate/Misc Adjustments	-0.001	0.000	-10.043	-	-10.043

**Change Summary Explanation**

The FY 2017 funding request was reduced by -\$6.8 million as required for the Department of the Navy to comply with the Bipartisan Budget Act of 2015.

Technical: Not applicable.

Schedule: Not applicable.

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy										Date: February 2016		
Appropriation/Budget Activity 1319 I 2					R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research				Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
COST (\$ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
0000: (U)Future Naval Capabilities Applied Research	0.000	166.866	179.538	165.103	-	165.103	175.233	175.258	176.250	183.188	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

FNC investments are typically 3-5 years in duration. They provide a continuance of basic research by maturing technologies from a Technology Readiness Level (TRL) of 3 or 4 to a TRL of 6. All FNC products require BA2 and BA3 funded technology development, which is coordinated to ensure tangible technology products are delivered upon completion of each investment. Each year the TOG refreshes the FNC Program by approving new ECs and technology products as older ones get delivered. After transition to an acquisition program, FNC products are further engineered, integrated and, ultimately, delivered to the warfighter. The development and delivery of each FNC product is guided by a Technology Transition Agreement (TTA) that is signed by the requirements and acquisition sponsors, as well as the S&T developer.

This project supports the naval pillars of Capable Manpower, Enterprise and Platform Enablers, Expeditionary Maneuver Warfare, Force Health Protection, Forcenet, Power and Energy, Sea Basing, Sea Shield and Sea Strike. Each of these pillars is listed as a separate R-2 Activity, as is FNC Management. Under each R-2 Activity, the BA 6.2 accomplishments and plans for every Enabling Capability (EC) and Technology Product in the FNC Program are listed. ECs are composed of one or more interrelated technology products, so for clarity, each product is shown under its EC.

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
<b>Title:</b> CAPABLE MANPOWER (CMP)	8.065	9.298	9.753	0.000	9.753
<b>Description:</b> This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Capable Manpower (CMP) FNC pillar. The CMP Pillar develops deliverable technologies that provide new capabilities in manpower and personnel management, training and education, and human-systems integration for more intuitive systems.					
The FY 2015 to FY 2016 increase was due primarily to the ramp-up of CMP-FY15-01 and CMP-FY15-02, and the initiation of CMP-FY16-01.					
<b>FY 2015 Accomplishments:</b> EC: CMP-FY11-01 NAVAL NEXT-GENERATION IMMERSIVE TECHNOLOGY (N2IT) - Complete Augmented Immersive Team Training (AITT) - Design and demonstrate software technology to deliver augmented reality scenarios tailored to the skills of the training audience for infantry operations. - Complete Perceptual Training Systems and Tools (PercepTs) - Identify the perceptual cues in the urban and dense infrastructure environments that may improve warfighter performance.					

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: CMP-FY12-01 LIVE, VIRTUAL, & CONSTRUCTIVE TRAINING FIDELITY - Continue Cognitive Fidelity Synthetic Environment - Develop optimal characteristics for virtual simulations to elicit the appropriate perceptual-cognitive responses for Naval aviation training. - Continue Tactics & Speech Capable Semi-Automated Forces - Conduct applied research to develop learner-aware semi-autonomous forces. - Continue Virtual-Constructive Representations on Live Avionics Displays - Develop design guidelines for effective and safe representation of virtual and constructive assets on live displays.							
EC: CMP-FY13-02 SIMULATION TOOLSET FOR ANALYSIS OF MISSION, PERSONNEL AND SYSTEMS (STAMPS) - Continue Manpower Planning and Optimization Toolset - Develop analytical techniques, data collection methodologies, and procedures to create optimized manpower requirements for the platform. - Continue Platform Design and Acquisition Toolset - Develop scenario-based models that characterize crew performance to operate ship systems during 60/90 day missions under varying physical and cognitive loads.							
EC: CMP-FY14-02 UNMANNED AERIAL SYSTEMS INTERFACE, SELECTION AND TRAINING TECHNOLOGIES (U-ASISTT) - Continue Dynamic, Adaptive & Modular Training for UAS - Expand Activity Learning capability to allow automatic matching between UAS operator training objectives, specific training contexts, and semi-automated forces behaviors. - Continue Selection for UAS Personnel (SUPer) - Develop mission scenarios to enable testing for the knowledge, skills and abilities required for operating Navy unmanned aircraft systems and integrate into an appropriate UAS simulator. - Continue UAS Control Station Human Machine Interface - Develop metrics that assess UAS Operator performance in terms of the likelihood of leading to successful unmanned aircraft system operation.							
EC: CMP-FY15-01 ACCELERATING DEVELOPMENT OF SMALL UNIT DECISION MAKERS (ADSUDM) - Initiate Decision Making-Learning Management System (DM-LMS) - Identify S&T solutions for Decision Making (DM) and instructional method guidelines and develop software products to plan, assess, and track decision making skill development.							

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016		
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>
<p>- Initiate Digital Integrated Representation of Tactical Environment (DIRTE) - Identify S&amp;T solutions for classroom and sustainment training and develop rapid terrain modeling and sketchpad software products to enable small unit leaders and instructors to create effective decision making environments and scenarios.</p> <p>- Initiate Simulation Tailored Training and Assessment (ST2A) - Identify S&amp;T solutions for situated tutor techniques and unobtrusive monitoring techniques and develop software and hardware prototypes to execute a decision making program of instruction and scenarios in simulation.</p> <p>EC: CMP-FY15-02 ENVIRONMENT DESIGNED TO UNDERTAKE COUNTER A2AD TACTICS TRAINING &amp; EXPERIMENTATION (EDUCAT2E)</p> <p>- Initiate Environment Designed to Undertake Counter A2AD Tactics Training &amp; Experimentation (EDUCAT2E) - Investigate and develop an approach to an objective, metrics-driven training and experimentation capability for Fast Attack Craft and Mine Warfare threats.</p> <p><b>FY 2016 Plans:</b></p> <p>EC: CMP-FY12-01 LIVE, VIRTUAL, &amp; CONSTRUCTIVE TRAINING FIDELITY</p> <p>- Complete Cognitive Fidelity Synthetic Environment - Develop optimal characteristics for virtual simulations to elicit the appropriate perceptual-cognitive responses for Naval aviation training.</p> <p>- Complete Tactics &amp; Speech Capable Semi-Automated Forces - Conduct applied research to develop learner-aware semi-autonomous forces.</p> <p>- Complete Virtual-Constructive Representations on Live Avionics Displays - Develop design guidelines for effective and safe representation of virtual and constructive assets on live displays.</p> <p>EC: CMP-FY13-02 SIMULATION TOOLSET FOR ANALYSIS OF MISSION, PERSONNEL AND SYSTEMS (STAMPS)</p> <p>- Continue Manpower Planning and Optimization Toolset - Optimize manpower variables (task allocation, job and occupation codes, billets, and training) to better estimate the manpower components of ship total ownership cost.</p> <p>- Continue Platform Design and Acquisition Toolset - Develop assessment reporting tools that identify the dependencies, drivers, and risks associated with different platform designs and manning configurations.</p> <p>EC: CMP-FY14-02 UNMANNED AERIAL SYSTEMS INTERFACE, SELECTION AND TRAINING TECHNOLOGIES (U-ASISTT)</p>					

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue Dynamic, Adaptive &amp; Modular Training for UAS - Expand the activity learning capability to allow automatic matching between UAS operator training objectives, specific training contexts, and computer generated force behaviors.</p> <p>- Continue Selection for UAS Personnel (SUPer) - Develop mission scenarios to enable testing for the knowledge, skills and abilities required to operate Navy unmanned aircraft systems and integrate them into an appropriate UAS simulator.</p> <p>- Continue UAS Control Station Human Machine Interface - Develop metrics that assess UAS Operator performance in terms of the likelihood of leading to successful unmanned aircraft system operation.</p> <p>EC: CMP-FY15-01 ACCELERATING DEVELOPMENT OF SMALL UNIT DECISION MAKERS (ADSUDM)</p> <p>- Continue Decision Making-Learning Management System (DM-LMS) - Develop new technology solutions for decision making, instructional method guidelines, and software products to plan, assess, and track decision making skill development.</p> <p>- Continue Digital Integrated Representation of Tactical Environment (DIRTE) - Develop new technology solutions for classroom and sustainment training and develop rapid terrain modeling and sketchpad software products to enable small unit leaders and instructors the ability to create effective decision making environments and scenarios.</p> <p>- Continue Simulation Tailored Training and Assessment (ST2A) - Develop new technology solutions for situated tutor techniques and unobtrusive monitoring techniques, and develop software and hardware prototypes to execute a decision making program of instruction and scenarios in simulation.</p> <p>EC: CMP-FY15-02 ENVIRONMENT DESIGNED TO UNDERTAKE COUNTER A2AD TACTICS TRAINING &amp; EXPERIMENTATION (EDUCAT2E)</p> <p>- Continue Environment Designed to Undertake Counter A2AD Tactics Training &amp; Experimentation (EDUCAT2E)</p> <p>- Investigate and develop an approach to an objective, metrics-driven training and experimentation capability for Fast Attack Craft and Mine Warfare threats.</p> <p>EC: CMP-FY16-01 OPERATIONAL PLANNING TOOL</p> <p>- Initiate Operational Planning Tool - Develop decision support analytic tools that enhance collaborative planning for generating and executing safe and effective navigation &amp; operational plans.</p> <p><b>FY 2017 Base Plans:</b></p>						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: CMP-FY13-02 SIMULATION TOOLSET FOR ANALYSIS OF MISSION, PERSONNEL AND SYSTEMS (STAMPS) - Continue Manpower Planning and Optimization Toolset - Develop measures and metrics to assess variable work packaging, improved manpower variables (task allocation, job and occupation codes, billets, and training), and estimate manpower, personnel, and training costs to better understand ship Total Ownership Cost. - Complete Platform Design and Acquisition Toolset - Deliver new manpower and system response metrics that report on the balance between system design and manpower requirements.							
EC: CMP-FY14-02 UNMANNED AERIAL SYSTEMS INTERFACE, SELECTION AND TRAINING TECHNOLOGIES (U-ASISTT) - Continue UAS Control Station Human Machine Interface - Define the priority autonomy capabilities needed by operators for the Supervisory Control of next generation unmanned systems. - Complete Selection for UAS Personnel (SUPer) - Evaluate and refine tests for the selected knowledge, skills, and abilities required to operate Navy unmanned aircraft systems. - Complete Dynamic, Adaptive & Modular Training for UAS - Analyze the generalization process of pattern-of-life for computer generated forces to novel activities, locations, and scenarios.							
EC: CMP-FY15-01 ACCELERATING DEVELOPMENT OF SMALL UNIT DECISION MAKERS (ADSUDM) - Continue Digital Integrated Representation of Tactical Environment (DIRTE) - Develop a Graphical User Interface (GUI) for environment generation and the capture of relevant environmental context, including maps and terrain, to train individual Marines, small unit leaders, and company level staff. - Continue Simulation Tailored Training and Assessment (ST2A) - Develop new technology solutions for situated tutor techniques and unobtrusive monitoring techniques, and develop software and hardware prototypes to execute a decision making program of instructional scenarios in simulation. - Continue Decision Making-Learning Management System (DM-LMS) - Define Kill Probability (KP) Measures (including non-performance) of decision making mastery for ground infantry squad leaders in order to reliably measure acquisition of expertise in psychomotor, cognitive/metacognitive, and affective domains.							
EC: CMP-FY15-02 ENVIRONMENT DESIGNED TO UNDERTAKE COUNTER A2AD TACTICS TRAINING & EXPERIMENTATION (EDUCAT2E) - Continue Environment Designed to Undertake Counter A2AD Tactics Training & Experimentation (EDUCAT2E) - Assess Artificial Intelligence-enabled activities in the Electromagnetic Spectrum (EMS) reflecting presence							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
of non-combatant entities in the EMS and a representation of Opposition Forces tailored to training audience proficiency and learning objectives.							
EC: CMP-FY16-01 OPERATIONAL PLANNING TOOL - Continue Operational Planning Tool - Develop a systematic understanding of distributed, near-real time collaboration and decision making applicable for planning and operational staff.							
EC: CMP-FY17-01 MANPOWER, PERSONNEL & TRAINING STRATEGIC PLANNING APPLICATION - Initiate Manpower, Personnel & Training Planning Application - Develop a fundamental understanding of the risks and uncertainties underlying Manpower, Personnel, and Training interconnections and performance drivers, including potential impact points, time delays, and pathways of decisions across the enterprise.							
EC: CMP-FY17-02 FUTURE INTEGRATED TRAINING ENVIRONMENT (FITE) - Initiate Future Integrated Training Environment (FITE) - Investigate and assess technologies and methods to improve the ability to conduct Live, Virtual, and Constructive training events for the Marine Air-Ground Task Force (MAGTF).							
FY 2017 OCO Plans: N/A							
Title: ENTERPRISE AND PLATFORM ENABLERS (EPE)			12.012	11.652	9.903	0.000	9.903
Description: This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Enterprise and Platform Enablers (EPE) FNC pillar. The EPE Pillar develops cross-cutting, deliverable technologies that provide new capabilities for naval service platforms that lower acquisition, operations and maintenance costs, improve system safety and availability, and improve platform survivability.							
The FY 2016 to FY 2017 decrease was due primarily to the completion of EPE-FY12-01 and EPE-FY13-01, and the planned ramp-down of EPE-FY14-02 and EPE-FY15-02.							
FY 2015 Accomplishments: EC: EPE-FY09-07 AFFORDABLE SUBMARINE PROPULSION AND CONTROL ACTUATION - Complete Advanced Material Propeller - Validate the finite element method (FEM) using the 1/4 scale AMP model testing data obtained by ARL/PSU for stresses, strains and deflections.							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016		
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research	
B. Accomplishments/Planned Programs (\$ in Millions)					
	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: EPE-FY10-03 CORROSION AND CORROSION RELATED SIGNATURE TECHNOLOGIES FOR INCREASED OPERATIONAL AVAILABILITY - Complete Advanced-Robust ICCP Anodes and Reference Cells - Complete reference cell laboratory performance research and testing.					
EC: EPE-FY11-01 FLIGHT DECK THERMAL MANAGEMENT - Continue Integrated Thermal Management System Design - Test panels for heat transfer capabilities.					
EC: EPE-FY12-01 CORROSION MITIGATION TECHNOLOGIES - Continue Corrosion Resistant Surface Treatment - Complete development of single-step corrosion treatment process. - Continue Sprayable Acoustic Damping Systems - Complete research and initial corrosion testing of prototype.					
EC: EPE-FY12-02 INTEGRATED HYBRID STRUCTURAL MANAGEMENT SYSTEM (IHSMS) - Continue IHSMS Fleet Structural Health Management Decision Tool (formerly known as Distributed Structural Micro-Sensor Nodes and Rotor Hot Spot Sensors and Integration) - Conduct research in wireless energy harvesting sensors for rotorcraft structural health management, and evaluate and optimize rotor-hot spot sensors and integration technologies that allow improved health assessment of rotating frame and selected structural hot spots.					
EC: EPE-FY13-01 TOWED ARRAY SYSTEM RELIABILITY IMPROVEMENT - Continue Tools for Predicting Array Operational Loading & Distribution - Develop individual predictive models for hydrodynamic effects on a towed array that include the forces imparted on a towed array by the handling system and the effects of the combined forces on array internal components.					
EC: EPE-FY14-02 ALUMINUM ALLOY CORROSION CONTROL AND PREVENTION - Continue Aluminum Alloy Corrosion Mitigation Technologies - Continue coating formulation. - Continue Aluminum Alloy Corrosion Prediction Tool - Conduct research to develop algorithm for 5000 series aluminum alloy degree of sensitization and for prediction of Mean Time to Repair.					
EC: EPE-FY15-02 GAS TURBINE UPGRADES FOR REDUCED TOTAL OWNERSHIP COST (TOC) AND IMPROVED SHIP IMPACT					



**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016					
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)				FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue Shipboard Gas Turbine Marinization Package for Higher Temperature, Higher Pressure Operation - Conduct laboratory hot corrosion testing and analysis under simulated shipboard environmental conditions.</p> <p>EC: EPE-FY15-03 SPECIAL HULL TREATMENT</p> <p>- Continue New Material(s) Development &amp; Lab Characterization - Develop new materials mitigation technology for submarines.</p> <p><b>FY 2016 Plans:</b></p> <p>EC: EPE-FY11-01 FLIGHT DECK THERMAL MANAGEMENT</p> <p>- Continue Integrated Thermal Management System Design - Conduct small scale testing of thermal management panels.</p> <p>EC: EPE-FY12-01 CORROSION MITIGATION TECHNOLOGIES</p> <p>- Complete Corrosion Resistant Surface Treatment - Determine best Corrosion Resistant Surface Treatment among carbon, nitrogen, and carbonitration approaches.</p> <p>- Complete Sprayable Acoustic Damping Systems - Investigate and develop spray applied damping systems for improved structural vibration control.</p> <p>EC: EPE-FY12-02 INTEGRATED HYBRID STRUCTURAL MANAGEMENT SYSTEM (IHSMS)</p> <p>- Complete IHSMS Fleet Structural Health Management Decision Tool - Optimize physics and statistical based structural health models, rotor hot-spot sensors and integration technologies, and finalize risk reduction experiments.</p> <p>EC: EPE-FY13-01 TOWED ARRAY SYSTEM RELIABILITY IMPROVEMENT</p> <p>- Complete Tools for Predicting Array Operational Loading &amp; Distribution - Develop a predictive model of the magnitude and distribution of hydrodynamic forces on a towed array and the effect of the forces on array internal components.</p> <p>EC: EPE-FY14-02 ALUMINUM ALLOY CORROSION CONTROL AND PREVENTION</p> <p>- Continue Aluminum Alloy Corrosion Mitigation Technologies - Investigate and develop advanced corrosion control and thermal load reduction coatings and surface treatment/repair technologies for improved corrosion and cracking resistance on aluminum substrates.</p>								

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue Aluminum Alloy Corrosion Prediction Tool - Develop a sensitization detection tool hardware and refine the prediction algorithm for determining the rate of sensitization.</p> <p>EC: EPE-FY15-02 GAS TURBINE UPGRADES FOR REDUCED TOTAL OWNERSHIP COST (TOC) AND IMPROVED SHIP IMPACT</p> <p>- Continue Shipboard Gas Turbine Marinization Package for Higher Temperature, Higher Pressure Operation - Develop and evaluate a set of alloys and coatings to support higher temperature capable gas turbine operation.</p> <p>EC: EPE-FY15-03 SPECIAL HULL TREATMENT</p> <p>- Continue New Material(s) Development &amp; Lab Characterization - Develop new hull treatment materials for submarines.</p> <p><b>FY 2017 Base Plans:</b></p> <p>EC: EPE-FY11-01 FLIGHT DECK THERMAL MANAGEMENT</p> <p>- Complete Integrated Thermal Management System Design - Analyze data of flight deck thermal management system during at-sea test.</p> <p>EC: EPE-FY14-02 ALUMINUM ALLOY CORROSION CONTROL AND PREVENTION</p> <p>- Continue Aluminum Alloy Corrosion Mitigation Technologies - Develop coating and repair tools for final testing.</p> <p>- Continue Aluminum Alloy Corrosion Prediction Tool - Assess the robustness of the Degree of Sensitization (DoS) prediction algorithm and refine the algorithm for integration into the DoS detection tool.</p> <p>EC: EPE-FY15-02 GAS TURBINE UPGRADES FOR REDUCED TOTAL OWNERSHIP COST (TOC) AND IMPROVED SHIP IMPACT</p> <p>- Continue Shipboard Gas Turbine Marinization Package for Higher Temperature, Higher Pressure Operation - Develop advanced marinized coatings for higher temperature service, marinized single crystal alloys, and disk coatings for oxidation and corrosion resistance.</p> <p>EC: EPE-FY15-03 SPECIAL HULL TREATMENT</p> <p>- Continue New Material(s) Development &amp; Lab Characterization - Develop new materials mitigation technology for submarines.</p> <p>EC: EPE-FY16-01 ADVANCED TOPCOAT SYSTEM (ATS)</p>						

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy				Date: February 2016		
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
- Initiate Advanced Topcoat Systems for Air Vehicle (ATS-AV) - Conduct formula optimization and modification development of advanced protective coating constituent combinations and preliminary material property validation towards TRL 6 formulas.  FY 2017 OCO Plans: N/A						
Title: EXPEDITIONARY MANEUVER WARFARE (EMW)  Description: This R-2 Activity contains all Navy funded Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Expeditionary Maneuver Warfare (EMW) FNC Pillar. The EMW Pillar develops deliverable technologies that provide new capabilities in expeditionary maneuver warfare, including naval ground forces, with special emphasis on regular and irregular warfare in urban environments and combating terrorism.  The FY 2016 to FY 2017 decrease was due primarily to the planned ramp down of EMW-FY12-02 and the continuation of EMW-FY14-01 and EMW-FY16-01 in PE 0602131M.  FY 2015 Accomplishments: EC: EMW-FY12-02 FUTURE JOINT COUNTER RADIO-CONTROLLED IED ELECTRONIC WARFARE (JCREW) - Continue Distributed Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (D-JCREW) - Develop distributed resource allocation and RF situational awareness techniques to provide automated tactical-level distributed jamming on multiple ground-based EW systems. - Continue Integrated Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (I-JCREW) - Develop components and techniques to enable simultaneous transmission and reception of EW and blue-force communication waveforms.  EC: EMW-FY13-01 AZIMUTH AND INERTIAL MICRO-ELECTRO-MECHANICA SYSTEM (MEMS) NAVIGATION SYSTEM - Continue Micro-Electro-Mechanical System (MEMS) Inertial Navigation System - Commence work to optimize sensor performance of MEMS to reduce target location error in the Navigation System of hand-held targeting systems.		6.553	6.260	2.959	0.000	2.959

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: EMW-FY14-01 SPECTRAL AND RECONNAISSANCE IMAGERY FOR TACTICAL EXPLOITATION (SPRITE) - Continue Automated Processing for Spectral Exploitation and Dissemination (APSED) - Conduct a feasibility effort to develop an Electro-Optical (EO) and Hyper-Spectral Imagery (HSI) image processing architecture that includes EO-to-HSI cross-correlation and fusion, image archiving and retrieval, and exploitation product generation. - Continue Compact Wide Area Reconnaissance and Spectral Sensor (CWARSS) - Complete preliminary hardware design for a wide-area intelligence, surveillance and reconnaissance capability with simultaneous high spatial and spectral resolution.						
FY 2016 Plans: EC: EMW-FY12-02 FUTURE JOINT COUNTER RADIO-CONTROLLED IED ELECTRONIC WARFARE (JCREW) - Continue Distributed Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (D-JCREW) - Refine radio frequency situational awareness techniques and distributed resource allocation on multiple ground-based Electronic Warfare systems by providing automated tactical-level distributed jamming. - Continue Integrated Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (I-JCREW) - Enable the simultaneous transmission and reception of blue-force and Electronic Warfare communication waveforms by finalizing the components and techniques.						
EC: EMW-FY13-01 AZIMUTH AND INERTIAL MICRO-ELECTRO-MECHANICA SYSTEM (MEMS) NAVIGATION SYSTEM - Complete Micro-Electro-Mechanical System (MEMS) Inertial Navigation System - Complete optimization of MEMS sensor performance to reduce target location error in the Navigation System of hand-held targeting systems.						
EC: EMW-FY14-01 SPECTRAL AND RECONNAISSANCE IMAGERY FOR TACTICAL EXPLOITATION (SPRITE) - Complete Automated Processing for Spectral Exploitation and Dissemination (APSED) - Develop an Electro-Optical (EO) and Hyper-Spectral Imagery (HSI) Image Processing architecture that includes EO to HSI cross-correlation and fusion, image archiving and retrieval, and exploitation product generation.						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Complete Compact Wide Area Reconnaissance and Spectral Sensor (CWARSS) - Develop preliminary hardware design for a wide-area intelligence, surveillance and reconnaissance capability with simultaneous high spatial and spectral resolution.</p> <p>EC: EMW-FY16-01 DENSIFIED PROPELLANT FIRE FROM ENCLOSURE - CONFINED SPACE (FFE/CS) PROPULSION TECHNOLOGIES</p> <p>- Initiate Densified Propellant Fire From Enclosure - Confined Space (FFE/CS) Propulsion Technologies - Refine tungsten-propellant mix, grain dimensions and configuration, and the fabrication process to reach suitable rocket nozzle exit velocities and sound pressure levels.</p> <p><b>FY 2017 Base Plans:</b></p> <p>EC: EMW-FY12-02 FUTURE JOINT COUNTER RADIO-CONTROLLED IED ELECTRONIC WARFARE (JCREW)</p> <p>- Complete Distributed Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (D-JCREW) - Conduct final testing of Radio Frequency (RF) situational awareness techniques and distributed resource allocation on multiple ground-based Electronic Warfare (EW) systems by providing automated tactical-level distributed jamming.</p> <p>- Complete Integrated Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (I-JCREW) - Finalize the components and techniques to allow simultaneous transmission and reception of blue-force and Electronic Warfare (EW) communication waveforms.</p> <p>EC: EMW-FY16-01 DENSIFIED PROPELLANT FIRE FROM ENCLOSURE - CONFINED SPACE (FFE/CS) PROPULSION TECHNOLOGIES</p> <p>- Continued in PE 0602131M</p> <p>EC: EMW-FY17-01 HIGH RELIABILITY DPICM REPLACEMENT (HRDR)</p> <p>- Initiate High Reliability DPICM Replacement - Define High Reliability Dual-purpose Improved Conventional Munitions Master Safe and Arm Device hardware design and system architecture to transfer all arming, safing, and communication signals to/from the projectile's 56 sub-munition fuzes in under 6 seconds.</p> <p><b>FY 2017 OCO Plans:</b></p> <p>N/A</p>							
Title: FNC MANAGEMENT			10.481	8.940	8.385	0.000	8.385

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p><b>Description:</b> This R-2 Activity includes the Science and Technology (S&amp;T) analyses and studies required to take new Future Naval Capabilities (FNC) Program Enabling Capabilities (ECs) approved by the Technology Oversight Group and produce the detailed technology specifications and performance metrics needed to procure the component level technologies that must be developed and tested in order to deliver technology products to the acquisition community. This activity includes development and implementation of innovative and dynamically changing technology management business processes required to manage FNC investments supporting the naval capability pillars.</p> <p>The FY 2015 to FY 2016 decrease was due to the FY15 increase new start preparation funds noted above and a subsequent return in FY16 to normal funding levels.</p> <p><b>FY 2015 Accomplishments:</b> FNC MGMT-NEW START PREPARATIONS - Continue FNC Management - New Start Preparations - Conduct technology analysis and studies to support the development and validation of technology performance specifications to ensure new enabling capabilities are able to commence execution in a timely manner.</p> <p>FNC MGMT-SUPPORT/OPS ANALYSIS - Continue FNC Management - Support/OPS Analysis - Conduct warfighter sustainment Applied Research and analysis, including technology management of FNC investments supporting the naval capability pillars.</p> <p><b>FY 2016 Plans:</b> FNC MANAGEMENT - Continue FNC Management - New Start Preparations - Conduct technology analysis and studies to support the development and validation of technology performance specifications to ensure new enabling capabilities are able to commence execution in a timely manner. - Continue FNC Management - Support/OPS Analysis - Conduct warfighter sustainment Applied Research and analysis, including technology management of FNC investments supporting the naval capability pillars.</p> <p><b>FY 2017 Base Plans:</b> FNC MANAGEMENT</p>							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue FNC Management - New Start Preparations - Conduct technology analysis and studies to support the development and validation of technology performance specifications to ensure new enabling capabilities are able to commence execution in a timely manner.</p> <p>- Continue FNC Management - Support/OPS Analysis - Conduct warfighter sustainment Applied Research and analysis, including technology management of FNC investments supporting the naval capability pillars.</p> <p><b>FY 2017 OCO Plans:</b> N/A</p>						
<p><b>Title:</b> FORCE HEALTH PROTECTION (FHP)</p> <p><b>Description:</b> This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Force Health Protection (FHP) FNC pillar. The FHP Pillar develops deliverable technologies that provide new capabilities that provide Sailors and Marines with the best possible protection from operational threats by reducing morbidity and mortality when casualties occur.</p> <p>The FY 2016 to FY 2017 decrease was due primarily to the completion of FHP-FY11-01 and FHP-FY12-02, and the planned ramp-down of FHP-FY14-01 and FHP-FY14-03.</p> <p><b>FY 2015 Accomplishments:</b> EC: FHP-FY11-01 MULTIFUNCTIONAL BLOOD SUBSTITUTE (MFBS) - Continue Multifunctional Blood Substitute (MFBS) - Conduct animal testing of optimal blood component mixture.</p> <p>EC: FHP-FY12-01 AUTOMATED CRITICAL CARE SYSTEM - Continue Automated Critical Care System (ACCS) - Construct mathematical models and build control algorithms for testing autonomous hardware and software system to monitor and maintain combat casualties with minimal human intervention during a 2-6 hour Casualty Evacuation (CASEVAC) scenario.</p> <p>EC: FHP-FY12-02 SAVING LIVES WITH EMERGENCY MEDICAL PERFLUOROCARBONS IN THE FIELD (SEMPER FI) FOR SEA, AIR &amp; LAND DYSOXIA - Complete SEMPer Fi for Air Dysoxia - Perform down-select of candidate drugs based on small and large animal testing for treatment of pulmonary hypertension.</p>		8.962	8.670	5.730	0.000	5.730

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue SEMPer Fi for Land Blast Kit - Establish animal models and mathematical simulations to formulate window of therapeutic intervention and dosing with hypothermia for immediate treatment of blast overpressure in small and large animals, including injury to the brain and/or internal organs.</p> <p>EC: FHP-FY13-03 EXTREME OPERATIONS: MITIGATING OXYGEN IMBALANCE AT ALTITUDE AND AT DEPTH</p> <p>- Continue Hypoxia Alert and Mitigation System - Formulate algorithms to detect/predict onset of hypoxia or hypoxia-like symptoms for mountain operators, casualties, and aviators.</p> <p>EC: FHP-FY14-01 ACUTE CARE COVER FOR SEVERELY INJURED LIMBS (ACCSIL)</p> <p>- Continue Acute Care Cover for Severely Injured Limbs (ACCSIL) - Establish efficacy parameters for a fieldable wound cover to include novel outer cover materials and internal pharmaceutical coating that improve the clinical outcome of severe wounds.</p> <p>EC: FHP-FY14-03 BLAST LOAD ASSESSMENT: SENSE AND TEST (BLAST)</p> <p>- Continue Algorithm - Design an algorithm relating blast intensity data with traumatic brain injury indicators to predict likelihood of brain injury after a given blast event.</p> <p>- Neuro-Functional Assessment Tool - Establish testing paradigm and sensory modality for a non-psychometric device that detects and estimates severity of traumatic brain injury.</p> <p>- Continue Sensor - Investigate designs for a self powered blast sensor that detects and quantifies acceleration, pressure, and impulse from a given blast event and outputs the data electronically.</p> <p><b>FY 2016 Plans:</b></p> <p>EC: FHP-FY11-01 MULTIFUNCTIONAL BLOOD SUBSTITUTE (MFBS)</p> <p>- Complete Multifunctional Blood Substitute (MFBS) - Finalize animal testing of optimal blood component mixture.</p> <p>EC: FHP-FY12-01 AUTOMATED CRITICAL CARE SYSTEM</p> <p>- Continue Automated Critical Care System (ACCS) - Formulate autonomous hardware and software system to monitor and maintain combat casualties with minimal human intervention during a 2-6 hour Casualty Evacuation scenario.</p>							



# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: FHP-FY12-02 SAVING LIVES WITH EMERGENCY MEDICAL PERFLUOROCARBONS IN THE FIELD (SEMPER FI) FOR SEA, AIR & LAND DYSOXIA - Complete SEMPer Fi for Land Blast Kit - Determine window of therapeutic intervention and dosing with hypothermia for immediate treatment of blast overpressure in small and large animals, including injury to the brain or internal organs.						
EC: FHP-FY13-03 EXTREME OPERATIONS: MITIGATING OXYGEN IMBALANCE AT ALTITUDE AND AT DEPTH - Continue Hypoxia Alert and Mitigation System - Conduct assembly of the sensor suite to detect and predict the onset of hypoxia and integrate mitigation strategies for individuals operating in high altitudes or Casualty Evacuation missions in unpressurized aircraft.						
EC: FHP-FY14-01 ACUTE CARE COVER FOR SEVERELY INJURED LIMBS (ACCSIL) - Continue Acute Care Cover for Severely Injured Limbs (ACCSIL) - Develop a fieldable wound cover comprising outer cover materials and an internal pharmaceutical coating that improves the clinical outcome of severe wounds.						
EC: FHP-FY14-03 BLAST LOAD ASSESSMENT: SENSE AND TEST (BLAST) - Continue Algorithm - Collect experimental data for use in algorithm development that relates integrated blast intensity with cognitive impairment to predict the likelihood of brain injury after single or multiple blast exposures. - Continue Neuro-Functional Assessment Tool - Conduct experimental development of a non-psychometric device that detects and estimates the severity of traumatic brain injury. - Continue Sensor - Demonstrate a self-powered blast sensor in bench and laboratory testing for sensitivity to acceleration, pressure and impulse.						
FY 2017 Base Plans: EC: FHP-FY12-01 AUTOMATED CRITICAL CARE SYSTEM - Complete Automated Critical Care System (ACCS) - Complete technology development of hardware/software to monitor and maintain combat casualties with minimal human intervention during a 2-6 hour Casualty Evacuation (CASEVAC) scenario.						
EC: FHP-FY13-03 EXTREME OPERATIONS: MITIGATING OXYGEN IMBALANCE AT ALTITUDE AND AT DEPTH						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Complete Hypoxia Alert and Mitigation System - Finalize methods of detecting individual-specific challenges associated with combating casualties in warfighters operating at altitude.</p> <p>EC: FHP-FY14-01 ACUTE CARE COVER FOR SEVERELY INJURED LIMBS (ACCSIL)</p> <p>- Continue Acute Care Cover for Severely Injured Limbs (ACCSIL) - Conduct efficacy testing of innovative pharmaceutical solutions and novel materials for use in an enhanced bandage system for management of complex limb trauma.</p> <p>EC: FHP-FY14-03 BLAST LOAD ASSESSMENT: SENSE AND TEST (BLAST)</p> <p>- Continue Blast Load Assessment: Sense and Test (BLAST) (formerly sensor, algorithm, and neurofunctional assessment tool) - Model the relationship between the injurious forces from blast incidents and the medical outcomes experienced by exposed warfighters, conduct validation of a Neuro-Functional Assessment Tool that provides a simple evaluation for Traumatic Brain Injury, and refine the self-powered, head-mounted, micro sensor being developed to detect the blast over-pressure and acceleration forces that cause traumatic brain injury.</p> <p>EC: FHP-FY16-01 INCAPACITATION PREDICTION FOR READINESS IN EXPEDITIONARY DOMAINS - AN INTEGRATED COMPUTATIONAL TOOL (I-PREDICT)</p> <p>- Initiate I-PREDICT - Begin development of an integrated, in-silico, morphometrically-scalable model of the human being that estimates the injury response from external forces.</p> <p><b>FY 2017 OCO Plans:</b> N/A</p>							
Title: FORCENET (FNT)			27.348	32.351	42.489	0.000	42.489
Description: This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Forcenet (FNT) FNC Pillar. The FNT pillar develops deliverable technologies that provide new capabilities in Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), networking, navigation, sensors, decision support, cyber-space, intelligence, and space technologies that will provide the architectural framework for naval warfare in the information age.							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
The FY 2015 to FY 2016 increase was due primarily to the planned ramp-up of FNT-FY15-01, FNT-FY15-02 and FNT-FY15-04, and the initiation of FHT-FY16-01 and FNT-FY16-02.							
The FY 2016 to FY 2017 increase was due primarily to the planned ramp-up of FNT-FY15-02 and FNT-FY16-02, and the initiation of FNT-FY17-01, FNT-FY17-02, and FNT-FY17-04.							
FY 2015 Accomplishments: EC: FNT-FY11-01 PRO-ACTIVE COMPUTER NETWORK DEFENSE AND INFORMATION ASSURANCE - Complete Pro-Active Computer Network Defense and Information Assurance (formerly known as Common Operational Security Decision System, Next Generation Security and Security Management Protocol, and Next Generation Sensors and Gateways) - Developed interactive controls for map-based visualization of Computer Network Defense policy deployments, a path-aware trusted routing algorithm for maximizing Information Assurance of security management communications, and adaptive learning and decision algorithms for pro-active defense mechanisms and for creating Computer Network Defense policy.							
EC: FNT-FY11-02 FAST MAGIC - Complete Fast Magic Product 1 - Conduct applied research. - Complete Fast Magic Product 2 - Conduct applied research.							
EC: FNT-FY11-05 NRL SPACE - Complete Multi-INT Tracking - Develop vessel tracking algorithms and characterization techniques. - Complete Tagging - Perform data tagging research based on key parametric values used in the Maritime environment.							
EC: FNT-FY12-01 ADVANCED TACTICAL DATA LINK (ATDL) - Continue Mission-Based Waveform Controls & Networking - Develop baseline waveforms and validate performance against operational scenarios.							
EC: FNT-FY12-02 AUTONOMOUS PERSISTENT TACTICAL SURVEILLANCE - Continue Autonomous Information-Based Surveillance Control - Develop algorithms for information based UAV routing and patching. - Continue Contextual Enterprise Information - Develop the analytical services framework, including enterprise exploitation services for situation context between relevant theater sensor collections and exploitation products.							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016					
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)				FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue Mobile Autonomous ISR to C2 Synchronization - Develop enterprise distributed software solution that will model mission tracks, translate these tracks to information tracks, and produce relevant information fulfillment and deficit objects.</p> <p>EC: FNT-FY13-01 EW BATTLE MANAGEMENT FOR SURFACE DEFENSE</p> <p>- Continue EW Battle Management (EWBM) - Develop data exchange message techniques and new algorithms for control and coordination of distributed EW assets.</p> <p>EC: FNT-FY13-03 SILK THREAD</p> <p>- Continue Silk Thread Product 1 - Conduct applied research.</p> <p>- Continue Silk Thread Product 2 - Conduct applied research.</p> <p>EC: FNT-FY13-04 DETECTION AND FUSION FOR REMOTE SENSORS</p> <p>- Continue Adaptive Multi-Int Correlation &amp; Identification (AMICA) - Research and analyze algorithms to enable cross-domain information fusion and optimize use of remote sensing assets.</p> <p>- Continue Detection &amp; Classification Algorithms (DCA) - Research and analyze algorithms to provide enhanced detection and classification metrics and robust performance under stressing environmental conditions.</p> <p>EC: FNT-FY14-02 ADAPTIVE TASKING, COLLECTION, PROCESSING, EXPLOITATION AND DISSEMINATION (TCPED) SERVICES</p> <p>- Continue Adaptive TCPED for ASW Services - Develop and evaluate the performance of methods that are context aware and determine the value of information for a mission.</p> <p>- Continue Data Exfiltration and Networked Platform Interaction - Develop components and design methods leading to a low cost radio that meets size, weight, and power constraints.</p> <p>EC: FNT-FY15-01 ADVANCED AIRBORNE EARLY WARNING ELECTRONIC PROTECTION (AAEWEP)</p> <p>- Initiate Advanced AEW Electronic Protection - Develop techniques to improve E2-D electronic protection.</p> <p>EC: FNT-FY15-02 DATA FOCUSED NAVAL TACTICAL CLOUD</p> <p>- Initiate Naval Tactical Cloud Analytics (formerly known as ASW Naval Tactical Cloud, EXW Naval Tactical Cloud, and IAMD Naval Tactical Cloud) - Perform the data science activities to ingest all relevant data (acoustic, IR, EO, magnetic, radar, SIGINT, METOC) into the Naval Tactical Cloud to enable efficient decision support analytics in support of effective ASW, EXW and IAMD mission execution based on Commander's Intent.</p>								

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy			<b>Date:</b> February 2016		
<b>Appropriation/Budget Activity</b> 1319 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602750N I (U)Future Naval Capabilities Applied Research	<b>Project (Number/Name)</b> 0000 I (U)Future Naval Capabilities Applied Research			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>
					<b>FY 2017 OCO</b>
					<b>FY 2017 Total</b>
<p>EC: FNT-FY15-04 SCALABLE INTEGRATED RF SYSTEM FOR UNDERSEA PLATFORMS (SIRFSUP)</p> <ul style="list-style-type: none"> <li>- Initiate Compact, Scalable Integrated RF (Compact-SIRF) - Develop techniques for high speed data conversion and processing between Radio Frequency (RF) collection and digital processing systems using low size, weight and power RF analog and digital designs.</li> <li>- Initiate Electronic Warfare Tactical Decision Aid (EW-TACAID) - Develop performance measures and expert models that provide meaningful feedback to the EW operator and develop an intuitive EW display.</li> <li>- Initiate Scalable Integrated RF for Submarines (SIRF-Sub) - Develop techniques for high speed data conversion and processing between RF collection and digital processing systems.</li> </ul> <p><b>FY 2016 Plans:</b></p> <p>EC: FNT-FY12-01 ADVANCED TACTICAL DATA LINK (ATDL)</p> <ul style="list-style-type: none"> <li>- Complete Mission-Based Waveform Controls &amp; Networking - Develop Anti-Access/Area Denial enhancements to waveforms, along with advanced networking techniques, and validate performance through emulation.</li> </ul> <p>EC: FNT-FY12-02 AUTONOMOUS PERSISTENT TACTICAL SURVEILLANCE</p> <ul style="list-style-type: none"> <li>- Complete Autonomous Information-Based Surveillance Control - Complete algorithm development for information based Unmanned Aerial Vehicle (UAV) routing and pathing.</li> <li>- Complete Contextual Enterprise Information - Develop and demonstrate the analytical services framework, including enterprise exploitation services, for situation context between relevant theater sensor collections and exploitation products.</li> <li>- Complete Mobile Autonomous ISR to C2 Synchronization - Transition to MARCORSYSCOM a set of services that can automate the mapping of mission relevant information requirements to information fulfillments or deficits, and provide a sensor tasking recommendation to resolve deficits.</li> </ul> <p>EC: FNT-FY13-01 EW BATTLE MANAGEMENT FOR SURFACE DEFENSE</p> <ul style="list-style-type: none"> <li>- Continue EW Battle Management (EWBM) - Develop automation techniques for multiple Electronic Warfare systems across multiple ships, including network layer monitoring.</li> </ul> <p>EC: FNT-FY13-03 SILK THREAD</p> <ul style="list-style-type: none"> <li>- Continue Silk Thread Product 1 - Conduct applied research.</li> <li>- Continue Silk Thread Product 2 - Conduct applied research.</li> </ul>					

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: FNT-FY13-04 DETECTION AND FUSION FOR REMOTE SENSORS - Continue Adaptive Multi-Int Correlation & Identification (AMICA) - Research and analyze algorithms to enable cross-domain information fusion and optimize use of remote sensing assets. - Continue Detection & Classification Algorithms (DCA) - Research and analyze algorithms to provide enhanced detection and classification metrics and robust performance under stressing environmental conditions.						
EC: FNT-FY14-02 ADAPTIVE TASKING, COLLECTION, PROCESSING, EXPLOITATION AND DISSEMINATION (TCPED) SERVICES - Continue Adaptive TCPED for ASW Services - Develop and evaluate the performance of methods that are context aware and determine the value of the information for an ASW mission. - Continue Data Exfiltration and Networked Platform Interaction - Develop digital radio components and waveforms directed toward host platforms with limited size, weight, and power and with the desired communication range and performance.						
EC: FNT-FY15-01 ADVANCED AIRBORNE EARLY WARNING ELECTRONIC PROTECTION (AAEWEP) - Continue Advanced AEW Electronic Protection - Develop techniques to improve E-2D Advanced Hawkeye electronic protection.						
EC: FNT-FY15-02 DATA FOCUSED NAVAL TACTICAL CLOUD - Continue Data Focused Naval Tactical Cloud (formerly called Naval Tactical Cloud Analytics) - Conduct the data science activities to ingest all relevant data into the Naval Tactical Cloud to enable efficient decision support analytics for enhanced ASW, IAMD and EXW situational awareness and improved mission execution effectiveness.						
EC: FNT-FY15-04 SCALABLE INTEGRATED RF SYSTEM FOR UNDERSEA PLATFORMS (SIRFSUP) - Continue Compact, Scalable Integrated RF (Compact-SIRF) - Develop scalable and modular, low Size, Weight and Power (SWaP) components and techniques for multi-function Radio Frequency processing on SWaP restricted platforms. - Continue Electronic Warfare Tactical Decision Aid (EW-TACAID) - Create an intuitive display with good user-centered design practices that has adaptive instructional content to suit an individual's aptitudes, learning preferences, and learning styles. - Continue Scalable Integrated RF for Submarines (SIRF-Sub) - Investigate techniques that facilitate the processing and high speed data conversion between digital processing and Radio Frequency collection systems.						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: FNT-FY16-01 BUGLE - Initiate Bugle - Develop algorithms that enable Battle Group communications.							
EC: FNT-FY16-02 COMBINED EO/IR SURVEILLANCE AND RESPONSE SYSTEM (CESARS) - Initiate Multispectral EO/IR Countermeasures against Advanced Threats (MEIRCAT) - Investigate multiband laser, window, and sensing technologies as well as advanced countermeasure techniques for shipboard defense. - Initiate Shipboard Panoramic EO/IR Cueing and Surveillance System (SPECSS) - Investigate small pixel Mid-Wave Infrared (MWIR) Focal Plane Array (FPA) technologies and innovative approaches for seamless stitching of multiple FPAs to create large format, high pixel-count imagers.							
FY 2017 Base Plans:							
EC: FNT-FY13-01 EW BATTLE MANAGEMENT FOR SURFACE DEFENSE - Continue EW Battle Management (EWBM) - Develop automated queuing/attack techniques and tactical use of cross domain data for multiple Electronic Warfare (EW) systems across multiple ships.							
EC: FNT-FY13-03 SILK THREAD - Continue Silk Thread Product 1 - Conduct applied research. - Continue Silk Thread Product 2 - Conduct applied research.							
EC: FNT-FY13-04 DETECTION AND FUSION FOR REMOTE SENSORS - Complete Adaptive Multi-Int Correlation & Identification (AMICA) - Research and analyze algorithms to enable cross-domain information fusion and optimization of theater and tactical battlespace assets to conduct anti-surface warfare. - Complete Detection & Classification Algorithms (DCA) - Research and analyze algorithms to provide enhanced detection and classification metrics and robust performance under stressing environmental conditions.							
EC: FNT-FY14-02 ADAPTIVE TASKING, COLLECTION, PROCESSING, EXPLOITATION AND DISSEMINATION (TCPED) SERVICES - Continue Adaptive TCPED for ASW Services - Develop advanced techniques for automated, high accuracy, low error rate, adaptive processing.							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue Data Exfiltration and Networked Platform Interaction - Integrate and conduct initial demonstration of the radio components and waveforms in a host platform in a simulated environment.</p> <p>EC: FNT-FY14-03 EXCHANGE OF ACTIONABLE INFORMATION AT THE TACTICAL EDGE (EAITE)</p> <p>- Continue from PE 0602131M Actionable Information Tactical Applications from PE 0602131M - Develop natural language processing lexicon algorithms to enable machine understanding of a user defined information requirement.</p> <p>EC: FNT-FY15-01 ADVANCED AIRBORNE EARLY WARNING ELECTRONIC PROTECTION (AAEWEP)</p> <p>- Continue Advanced AEW Electronic Protection - Develop techniques to improve Advanced Hawkeye (E2-D) electronic protection capability.</p> <p>EC: FNT-FY15-02 DATA FOCUSED NAVAL TACTICAL CLOUD</p> <p>- Continue Data Focused Naval Tactical Cloud - Mature Naval Tactical Cloud platform services for streaming, serial ingest and data management within an all source/adaptive data ecosystem, with additional focus on development of federated query and analytic services, to include Expeditionary Warfare readiness and course-of-action recommendations.</p> <p>EC: FNT-FY15-04 SCALABLE INTEGRATED RF SYSTEM FOR UNDERSEA PLATFORMS (SIRFSUP)</p> <p>- Continue Scalable Integrated RF for Submarines (SIRF-Sub) - Investigate new techniques/functionality focusing on Electronic Warfare/Intelligence, Surveillance, Reconnaissance/Electronic INTelligence (EW/ISR/ELINT) collection and processing techniques for the modular functionality payload.</p> <p>- Continue Compact, Scalable Integrated RF (Compact-SIRF) - Develop a modular payload bay and modular Radio Frequency (RF) front end bay for small/medium sized unmanned undersea vehicles.</p> <p>- Continue Electronic Warfare Tactical Decision Aid (EW-TACAD) - Develop new user interface concepts to mitigate shortcomings and issues associated with the Electronic Warfare environment and develop a deeper understanding of the nature of the Electronic Warfare domain content that is most suited for instruction via adaptive training.</p> <p>EC: FNT-FY16-01 BUGLE</p> <p>- Continue Bugle - Develop algorithms that enable battle group communications in communication-challenged, forward-deployed environments.</p>						



**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: FNT-FY16-02 Combined EO/IR Surveillance and Response System (CESARS) - Continue Shipboard Panoramic EO/IR Cueing and Surveillance System (SPECSS) - Begin high fidelity tracking algorithm development. - Continue Multispectral EO/IR Countermeasures against Advanced Threats (MEIRCAT) - Begin high resolution sensor algorithm development.  EC: FNT-FY17-01 COMMUNICATIONS AND INTEROPERABILITY FOR INTEGRATED FIRES (CIIF) - Initiate Communications as a Service (CaaS) - Develop distributed optimization algorithms and Quality of Service (QoS) protocols for heterogeneous data link networks. - Initiate Mission-Based Networking for DDS (MiND) - Develop forward error correction and directional networking algorithms.  EC: FNT-FY17-02 SUBMARINE SIMULTANEOUS TRANSMIT AND RECEIVE (SUBSTAR) - Initiate Submarine Simultaneous Transmit and Receive (SubSTAR) - Develop a submarine broadband antenna enabling simultaneous transmit and receive capability.  EC: FNT-FY17-04 RESILIENT HULL/INFRASTRUCTURE MECHANICAL & ELECTRICAL SECURITY (RHIMES) - Initiate SCAMM - Develop software algorithms that protect naval Hull, Mechanical and Electrical (HM&E) systems against cyber threats. - Initiate SCRAM - Develop information shaping cyber capabilities for tactical platforms.  FY 2017 OCO Plans: N/A						
Title: POWER AND ENERGY (P&E)  Description: This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Power and Energy (P&E) FNC pillar. The P&E Pillar develops deliverable technologies that provide new capabilities in energy security, efficient power and energy systems, high energy and pulse power.  The FY 2015 to FY 2016 decrease was due primarily to the planned ramp-down of P&E-FY12-01 and P&E-FY12-03.		8.200	6.758	11.795	0.000	11.795

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
The FY 2016 to FY 2017 increase was due to the initiation of P&E-FY17-02.						
FY 2015 Accomplishments: EC: P&E-FY12-01 RENEWABLE-SUSTAINABLE EXPEDITIONARY POWER - Continue Renewable Thermal Engine - Conduct test planning for integration of component technologies including test methods, procedures, facilities, and schedule.  EC: P&E-FY12-03 LONG ENDURANCE UNDERSEA VEHICLE PROPULSION - Continue Air Independent Propulsion System - Develop Standard Operating Procedures, maintenance schedules, system piping and instrumentation diagrams, and system components for an Unmanned Undersea Vehicle energy section.  EC: P&E-FY14-01 EFFICIENT AND POWER DENSE ARCHITECTURE AND COMPONENTS - Continue High Power Solid State Circuit Protection for Power Distribution and Energy Storage - Assess circuit protection analytic model results, pursue circuit protection component and system design for Phase 1, and initiate Phase 2 model development for components and system circuit protection.  EC: P&E-FY15-03 MULTIFUNCTION ENERGY STORAGE FOR NAVY / USMC APPLICATIONS TO MAXIMIZE OPERATIONAL EFFECTIVENESS AND EFFICIENCY - Initiate Compact High Density Tactical Energy Storage - Conduct evaluation of conceptual multifunction energy storage module technologies and overall operational modeling analysis. - Initiate Multi-Function High Density Shipboard Energy Storage - Conduct full-scale ship multifunctional energy storage module analysis and evaluation of conceptual multifunction energy storage module technologies.  FY 2016 Plans: EC: P&E-FY12-01 RENEWABLE-SUSTAINABLE EXPEDITIONARY POWER - Complete Renewable Thermal Engine - Finish final design and fabrication of full-scale tactical power system prototype, incorporating all features to be exercised in a TRL 6 demonstration.  EC: P&E-FY12-03 LONG ENDURANCE UNDERSEA VEHICLE PROPULSION - Continue Air Independent Propulsion System - Conduct final design of Phase II fuel cell energy system and coordinate test planning.						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: P&E-FY14-01 EFFICIENT AND POWER DENSE ARCHITECTURE AND COMPONENTS - Continue High Power Solid State Circuit Protection for Power Distribution and Energy Storage - Conduct modelling, simulation and cost analyses of Phase II circuit protection designs and prepare test and safety plans for Phase II circuit protection devices.							
EC: P&E-FY15-03 MULTIFUNCTION ENERGY STORAGE FOR NAVY / USMC APPLICATIONS TO MAXIMIZE OPERATIONAL EFFECTIVENESS AND EFFICIENCY - Continue Compact High Density Tactical Energy Storage - Develop tactical multifunction Energy Storage Module subcomponent technology and designs. - Continue Multi-Function High Density Shipboard Energy Storage - Develop final designs, which integrate ship energy storage module component technologies into a subscale system, and develop subscale system test plans.							
FY 2017 Base Plans:							
EC: P&E-FY12-03 LONG ENDURANCE UNDERSEA VEHICLE PROPULSION - Complete Air Independent Propulsion System - Conduct final design of Phase II fuel cell energy system and coordinate test planning.							
EC: P&E-FY14-01 EFFICIENT AND POWER DENSE ARCHITECTURE AND COMPONENTS - Continue High Power Solid State Circuit Protection for Power Distribution and Energy Storage - Transition the modeling and simulation and technology development effort from an initial 1kV voltage level to the final 20kV voltage level.							
EC: P&E-FY15-03 MULTIFUNCTION ENERGY STORAGE FOR NAVY / USMC APPLICATIONS TO MAXIMIZE OPERATIONAL EFFECTIVENESS AND EFFICIENCY - Continue Multi-Function High Density Shipboard Energy Storage - Demonstrate the capability of subscale energy storage component technologies and perform an analysis of the ship impact of multifunction energy storage with high pulse loads. - Continue Compact High Density Tactical Energy Storage - Complete development of tactical multifunction Energy Storage Module subcomponent technology and continue analysis of tactical multifunction Energy Storage Module technology designs.							

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: P&E-FY17-02 TORPEDO ADVANCED PROPULSION SYSTEM (TAPS) - Initiate Torpedo Advanced Propulsion System (TAPS) - Initiate safety analyses and system modeling concepts for each technology identified in the Analysis of Alternatives (AoA).  <b>FY 2017 OCO Plans:</b> N/A						
<b>Title:</b> SEA BASING (BAS)  <b>Description:</b> This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Sea Basing (BAS) FNC pillar. The BAS Pillar develops deliverable logistics, shipping and at-sea transfer technologies that provide new capabilities for projecting expeditionary force from the sea base and providing sea based joint operational independence through improved connector, at-sea transfer and shipboard logistical capabilities.  The FY 2015 to FY 2016 decrease was due to the planned ramp-down of BAS-FY11-01.  <b>FY 2015 Accomplishments:</b> EC: BAS-FY11-01 CONNECTORS AND THE SEA BASE - Continue Environmental Ship Motion Forecasting - Develop environmental and ship motion sensor and forecasting components.  <b>FY 2016 Plans:</b> EC: EC: BAS-FY11-01 CONNECTORS AND THE SEA BASE - Complete Environmental Ship Motion Forecasting - Develop environmental and ship motion sensor and forecasting components.  <b>FY 2017 Base Plans:</b> N/A  <b>FY 2017 OCO Plans:</b> N/A		5.590	0.066	0.000	0.000	0.000
<b>Title:</b> SEA SHIELD (SHD)  <b>Description:</b> This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE that are aligned to the Sea Shield (SHD) FNC pillar. The SHD Pillar develops deliverable technologies that provide new capabilities in theater air and missile defense, anti-submarine warfare,		45.190	52.681	42.097	0.000	42.097

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
mine countermeasures, defensive surface warfare, global defensive assurance, anti-terrorism, and fleet/force protection.						
The FY 2015 to FY 2016 increase was due primarily to the initiation of SHD-FY16-04, SHD-FY16-05, SHD-FY16-06, SHD-FY16-07 and SHD-FY16-OSD.						
The FY 2016 to FY 2017 decrease was due primarily to the completion of SHD-FY10-01, SHD-FY10-03, SHD-FY11-01, SHD-FY12-01 and SHD-FY12-03, the planned ramp-down of SHD-FY13-07, SHD-FY14-02, SHD-FY14-04, SHD-FY14-08 and SHD-FY15-07, and the movement of SHD-FY16-OSD out of the FNC Program into PE 0602782N.						
FY 2015 Accomplishments:						
EC: SHD-FY10-01 ANTI-SHIP MISSILE DEFENSE TECHNOLOGIES						
- Continue Enhanced Lethality Guidance Algorithms (ELGA) - Develop STANDARD missile guidance algorithm to support the dual-pulse rocket motor.						
- Continue Enhanced Maneuverability Missile Airframe (EMMA) - Develop a dual-pulse rocket motor for STANDARD missile.						
EC: SHD-FY10-03 ADVANCED SONAR TECHNOLOGY FOR HIGH CLEARANCE RATE MCM						
- Continue Long Range LFBB Sonar (AUV Platform Option) - Demonstrate and refine detection & classification algorithms for stealthy mines.						
EC: SHD-FY10-05 AFFORDABLE VECTOR SENSOR TOWED ARRAY AND SIGNAL PROCESSING						
- Complete Vector Sensor Towed Array - Evaluate and deliver component technology for thin-line Vector Sensor Towed Array (VSTA), common array acoustic modules, and a validated physics-based VSTA performance model.						
- Complete Vector Sensor Towed Array Signal Processing - Evaluate and report sonar signal processing detection performance from at-sea and laboratory test events and assess hardware implications for the processing strategy.						
EC: SHD-FY11-01 TORPEDO COMMON HYBRID FUZING SYSTEM						
- Continue Torpedo Common Hybrid Fuzing System - Conduct developmental simulation and testing.						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: SHD-FY12-01 FORCE LEVEL RADAR RESOURCE MANAGEMENT FOR INTEGRATED AIR AND MISSILE DEFENSE (IAMD) - Continue Radar Resource Manager for IAMD - Develop algorithms to provide dynamic force-level management and coordination of radar tracks.						
EC: SHD-FY12-03 SONAR AUTOMATION - Continue Active Sonar Automation - Identify and evaluate in lab performance of algorithms to improve active sonar operator performance in detecting submarines while reducing false contact rates. - Continue Passive Sonar Automation - Identify and evaluate the in-laboratory performance of algorithms that improve passive sonar operator against quiet submarines in the presence of clutter.						
EC: SHD-FY12-04 DETECTION AND NEUTRALIZATION OF NEAR-SURFACE DRIFTING-OSCILLATING MINES - Continue Compact Modular Sensor-Processing Suite (CMSS) - Develop processing & data fusion for onboard classification.						
EC: SHD-FY13-01 COOPERATIVE NETWORKED RADAR - Continue Cooperative Networked Radar - Develop techniques for cross platform radar operation.						
EC: SHD-FY13-05 HIGH ALTITUDE ASW (HAASW) FROM THE P-8 - Continue Next Generation Multistatic Active Capability (NGMAC) - Develop algorithms for use in the Multistatic Active Capability system that improve performance, reduce operator workload, and allow for use in all ocean environments. - Continue Unmanned Targeting Air System (UTAS) - Update vehicle noise models and coordinate with Magnetic Anomaly Detection algorithms.						
EC: SHD-FY13-07 USV PAYLOADS FOR SINGLE SORTIE MINE COUNTERMEASURES - Continue USV-based Mine Neutralization (formerly called Drifting Mine Neutralization Technology) - Develop low-cost sensing, navigation, and battle damage assessment solutions, algorithm development, and associated autonomy. - Continue MCM Payload Automation for Data Analysis (Formerly a technology component of MCM Payload Automation) - Develop automatic target recognition algorithms for risk-based MCM.						

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue MCM Payload Automation for Planning (Formerly a technology component of MCM Payload Automation) - Develop planning algorithms for risk-based MCM.</p> <p>- Continue Single Sortie MCM Detect-to-Engage Payload - Develop architecture, command and control, planning algorithms and design options for hardware.</p> <p>EC: SHD-FY14-02 FULL SECTOR TORPEDO DEFENSE</p> <p>- Continue ATT Timeline Compression (ATTTC) - Perform technology requirements definition, algorithm development, and performance prediction for acoustic illumination and engagement controller.</p> <p>- Continue Concept C Countermeasure - Perform technology requirements definition.</p> <p>- Continue HVU Mounted Sonar - Conduct requirements studies and ship scope checks.</p> <p>EC: SHD-FY14-04 ADVANCED UNDERSEA WEAPON SYSTEM (AUWS)</p> <p>- Continue Autonomous Threat Detection and Localization - Model the AUWS sensor architecture, target detection and tracking algorithms and fusion methodology, and conduct simulation testing.</p> <p>- Continue Remote Command &amp; Control - Model the AUWS sensor, weapon and gateway communications protocols and algorithms, and conduct simulation testing.</p> <p>- Continue Tactical Positioning &amp; Fire Control - Model the AUWS node positioning and management algorithms for effective fire control, and conduct simulation testing.</p> <p>EC: SHD-FY14-08 TERMINATOR (T3)</p> <p>- Continue Terminator S - Develop a hypothesis-based algorithm to provide a fire control solution against a missile defense threat.</p> <p>- Continue Terminator E - Develop guidance modifications to the Evolved Sea Sparrow Missile.</p> <p>- Continue Terminator R - Develop guidance modifications to the Rotating Airframe Missile.</p> <p>EC: SHD-FY15-07 HYPER VELOCITY PROJECTILE</p> <p>- Continue Hyper Velocity Projectile - Demonstrate the component technology required to support hypervelocity launch and common interfaces for powder gun and railgun launch conditions.</p> <p><b>FY 2016 Plans:</b></p> <p>EC: SHD-FY10-01 ANTI-SHIP MISSILE DEFENSE TECHNOLOGIES</p> <p>- Complete Enhanced Lethality Guidance Algorithms (ELGA) - Optimize the guidance algorithm to increase the probability of kill against an expanded threat set.</p>						

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016					
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>				<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
<p>- Complete Enhanced Maneuverability Missile Airframe (EMMA) - Mature the technologies associated with the dual pulse rocket motor and integrated thrust vector control, incorporating risk reduction schemes.</p> <p>EC: SHD-FY10-03 ADVANCED SONAR TECHNOLOGY FOR HIGH CLEARANCE RATE MCM</p> <p>- Complete Long Range LFBB Sonar (AUV Platform Option) - Finalize software configuration and perform final data collection.</p> <p>EC: SHD-FY11-01 TORPEDO COMMON HYBRID FUZING SYSTEM</p> <p>- Complete Torpedo Common Hybrid Fuzing System - Conduct final at-sea data collection, testing and demonstration of Technology Readiness Level #6.</p> <p>EC: SHD-FY12-01 FORCE LEVEL RADAR RESOURCE MANAGEMENT FOR INTEGRATED AIR AND MISSILE DEFENSE (IAMD)</p> <p>- Complete Radar Resource Manager for IAMD - Refine, mature, and test advanced algorithms for ballistic missile defense track coordination.</p> <p>EC: SHD-FY12-03 SONAR AUTOMATION</p> <p>- Complete Active Sonar Automation - Evaluate and deliver algorithms to improve active sonar operator performance in detecting submarines while reducing false contact rates.</p> <p>- Complete Passive Sonar Automation - Evaluate and deliver algorithms that improve Passive Sonar operator performance against quiet submarines in the presence of clutter.</p> <p>EC: SHD-FY12-04 DETECTION AND NEUTRALIZATION OF NEAR-SURFACE DRIFTING-OSCILLATING MINES</p> <p>- Continue Compact Modular Sensor-Processing Suite (CMSS) - Achieve low False Alarm Rate with advanced data fusion techniques.</p> <p>EC: SHD-FY13-01 COOPERATIVE NETWORKED RADAR</p> <p>- Continue Cooperative Networked Radar - Develop techniques for cross platform radar operation.</p> <p>EC: SHD-FY13-05 HIGH ALTITUDE ASW (HAASW) FROM THE P-8</p>								



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy			<b>Date:</b> February 2016				
<b>Appropriation/Budget Activity</b> 1319 / 2		<b>R-1 Program Element (Number/Name)</b> PE 0602750N I (U)Future Naval Capabilities Applied Research		<b>Project (Number/Name)</b> 0000 I (U)Future Naval Capabilities Applied Research			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
<ul style="list-style-type: none"> <li>- Continue Next Generation Multistatic Active Capability (NGMAC) - Develop algorithms for use in the Multistatic Active Capability system that improve performance, reduce operator workload, and allow for use in all ocean environments.</li> <li>- Complete Unmanned Targeting Air System (UTAS) - Update vehicle noise models and coordinate with Magnetic Anomaly Detection algorithms.</li> </ul> <p>EC: SHD-FY13-07 USV PAYLOADS FOR SINGLE SORTIE MINE COUNTERMEASURES</p> <ul style="list-style-type: none"> <li>- Continue MCM Payload Automation for Data Analysis - Develop probabilistic Enemy Course of Action models and update algorithms supporting Net-centric Sensor Analysis for MIW (NSAM).</li> <li>- Continue MCM Payload Automation for Planning - Develop probabilistic Enemy Course of Action models and update algorithms supporting Mine-warfare Environmental Decision-Aid Library (MEDAL).</li> <li>- Continue Single Sortie MCM Detect-to-Engage Payload - Develop the architecture, command and control algorithms, planning algorithms, and hardware design options.</li> <li>- Continue USV-based Mine Neutralization - Develop low-cost sensing, navigation, and battle damage assessment solutions, algorithms, and associated autonomy technology.</li> </ul> <p>EC: SHD-FY14-02 FULL SECTOR TORPEDO DEFENSE</p> <ul style="list-style-type: none"> <li>- Continue Concept C Countermeasure - Commence array re-design to correct technical issues discovered during testing.</li> <li>- Continue ATT Timeline Compression (ATTTC) - Develop algorithms and real time code for guidance enhancements.</li> <li>- Complete HVU Mounted Sonar - Develop an array hull-mount and baffling mechanism, and model the resultant acoustic performance.</li> </ul> <p>EC: SHD-FY14-04 ADVANCED UNDERSEA WEAPON SYSTEM (AUWS)</p> <ul style="list-style-type: none"> <li>- Continue Autonomous Threat Detection and Localization - Model system node positioning algorithms and mission planning improvements, and conduct simulation testing.</li> <li>- Continue Remote Command &amp; Control - Model and assess improved integrated system communications configuration protocols and algorithms.</li> <li>- Continue Tactical Positioning &amp; Fire Control - Develop an improved sensor node architecture and conduct evaluation modeling of detection, classification, localization and targeting capabilities.</li> </ul> <p>EC: SHD-FY14-08 TERMINATOR (T3)</p>							

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy			<b>Date:</b> February 2016				
<b>Appropriation/Budget Activity</b> 1319 / 2		<b>R-1 Program Element (Number/Name)</b> PE 0602750N I (U) <i>Future Naval Capabilities Applied Research</i>		<b>Project (Number/Name)</b> 0000 I (U) <i>Future Naval Capabilities Applied Research</i>			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
<p>- Continue Terminator S (formerly Terminator E, S and R) - Develop fire control algorithms for implementation in the Ship Self-Defense System (SSDS).</p> <p>EC: SHD-FY15-03 AUTOMATION FOR UXV-BASED MCM</p> <p>- Initiate MCM Task Force Planning - Develop algorithmic approaches for optimal tailoring of heterogeneous MCM assets.</p> <p>- Initiate Expeditionary MCM Automated Data Analysis - Investigate the applicability of physics-based approaches to performance estimation.</p> <p>EC: SHD-FY15-07 HYPER VELOCITY PROJECTILE</p> <p>- Continue Hyper Velocity Projectile - Demonstrate the component technology required to support a hypervelocity launch and common interfaces for powder gun and railgun launch conditions.</p> <p>EC: SHD-FY16-04 SHIP-LAUNCHED EW EXTENDED ENDURANCE DECOY (SEWEED)</p> <p>- Initiate Ship-launched EW Extended Endurance Decoy (SEWEED) - Develop preliminary vehicle, payload, rocket, and launcher conceptual designs and sizing.</p> <p>EC: SHD-FY16-05 SURFACE SHIP PERISCOPE DETECTION AND DISCRIMINATION (SSPDD)</p> <p>- Initiate Surface Ship Periscope Detection and Discrimination (SSPDD) - Develop specialized interface hardware for technology components.</p> <p>EC: SHD-FY16-06 NEXT GENERATION AIRBORNE PASSIVE SYSTEM (NGAPS)</p> <p>- Initiate Next Generation Airborne Passive System (NGAPS) - Develop an 'A-size' deep, long-duration, passive sonobuoy for area surveillance that takes advantage of Reliable Acoustic Path detection against modern quiet submarines and is tethered to a surface float containing a radio.</p> <p>EC: SHD-FY16-07 SOFTKILL PERFORMANCE AND REAL-TIME ASSESSMENT (SPARTA)</p> <p>- Initiate Softkill Performance and Real-Time Assessment (SPARTA) - Develop and establish design criteria, system requirements and software requirements.</p> <p>EC: SHD-FY16-OSD MODULAR UNDERSEA EFFECTORS (MUSE)</p>							

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Initate Modular UnderSea Effectors (MUSE) - Develop acoustic propagation modeling, algorithms for tracking and tracking, and algorithms to exploit the acoustic communications environment.</p> <p><b>FY 2017 Base Plans:</b> EC: SHD-FY12-04 DETECTION AND NEUTRALIZATION OF NEAR-SURFACE DRIFTING-OSCILLATING MINES</p> <p>- Complete Compact Modular Sensor-Processing Suite (CMSS) - Use additional environmental data to validate advanced data fusion techniques and low False Alarm Rates.</p> <p>EC: SHD-FY13-01 COOPERATIVE NETWORKED RADAR</p> <p>- Complete Cooperative Networked Radar - Develop software algorithms and techniques for cross-platform radar operation that deliver enhanced sensitivity.</p> <p>EC: SHD-FY13-05 HIGH ALTITUDE ASW (HAASW) FROM THE P-8</p> <p>- Complete Next Generation Multistatic Active Capability (NGMAC) - Finish applied research efforts in support of a demonstration of the Next Generation Multistatic Active Capability sonobuoys in a relevant at sea Navy environment.</p> <p>EC: SHD-FY13-07 USV PAYLOADS FOR SINGLE SORTIE MINE COUNTERMEASURES</p> <p>- Complete USV-Based Mine Neutralization - Finalize low-cost sensing and navigation solutions, algorithm development, and associated autonomy.</p> <p>- Complete Single Sortie MCM Detect-to-Engage Payload - Finalize command and control technology and planning algorithms, and implement them on the MCM hardware.</p> <p>- Complete MCM Payload Automation for Data Analysis - Finish algorithm development and description.</p> <p>- Complete MCM Payload Automation for Planning - Finalize risk calculation software integration and documentation.</p> <p>EC: SHD-FY14-02 FULL SECTOR TORPEDO DEFENSE</p> <p>- Continue ATT Timeline Compression (ATTTC) - Modify the algorithms based on test results.</p> <p>- Continue Concept C Countermeasure - Continue with array re-design to correct technical issues discovered during testing.</p> <p>EC: SHD-FY14-04 ADVANCED UNDERSEA WEAPON SYSTEM (AUWS)</p>						

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue Tactical Positioning &amp; Fire Control - Develop enhanced fire control solution algorithms and technology for advanced minefield planning.</p> <p>- Continue Autonomous Threat Detection and Localization - Model improved sensor node algorithms and updated software.</p> <p>- Continue Remote Command &amp; Control - Develop final gateway buoy design and adaptive acoustic communications protocols.</p> <p>EC: SHD-FY14-08 TERMINATOR (T3)</p> <p>- Continue Terminator S (formerly Terminator E, S and R) - Develop fire control algorithms for implementation in the Ship Self-Defense System (SSDS).</p> <p>EC: SHD-FY15-03 AUTOMATION FOR UXV-BASED MCM</p> <p>- Continue MCM Task Force Planning - Formulate core algorithms that provide mathematical foundation for effects based application of risk, re-planning, and incorporation of legacy and emerging MCM systems.</p> <p>- Continue Expeditionary MCM Automated Data Analysis - Develop performance estimation and environmentally-adaptive Automatic Target Recognition (ATR) algorithms.</p> <p>EC: SHD-FY15-07 HYPER VELOCITY PROJECTILE</p> <p>- Continue Hyper Velocity Projectile - Demonstrate the component technology required to support a hypervelocity launch with common interfaces for powder gun and railgun launch conditions.</p> <p>EC: SHD-FY16-04 SHIP-LAUNCHED EW EXTENDED ENDURANCE DECOY (SEWEED)</p> <p>- Continue Ship-launched EW Extended Endurance Decoy (SEWEED) - Develop preliminary vehicle, payload, rocket, and launcher conceptual designs and sizing.</p> <p>EC: SHD-FY16-05 SURFACE SHIP PERISCOPE DETECTION AND DISCRIMINATION (SSPDD)</p> <p>- Continue Surface Ship Periscope Detection and Discrimination (SSPDD) - Develop specialized interface hardware for technology components.</p> <p>EC: SHD-FY16-06 NEXT GENERATION AIRBORNE PASSIVE SYSTEM (NGAPS)</p> <p>- Continue Next Generation Airborne Passive System (NGAPS) - Develop Algorithms and hardware for field communications, control, health monitoring, mission planning and contact separation and correlation.</p>						

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: SHD-FY16-07 SOFTKILL PERFORMANCE AND REAL-TIME ASSESSMENT (SPARTA) - Continue Softkill Performance and Real-Time Assessment (SPARTA) - Develop and establish design criteria, system requirements, and software requirements.						
EC: SHD-FY16-OSD MODULAR UNDERSEA EFFECTORS (MUSE) - Continued in PE 0602782N						
EC: SHD-FY17-02 AUTONOMOUS UNMANNED SURFACE VEHICLES FOR MINE WARFARE (MIW) - Initiate Autonomous Situational Awareness and Hazard Avoidance System for USVs - Develop perception and route-planning autonomous control for Unmanned Surface Vehicles (USVs). - Initiate High Temperature Superconducting (HTS) Magnetic Influence Sweep Payload for USVs - Develop superconducting technology for the mine influence sweep payload on Unmanned Surface Vehicles (USVs). - Initiate Underway Refueling and Data Transfer for USVs and RMMVs - Develop technology for underway refueling of Unmanned Surface Vehicles (USVs) and Remote Multi-Mission Vehicles (RMMVs) and conduct data transfer from an RMMV.						
EC: SHD-FY17-05 DEEP RELIABLE ACOUSTIC PATH EXPLOITATION SYSTEM (DRAPES) - Initiate Deep Reliable Acoustic Path Exploitation System (DRAPES) - Develop algorithms for undersea communications, health monitoring, and contact separation and correlation.						
FY 2017 OCO Plans: N/A						
Title: SEA STRIKE (STK)		34.465	42.862	31.992	0.000	31.992
Description: This R-2 Activity contains all Future Naval Capabilities (FNC) Program Enabling Capability (ECs) investments in this PE. The Sea Strike (STK) FNC pillar develops deliverable technologies that provide new capabilities in power projection and deterrence, precise and persistent offensive power, weapons, aircraft, and expeditionary warfare.						
The FY 2015 to FY 2016 increase was due primarily to the planned ramp-up of STK-FY15-01, STK-FY15-02 and STK-FY15-03, and the initiation of STK-FY16-01 and STK-FY16-02.						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
The FY 2016 to FY 2017 decrease was due primarily to the completion of STK-FY12-01 and STK-FY13-02, and the planned ramp-down of STK-FY13-04, STK-FY14-01, STK-FY14-03, STK-FY15-03 and STK-FY17-04.							
<b>FY 2015 Accomplishments:</b> EC: STK-FY11-01 STRIKE ACCELERATOR - Complete Strike Accelerator - Develop and understand advanced airborne capability to accurately identify targets using Advanced Target Recognition.  EC: STK-FY11-02 RADAR ELECTRONIC ATTACK PROTECTION (REAP) - Complete Identification and Defeat of EA Systems (IDEAS) - Develop innovative EW countermeasures that employ flexible and robust techniques against advanced Electronic Attack systems. - Complete Network "Sentric" Electronic Protection (EP) - Develop techniques for APG-79 electronic protection.  EC: STK-FY12-01 SUBMARINE SURVIVABILITY - ELECTRONIC WARFARE. - Continue Coherent Electronic Attack for Submarines (CEAS) - Develop advanced Electronic Support and Electronic Attack techniques for detecting and countering advanced coastal surveillance RF threats.  EC: STK-FY13-01 LONG RANGE RF FIND, FIX AND ID - Continue Long Range Find, Fix and ID - Develop algorithms for moving maritime RF identification.  EC: STK-FY13-02 HOSTILE FIRE (HF) SUPPRESSION - Continue Hostile Fire Suppression System - Develop a robust muzzle flash tracking algorithm and begin the laser source design process.  EC: STK-FY13-03 ANTI-SURFACE WARFARE (ASUW) WEAPON UPGRADE - Continue Anti-Surface Warfare (ASuW) Weapon Upgrade - Evaluate hardware and software.  EC: STK-FY13-04 AIM-9X ENABLERS (AXE) - Continue SMOKE - Design and model an advanced rocket motor and subsystems device for the AIM-9X Sidewinder missile.  EC: STK-FY14-01 BANK SHOT - Continue Bank Shot - Study and understand passive sensor phenomenology to enable its use for surveillance.							

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: STK-FY14-03 INTELLIGENT COLLABORATIVE ENGAGEMENT (ICE) - Continue Collaborative Anti-Surface Warfare Engagement (CASE) - Design, develop, and improve weapon-to-weapon communications, coupled with algorithms for limited weapon autonomy, to address the surface warfare mission area. - Continue Collaborative Electronic Attack (CEA) - Develop concepts and techniques that improve U.S. Naval forces ability to conduct Anti Surface Warfare.							
EC: STK-FY15-01 SYNTHETIC APERTURE RADAR ELECTRONIC PROTECTION (SAREP) - Continue Synthetic Aperture Radar Electronic Protection - Develop algorithms and techniques to improve synthetic aperture radar electronic protection.							
EC: STK-FY15-02 ROTOR-CRAFT ADVANCED PROTECTION FROM IR/EO/RPG (RAPIER) - Initiate Helicopter Active RPG Protection (HARP) - Design and develop prototype concepts and new processes for a Rocket Propelled Grenade (RPG) hard kill defense for rotorcraft. - Initiate Multi-Spectral EO/IR Seeker Defeat - Develop and enhance existing test capability to include EO/IR hybrid hardware-in-the-loop for obscurant and jammer evaluation.							
EC: STK-FY15-03 EXTENDED RANGE MODULAR UNDERSEA HEAVYWEIGHT VEHICLE (ER MUHV) - Initiate MUHV Autonomy Suite - Define the autonomy framework. - Initiate MUHV Sensors, Navigation and Guidance - Evaluate and downselect hardware.							
EC: STK-FY16-01 EXTENDED-RANGE TARGETING (E-RAT) - Continue Extended-Range Targeting (E-RAT) - Design and develop prototypes and processes that address extended range targeting and fire control.							
EC: STK-FY17-04 ALPO - Initiate ALPO - Begin the concept and technology development phase to establish the initial feasibility of the proposed solution for an advance signal processing system.							
FY 2016 Plans: EC: STK-FY12-01 SUBMARINE SURVIVABILITY - ELECTRONIC WARFARE							

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016				
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research	Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research				
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Complete Coherent Electronic Attack for Submarines (CEAS) - Conduct experiments of the waveform interactions and spectrum processing that occurs between advanced Electronic Warfare and radar systems in order to assess the effectiveness of new electronic support detection and electronic attack countermeasure techniques.</p> <p>EC: STK-FY13-01 LONG RANGE RF FIND, FIX AND ID</p> <p>- Continue Long Range Find, Fix and ID - Develop algorithms for moving maritime Radio Frequency identification.</p> <p>EC: STK-FY13-02 HOSTILE FIRE (HF) SUPPRESSION</p> <p>- Complete Hostile Fire Suppression System - Demonstrate real-time muzzle flash detection and tracking.</p> <p>EC: STK-FY13-03 ANTI-SURFACE WARFARE (ASUW) WEAPON UPGRADE</p> <p>- Continue Anti-Surface Warfare (ASuW) Weapon Upgrade - Develop relevant algorithms.</p> <p>EC: STK-FY13-04 AIM-9X ENABLERS (AXE)</p> <p>- Continue SMOKE - Evaluate and model advanced kinematic technology improvements for a future Air-to-Air missile.</p> <p>EC: STK-FY14-01 BANK SHOT</p> <p>- Bank Shot - Study and understand passive sensor phenomenology.</p> <p>EC: STK-FY14-03 INTELLIGENT COLLABORATIVE ENGAGEMENT (ICE)</p> <p>- Continue Collaborative Anti-Surface Warfare Engagement (CASE) - Design, develop, and improve weapon-to-weapon communications, coupled with algorithms for limited weapon autonomy, that address the surface warfare mission area.</p> <p>- Continue Collaborative Electronic Attack (CEA) - Develop adaptable Electronic Warfare mission prioritization and collaborative classification algorithms to enable U.S. Naval forces the ability to conduct Anti-Surface Warfare.</p> <p>EC: STK-FY15-01 SYNTHETIC APERTURE RADAR ELECTRONIC PROTECTION (SAREP)</p> <p>- Continue Synthetic Aperture Radar Electronic Protection - Develop algorithms and techniques to improve synthetic aperture radar electronic protection.</p>							



**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
EC: STK-FY15-02 ROTOR-CRAFT ADVANCED PROTECTION FROM IR/EO/RPG (RAPIER) - Continue Helicopter Active RPG Protection (HARP) - Design and develop prototype concepts and new processes for a Rocket Propelled Grenade (RPG) hard-kill defense for rotorcraft. - Continue Multi-Spectral EO/IR Seeker Defeat - Conduct modeling and simulation to define countermeasure sources and expendables requirements for rotary wing aircraft defense against advanced multi-spectral Electro-Optical/Infrared (EO/IR) Man Portable Air Defense Systems (MANPADS).						
EC: STK-FY15-03 EXTENDED RANGE MODULAR UNDERSEA HEAVYWEIGHT VEHICLE (ER MUHV) - Continue MUHV Autonomy Suite - Downselect an autonomy suite prototype. - Continue MUHV Sensors, Navigation and Guidance - Conduct fiber optic development.						
EC: STK-FY16-01 EXTENDED-RANGE TARGETING (E-RAT) - Continue Extended-Range Targeting (E-RAT) - Design, develop, and improve prototypes and processes that address extended range targeting and fire control.						
EC: STK-FY16-02 REACTIVE ELECTRONIC ATTACK MEASURES (REAM) - Initiate Reactive Electronic Attack Measures (REAM) - Develop signal detection and classification techniques that can recognize new and agile radar threats.						
EC: STK-FY17-04 ALPO - Continue ALPO - Commence development of advanced signal processing system algorithms.						
FY 2017 Base Plans:						
EC: STK-FY13-01 LONG RANGE RF FIND, FIX AND ID - Continue Long Range Find, Fix and ID - Develop algorithms for achieving Radio Frequency (RF) identification of moving maritime contacts.						
EC: STK-FY13-03 ANTI-SURFACE WARFARE (ASUW) WEAPON UPGRADE - Continue Anti-Surface Warfare (ASuW) Weapon Upgrade - Refine the subsystem design and development plan.						
EC: STK-FY13-04 AIM-9X ENABLERS (AXE)						

# UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016			
Appropriation/Budget Activity 1319 / 2		R-1 Program Element (Number/Name) PE 0602750N I (U)Future Naval Capabilities Applied Research		Project (Number/Name) 0000 I (U)Future Naval Capabilities Applied Research		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>- Continue SMOKE - Evaluate and model advanced kinematic technology improvements for a future Air-to-Air missile.</p> <p>EC: STK-FY14-01 BANK SHOT</p> <p>- Complete Bank Shot - Evaluate and model sensor phenomenology.</p> <p>EC: STK-FY14-03 INTELLIGENT COLLABORATIVE ENGAGEMENT (ICE)</p> <p>- Continue Collaborative Anti-Surface Warfare Engagement (CASE) - Design, develop, and improve weapon-to-weapon communications, coupled with algorithms for limited weapon autonomy that address the surface warfare mission area.</p> <p>- Continue Collaborative Electronic Attack (CEA) - Develop and prototype highly synchronized collaborative multiple platform Electronic Attack (EA) techniques.</p> <p>EC: STK-FY15-01 SYNTHETIC APERTURE RADAR ELECTRONIC PROTECTION (SAREP)</p> <p>- Continue Synthetic Aperture Radar Electronic Protection - Develop of algorithms and techniques to improve synthetic aperture radar electronic protection.</p> <p>EC: STK-FY15-02 ROTOR-CRAFT ADVANCED PROTECTION FROM IR/EO/RPG (RAPIER)</p> <p>- Continue Helicopter Active RPG Protection (HARP) - Design and develop prototype concepts and new processes for a Rocket Propelled Grenade (RPG) hard-kill defense for rotorcraft.</p> <p>- Continue Multi-Spectral EO/IR Seeker Defeat - Develop Infra-Red CounterMeasures (IRCM) Electro-Optic/Infra-Red (EO/IR) techniques for both flare and jammer, used alone and in combination, while utilizing Navy developed Hardware-In-The-Loop (HITL).</p> <p>EC: STK-FY15-03 EXTENDED RANGE MODULAR UNDERSEA HEAVYWEIGHT VEHICLE (ER MUHV)</p> <p>- Continue MUHV Autonomy Suite - Develop autonomy algorithms for mission planning, waypoint navigation, and vehicle health assessment.</p> <p>- Continue MUHV Sensors, Navigation and Guidance - Develop multiband and hybrid sonar, inertial navigation, and fiber optic systems.</p> <p>EC: STK-FY16-01 EXTENDED-RANGE TARGETING (E-RAT)</p> <p>- Continue Extended-Range Targeting (E-RAT) - Design, develop, and improve prototypes and processes that address extended range targeting and fire control.</p>						

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy				<b>Date:</b> February 2016		
<b>Appropriation/Budget Activity</b> 1319 / 2		<b>R-1 Program Element (Number/Name)</b> PE 0602750N I (U)Future Naval Capabilities Applied Research		<b>Project (Number/Name)</b> 0000 I (U)Future Naval Capabilities Applied Research		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>						
		<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
EC: STK-FY16-02 REACTIVE ELECTRONIC ATTACK MEASURES (REAM) - Continue Reactive Electronic Attack Measures (REAM) - Adapt machine learning algorithms from the Adaptive Radar Countermeasures (ARC) program to support offensive Electronic Warfare Support (ES) and Electronic Attack (EA) capabilities, including integrated unknown emitter characterization and response.						
EC: STK-FY17-04 ALPO - Continue ALPO - Continue developing advanced signal processing system algorithms for the advanced signal processing system.						
<b>FY 2017 OCO Plans:</b> N/A						
<b>Accomplishments/Planned Programs Subtotals</b>		166.866	179.538	165.103	0.000	165.103
<b>C. Other Program Funding Summary (\$ in Millions)</b>						
N/A						
<b>Remarks</b>						
<b>D. Acquisition Strategy</b>						
N/A						
<b>E. Performance Metrics</b>						
<p>As discussed in Section A, there are a significant number of FNC technology products within this PE. In all cases, these technology products support the Department of the Navy FNC Program and are managed at the Office of Naval Research. All FNC investments in this PE are subjected to management oversight by 2-star chaired Integrated Product Teams (IPTs) that control the naval pillars of Sea Shield, Sea Strike, Sea Basing, Forcenet, Naval Expeditionary Maneuver Warfare, Enterprise and Platform Enablers, Power and Energy, Capable Manpower, and Force Health Protection. Each EC is aligned to a pillar and each technology product is aligned to an EC. At the lowest level, each technology product is measured against both technical and financial milestones on a monthly basis. Annually, each technology product is reviewed in depth for technical performance and development status by the Chief of Naval Research against goals that have been approved by the Navy's 3-star Technology Oversight Group (TOG). Also annually, each technology product is reviewed by its 2-star chaired pillar IPT for transition planning adequacy and transition commitment level. Products must meet TOG required transition commitment levels for S&amp;T development to continue. Transition issues and required adjustments are reported annually by the Chief of Naval Research to the TOG, which establishes investment priorities for the FNC Program.</p>						

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy										<b>Date:</b> February 2016		
<b>Appropriation/Budget Activity</b> 1319 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602750N / (U)Future Naval Capabilities Applied Research				<b>Project (Number/Name)</b> 3346 / Future Naval Capabilities Adv Tech Dev			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
3346: Future Naval Capabilities Adv Tech Dev	0.000	5.125	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.125
<b>A. Mission Description and Budget Item Justification</b> <p>The efforts described in this Project address the Applied Research associated with the Future Naval Capabilities (FNC) Program. The FNC Program represents the requirements-driven, delivery-oriented portion of the Navy's Science and Technology (S&amp;T) portfolio. FNC investments respond to Naval S&amp;T Gaps that are identified by the Navy and Marine Corps after receiving input from Naval Research Enterprise (NRE) stakeholders. The Enabling Capabilities (ECs) and associated technology product investments of the FNC Program are competitively selected by a 3-star Technology Oversight Group (TOG), chartered by the S&amp;T Corporate Board and representing the requirements, acquisition, research and fleet/forces communities of the Navy and the Marine Corps.</p>												
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>							<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>	
<b>Title:</b> New Accomplishment/Planned Program Entry							5.125	0.000	0.000	0.000	0.000	
<b>FY 2015 Accomplishments:</b> <p>Accelerated the develop of the Automated Critical Care System (ACCS) for care of injured personnel during transport to a medical facility. Initiated the development of autonomous control of cyber secure long distance medical data transfer and patient sedation. Completed the development of autonomous control of patient ventilation.</p>												
<b>FY 2016 Plans:</b> <p>N/A</p>												
<b>FY 2017 Base Plans:</b> <p>N/A</p>												
<b>FY 2017 OCO Plans:</b> <p>N/A</p>												
<b>Accomplishments/Planned Programs Subtotals</b>							5.125	0.000	0.000	0.000	0.000	
<b>C. Other Program Funding Summary (\$ in Millions)</b> <p>N/A</p>												
<b>Remarks</b>												

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy		<b>Date:</b> February 2016
<b>Appropriation/Budget Activity</b> 1319 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602750N / (U)Future Naval Capabilities Applied Research	<b>Project (Number/Name)</b> 3346 / Future Naval Capabilities Adv Tech Dev
<b>D. Acquisition Strategy</b> N/A		
<b>E. Performance Metrics</b> <p>In all cases, FNC technology products support the Department of the Navy's FNC Program and are managed at the Office of Naval Research. All FNC investments in this PE are subjected to management oversight by 2-star chaired Integrated Product Teams (IPTs). Each EC is aligned to a pillar and each technology product is aligned to an EC. At the lowest level, each technology product is measured against both technical and financial milestones on a monthly basis. Annually, each technology product is reviewed in depth for technical performance and development status by the Chief of Naval Research against goals that have been approved by the Navy's 3-star Technology Oversight Group (TOG). Also annually, each technology product is reviewed by its 2-star chaired pillar IPT for transition planning and adequacy and transition commitment level. Products must meet TOG required transition commitment levels for S&amp;T development to continue. Transition issues and required adjustments are reported annually by the Chief of Naval Research to the TOG, which establishes investment priorities for the FNC Program.</p>		

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED