Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy											Date: February 2018	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*						**R-1 Program Element (Number/Name)** PE 0602750N I *(U)Future Naval Capabilities Applied Research*						

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	0.000	152.427	156.805	147.771	-	147.771	155.625	168.512	181.877	185.572	Continuing	Continuing
0000: *(U)Future Naval Capabilities Applied Research*	0.000	152.427	156.805	147.771	-	147.771	155.625	168.512	181.877	185.572	Continuing	Continuing

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 objective of the work in this PE is to develop and mature technologies needed by the Navy and Marine Corps to initiate FNCs in PE 0603673N Future Naval Capabilities Advanced Technology Development that can be commenced at higher Technology Readiness Levels (TRLs). The FNC Program was restructured for FY19 to accelerate transition to the Fleet and Force. This restructuring involved a zero based review of all ongoing FNC projects where each effort was assessed for its technology maturity and transition commitment. Ongoing efforts were categorized as FNCs or Technology Candidates. Some efforts were terminated and others were accelerated to achieve the goals of the restructured program. Funding for FNCs, which have higher Technology Readiness Levels (TRLs of 4/5 to 6) and transition funding commitments, is being resourced in PE 0603673N Future Naval Capabilities Advanced Technology Development. Funding for technology candidates at lower TRLs (3 to 4) is being resourced in this PE. ONR is working closely with the Resource Sponsors and acquisition stakeholders to develop high priority technological capabilities needed by the operational forces.

B. Program Change Summary ($ in Millions)

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	165.103	156.805	158.197	-	158.197
Current President's Budget	152.427	156.805	147.771	-	147.771
Total Adjustments	-12.676	0.000	-10.426	-	-10.426
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.877	0.000			
• SBIR/STTR Transfer	-2.666	0.000			
• Program Adjustments	0.000	0.000	-9.700	-	-9.700
• Rate/Misc Adjustments	0.000	0.000	-0.726	-	-0.726
• Congressional General Reductions Adjustments	-0.133	-	-	-	-
• Congressional Directed Reductions Adjustments	-8.000	-	-	-	-

Exhibit R-2, **RDT&E Budget Item Justification:** PB 2019 Navy		**Date:** February 2018
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Change Summary Explanation

The FY 2019 funding request was reduced by $0.285 million to reflect the Department of Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.

Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										**Date:** February 2018	

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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0000: (U)Future Naval Capabilities Applied Research	0.000	152.427	156.805	147.771	-	147.771	155.625	168.512	181.877	185.572	Continuing	Continuing

A. Mission Description and Budget Item Justification

Prior to FY19, the underlying FNC Program investments in this PE were aligned to specific FNC projects. In order to increase agility, exploit technology advances, and respond quickly to naval needs, future BA 2 investments supporting candidate FNC technologies are being developed in a more flexible manner. This approach facilitates an optimum response when developing and maturing the technology options that will be developed further in PE 0603673N, Future Naval Capabilities Advanced Tech Div.

The FNC Program has been fully restructured in favor of a more direct and higher level of collaboration. R-2 activities are now organized by the ONR Departments tasked to collaborate with the acquisition stakeholders and their resource sponsors. A complete accounting of the technology candidates being developed and a full disposition of each technology development effort referenced as continuing in the FY18 plans of this PE will be provided separately to the Congressional oversight committees.

B. Accomplishments/Planned Programs ($ in Millions)

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: CAPABLE MANPOWER (CMP) **Description:** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. **FY 2018 Plans:** FNC: CMP-FY13-02 SIMULATION TOOLSET FOR ANALYSIS OF MISSION, PERSONNEL AND SYSTEMS (STAMPS) - Complete Manpower Planning and Optimization Toolset - Demonstrate the new analytics to measure variable work packaging, optimize manpower variables (task allocation, job and occupation codes, billets, and training), and estimate manpower, personnel, and training costs to better characterize manpower components of overall ship total ownership cost. FNC: CMP-FY14-02 UNMANNED AERIAL SYSTEMS INTERFACE, SELECTION AND TRAINING TECHNOLOGIES (U-ASISTT) - Complete UAS Control Station Human Machine Interface - Validate the human machine interface design concepts for supervisory control and for documenting design lessons learned from user experimentation. FNC: CMP-FY15-01 ACCELERATING DEVELOPMENT OF SMALL UNIT DECISION MAKERS (ADSUDM)	9.005	9.929	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018	
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	

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**
- Complete Decision Making-Learning Management System (DM-LMS) - Research and design measures of decision making mastery for ground infantry squad leaders in order to reliably measure acquisition of expertise. - Complete Digital Integrated Representation of Tactical Environment (DIRTE) - Design the 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. - Complete Simulation Tailored Training and Assessment (ST2A) - Assess feasibility and design solutions for situated tutor techniques and unobtrusive monitoring techniques, and develop software and hardware prototypes to execute adaptive decision making scenarios in simulation. FNC: CMP-FY15-02 ENVIRONMENT DESIGNED TO UNDERTAKE COUNTER A2AD TACTICS, TRAINING & EXPERIMENTATION (EDUCAT2E) - Complete Environment Designed to Undertake Counter A2AD Tactics, Training & Experimentation (EDUCAT2E) - Finish modeling of the pacing threat denied and degraded effects on the unit sensors of blue, joint and partner nations in a distributed, virtual/constructive training, and certification/mission rehearsal environment. FNC: CMP-FY16-01 OPERATIONAL PLANNING TOOL - Continue Operational Planning Tool - Develop new capabilities to support, plan, brief, execute, and assess the Navy planning process in order to facilitate real-time situational awareness and rapid re-planning. FNC: CMP-FY17-01 MANPOWER, PERSONNEL & TRAINING STRATEGIC PLANNING APPLICATION - Initiate Manpower, Personnel & Training Planning Application - For this FNC, delayed one year to start in FY18, 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. FNC: CMP-FY17-02 FUTURE INTEGRATED TRAINING ENVIRONMENT (FITE) - Continue Future Integrated Training Environment (FITE) - Assess feasibility and design solutions for a single world-like representation of available terrain databases, making them easily available to exercise planners, and develop initial requirements to link ground and air simulation trainers. FNC: CMP-FY18-01 LEARNING CONTINUUM AND PERFORMANCE AID (LCAPA)					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018	
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Initiate Learning Continuum and Performance Aid (LCaPA) - Develop a fundamental understanding of the skills, training, and performance measures necessary to manage individualized learning and performance tracking. FNC: CMP-FY18-02 MANNED AND UNMANNED COMMON PLANNING PICTURE - Initiate Manned and Unmanned Common Planning Picture - Develop software heuristics and automated rule sets for future integration into a single Commander's intent planner. FNC: CMP-FY19-03 Fleet Training Technologies (FleeT2) - Initiate FleeT2 - Conduct analyses of representational techniques, model dynamics, and high computational tractability. *FY 2019 Base Plans:* N/A *FY 2019 OCO Plans:* N/A *FY 2018 to FY 2019 Increase/Decrease Statement:* The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: ENTERPRISE AND PLATFORM ENABLERS (EPE) *Description:* The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. *FY 2018 Plans:* FNC: EPE-FY14-02 ALUMINUM ALLOY CORROSION CONTROL AND PREVENTION - Continue Aluminum Alloy Corrosion Mitigation Technologies - Conduct a final assessment of the aluminum coating to minimize radiant heat build-up and an evaluation of aluminum repair tools. - Complete Aluminum Alloy Corrosion Prediction Tool - Conduct an assessment of aluminum corrosion prediction software integrated with the developed Degree of Sensitization (DoS) detection tools. FNC: EPE-FY15-02 GAS TURBINE UPGRADES FOR REDUCED TOTAL OWNERSHIP COST (TOC) AND IMPROVED SHIP IMPACT	9.142	13.708	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018		
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Continue Shipboard Gas Turbine Marinization Package for Higher Temperature, Higher Pressure Operation - Complete university hot corrosion and mechanical testing of materials and down-select the best materials for hardware development. FNC: EPE-FY15-03 SPECIAL HULL TREATMENT - Continue New Material(s) Development & Lab Characterization - Evaluate new material mitigation technology. FNC: EPE-FY16-01 ADVANCED TOPCOAT SYSTEM (ATS) - Continue 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 toward TRL 6 formulas. FNC: EPE-FY19-04 Signature Management System (SMS) - Continue SMS - Continue applied research technology development for submarine applications. *FY 2019 Base Plans:* N/A *FY 2019 OCO Plans:* N/A *FY 2018 to FY 2019 Increase/Decrease Statement:* The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: EXPEDITIONARY MANEUVER WARFARE (EMW) *Description:* The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. *FY 2018 Plans:* N/A *FY 2019 Base Plans:* N/A *FY 2019 OCO Plans:*	2.731	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018		
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A **FY 2018 to FY 2019 Increase/Decrease Statement:** Funding decreased from FY17 to FY18 is due to FNC:EMW-FY17-01 HIGH RELIABILITY DPICM REPLACEMENT(HRDR) move that will continue in PE 0602131M Marine Corps Landing Force Technology.					
Title: FNC MANAGEMENT	7.742	8.056	0.000	0.000	0.000
Description: The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. **FY 2018 Plans:** 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. **FY 2019 Base Plans:** N/A **FY 2019 OCO Plans:** N/A **FY 2018 to FY 2019 Increase/Decrease Statement:** The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: FORCE HEALTH PROTECTION (FHP)	5.290	4.308	0.000	0.000	0.000
Description: The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. **FY 2018 Plans:** FNC: FHP-FY13-03 EXTREME OPERATIONS: MITIGATING OXYGEN IMBALANCE AT ALTITUDE AND AT DEPTH - Continue applied research efforts to exploit methods of detecting individual-specific challenges associated with combating casualties in warfighters operating at altitude.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FNC: FHP-FY14-01 ACUTE CARE COVER FOR SEVERELY INJURED LIMBS (ACCSIL) - Complete Acute Care Cover for Severely Injured Limbs (ACCSIL) - Conduct efficacy testing of innovative pharmaceutical solutions and novel materials that will enhance the bandage system for management of complex limb trauma. FNC: FHP-FY14-03 BLAST LOAD ASSESSMENT: SENSE AND TEST (BLAST) - Complete Blast Load Assessment: Sense and Test (BLAST) - Finish algorithm predictions, integrate data and power management technologies, and validate the neuro-functional assessment device to estimate Traumatic Brain Injury. FNC: FHP-FY16-01 INCAPACITATION PREDICTION FOR READINESS IN EXPEDITIONARY DOMAINS - AN INTEGRATED COMPUTATIONAL TOOL (I-PREDICT) - Continue I-PREDICT - Develop an integrated, in-silico, morphometrically scalable model of the human being to estimate injury response from external forces (i.e., blunt, blast and vibratory forces). ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: FORCENET (FNT) **Description:** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. ***FY 2018 Plans:*** FNC: FNT-FY13-01 EW BATTLE MANAGEMENT FOR SURFACE DEFENSE - Complete EW Battle Management (EWBM) - Integrate combat system data with cross domain data to automate tactical Electronic Warfare (EW) decision making across multiple ships. FNC: FNT-FY13-03 SILK THREAD	39.227	41.368	0.000	0.000	0.000

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Complete Silk Thread Product 1 - Finish applied research efforts for this classified program. - Complete Silk Thread Product 2 - Finish applied research efforts for this classified program. FNC: FNT-FY14-02 ADAPTIVE TASKING, COLLECTION, PROCESSING, EXPLOITATION AND DISSEMINATION (TCPED) SERVICES - Complete Adaptive TCPED for ASW Services - Complete the development of advanced techniques for automated high accuracy, low error rate, adaptive processing. - Complete Data Exfiltration and Networked Platform Interaction - Integrate radio components and waveforms in a host platform. FNC: FNT-FY14-03 EXCHANGE OF ACTIONABLE INFORMATION AT THE TACTICAL EDGE (EAITE) - Continue Actionable Information Tactical Applications - Research and design natural language processing algorithms to enable machine understanding of an information requirement. FNC: FNT-FY15-01 ADVANCED AIRBORNE EARLY WARNING ELECTRONIC PROTECTION (AAEWEP) - Continue Advanced AEW Electronic Protection - Implement real-time AEW Electronic Protection improvements within the airborne prototype. FNC: FNT-FY15-02 DATA FOCUSED NAVAL TACTICAL CLOUD - Continue Data Focused Naval Tactical Cloud - Perform applied research in machine learning analytics to support automated enemy course-of-action predictions based on all-source intelligence for integrated fires and integrated air and missile defense. FNC: FNT-FY15-04 SCALABLE INTEGRATED RF SYSTEM FOR UNDERSEA PLATFORMS (SIRFSUP) - Continue Compact, Scalable Integrated RF (Compact-SIRF) - Perform laboratory effectiveness testing to evaluate the RF design, which includes communications, cyber, information operations and electronic warfare operational performance requirements. - Complete Electronic Warfare Tactical Decision Aid (EW-TACAID) - Conduct analyses of efficient operator interfaces in support of netted sensor and coordinated EW operations. - Continue Scalable Integrated RF for Submarines (SIRF-Sub) - Conduct laboratory analysis of temporal, spectral and resource allocation management techniques for optimized resource sharing. FNC: FNT-FY16-01 BUGLE					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		**Date:** February 2018		
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Continue Bugle - Continue applied research efforts supporting advanced waveforms. FNC: FNT-FY16-02 COMBINED EO/IR SURVEILLANCE AND RESPONSE SYSTEM (CESARS) - Continue Multispectral EO/IR Countermeasures against Advanced Threats (MEIRCAT) - Finalize development of the high resolution sensor algorithms, laser hardware, and countermeasure algorithms and techniques. - Continue Shipboard Panoramic EO/IR Cueing and Surveillance System (SPECSS) - Develop, assess and analyze algorithms, noise performance, resolution and sensitivity technology, and software for data capture, recording, processing and display. FNC: FNT-FY17-01 COMMUNICATIONS AND INTEROPERABILITY FOR INTEGRATED FIRES (CIIF) - Continue Communications as a Service (CaaS) - Validate and test distributed optimization algorithms and quality-of-service protocols. - Continue Mission-Based Networking for DDS (MiND) - Conduct simulation and system engineering of waveform coding/modulation, adaptive link management and Data Distribution System (DDS) networking/quality of service. FNC: FNT-FY17-02 SUBMARINE SIMULTANEOUS TRANSMIT AND RECEIVE (SUBSTAR) - Continue Submarine Simultaneous Transmit and Receive (SubSTAR) - Develop and prototype initial broadband simultaneous transmit and receive antenna designs. FNC: FNT-FY17-04 RESILIENT HULL/INFRASTRUCTURE MECHANICAL & ELECTRICAL SECURITY (RHIMES) - Continue SCAMM - Develop information sharing capabilities for tactical platforms. - Continue SCRAM - Develop resilient software for integrated control systems, including those without redundant processors. FNC: FNT-FY18-04 NANOSAT COMMUNICATIONS FOR A2AD OPERATIONS - Initiate Nanosat Communications Payloads - Develop and prototype a nanosat communication payload in UHF- and X-bands. (In FY19, this FNC Product will be realigned within this PE to IW-FY18-02 under a new Information Warfare R-2 Activity) - Initiate Shipboard Integration - Develop and integrate shipboard networking in UHF- and X-bands with Digital Mobile Radio and Navy multiband terminal. (In FY19, this FNC Product will be realigned within this PE to IW-FY18-02 under a new Information Warfare R-2 Activity)					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FNC: FNT-FY18-05 ADVANCED COORDINATION TECHNIQUES FOR DISTRIBUTED EW - Continue Coordinated Radio Frequency EW (CRFEW) - Continue analyzing precision geo-location and coordinated engagement techniques to support netted sensor battlespace emitter geo-location and coordinated Electronic Warfare (EW) operations. - Continue Next Generation Surface Electronic Warfare User Interface - Continue the analysis of surface EW to inform user requirements of single and cross-ship sensor correlation, disambiguation and fixing, and tactical decision making. - Continue Propagation Channel Assessment and Prediction (PCAP) - Continue analyzing real-time techniques for assessing radio frequency propagation channels in support of naval operations. (***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: POWER AND ENERGY (P&E) ***Description:*** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. ***FY 2018 Plans:*** FNC: P&E-FY14-01 EFFICIENT AND POWER DENSE ARCHITECTURE AND COMPONENTS - Complete High Power Solid State Circuit Protection for Power Distribution and Energy Storage - Transition a knowledge product with relevant voltage, current and protection ratings to the acquisition sponsor. FNC: P&E-FY15-03 MULTIFUNCTION ENERGY STORAGE FOR NAVY / USMC APPLICATIONS TO MAXIMIZE OPERATIONAL EFFECTIVENESS AND EFFICIENCY - Complete Compact High Density Tactical Energy Storage - Complete module subsystem modeling, analysis, and development. - Continue Multi-Function High Density Shipboard Energy Storage - Conduct an analysis of the ship impact of multifunction energy storage technology with high pulse loads.	10.890	11.038	0.000	0.000	0.000

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FNC: P&E-FY17-02 TORPEDO ADVANCED PROPULSION SYSTEM (TAPS) - Continue Torpedo Advanced Propulsion System (TAPS) - Complete safety and cost analyses of the technology solutions being developed. **FY 2019 Base Plans:** N/A **FY 2019 OCO Plans:** N/A **FY 2018 to FY 2019 Increase/Decrease Statement:** The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: SEA SHIELD (SHD) **Description:** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. **FY 2018 Plans:** FNC: SHD-FY12-04 DETECTION AND NEUTRALIZATION OF NEAR-SURFACE DRIFTING-OSCILLATING MINES - Complete Compact Modular Sensor-Processing Suite (CMSS) - Finish developing an extension of the software and algorithms to include interaction with the seabed necessary for the new three dimensional cameras. FNC: SHD-FY13-01 COOPERATIVE NETWORKED RADAR - Complete Cooperative Networked Radar - Finish developing software algorithms and techniques for cross-platform radar operation that deliver enhanced sensitivity. FNC: SHD-FY14-02 FULL SECTOR TORPEDO DEFENSE - Continue ATT Timeline Compression (ATTTC) - Continue development of bi-static and acoustic communication algorithms. - Continue Concept C Countermeasure - Conduct electronic subsystem software integration. FNC: SHD-FY14-04 ADVANCED UNDERSEA WEAPON SYSTEM (AUWS) - Complete Autonomous Threat Detection and Localization - Finalize and document algorithm development and detection, classification, localization, and tracking performance.	38.865	40.074	0.000	0.000	0.000

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Complete Remote Command & Control - Finalize and document algorithm development and command and control functionality. - Complete Tactical Positioning & Fire Control - Finalize and document system autonomy and fire solution algorithms. FNC: SHD-FY14-08 TERMINATOR (T3) - Continue Terminator S - Develop fire control algorithms for implementation in the Ship Self-Defense System (SSDS). FNC: SHD-FY15-03 AUTOMATION FOR UXV-BASED MCM - Continue Expeditionary MCM Automated Data Analysis - Develop fusion algorithms for low frequency sonar and acoustic color with high frequency imaging systems. - Continue MCM Task Force Planning - Refine re-planning algorithms and integrate them with algorithms for the effects-based application of risk. FNC: SHD-FY15-07 HYPER VELOCITY PROJECTILE - Complete Hyper Velocity Projectile - Demonstrate the component technology required to support a hypervelocity launch and develop common interfaces for powder gun and railgun launch conditions. FNC: SHD-FY16-04 SHIP-LAUNCHED EW EXTENDED ENDURANCE DECOY (SEWEED) - Continue Ship-launched EW Extended Endurance Decoy (SEWEED) - Conduct design development of the demonstrator vehicle and payload bay, and continue documentation of design and interface control. FNC: SHD-FY16-05 SURFACE SHIP PERISCOPE DETECTION AND DISCRIMINATION (SSPDD) - Continue Surface Ship Periscope Detection and Discrimination (SSPDD) - Continue development of the generation 2.5 government-reference prototype sensor, data fusion system, and pre-planned product improvement options. FNC: SHD-FY16-06 NEXT GENERATION AIRBORNE PASSIVE SYSTEM (NGAPS) - Continue Next Generation Airborne Passive System (NGAPS) - Model and test algorithms and hardware for field communications, control, health monitoring, mission planning and contact separation/correlation. FNC: SHD-FY16-07 SOFTKILL PERFORMANCE AND REAL-TIME ASSESSMENT (SPARTA)					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Continue Softkill Performance and Real-Time Assessment (SPARTA) - Develop and establish design criteria, system requirements, and software requirements. FNC: SHD-FY17-02 AUTONOMOUS UNMANNED SURFACE VEHICLES FOR MINE WARFARE (MIW) - Continue Autonomous Situational Awareness and Hazard Avoidance System for USVs - Develop autonomous situational awareness and hazard avoidance system components for Unmanned Surface Vehicles (USVs) that enable avoidance of fixed and moving hazards, while providing the ability to regain track and revisit missed areas using a low bandwidth control link. - Continue High Temperature Superconducting (HTS) Magnetic Influence Sweep Payload for USVs - Develop magnetic, mine-influence, sweep system technology components that can be integrated on an Unmanned Surface Vehicle (USV) enabling a sweep capability that is self-contained and capable of unmanned tactical operations. - Continue Underway Refueling and Data Transfer for USVs and RMMVs - Develop automated underway refueling technology for Unmanned Surface Vehicles (USVs) and unmanned semisubmersible vehicles that is capable of conducting unmanned/automated refueling operations and data download/upload in up to sea state 3, away from a host refueling ship. FNC: SHD-FY17-05 DEEP RELIABLE ACOUSTIC PATH EXPLOITATION SYSTEM (DRAPES) - Continue Deep Reliable Acoustic Path Exploitation System (DRAPES) - Develop algorithms for undersea communications, health monitoring, and contact separation/correlation. FNC: SHD-FY18-08 FORCE-LEVEL INTEGRATED FIRES REAL-TIME ENGAGEMENT COORDINATION AND PERFORMANCE ESTIMATION (FIRECAPE) - Initiate FIRECAPE Algorithms - Begin development of performance estimation and coordination algorithms and validate their performance using Monte Carlo analysis against complex threat raids. FNC: SHD-FY19-07 (IW-FY19-03) Theater ASW Commander Battle Management (TASWC BaM TDA) - Initiate TASWC Battle Management TDA - Establish protocol and setup for Measures of Effectiveness analysis. *FY 2019 Base Plans:* N/A *FY 2019 OCO Plans:*					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: SEA STRIKE (STK)	29.535	28.324	0.000	0.000	0.000
Description: The investments that would have continued in this R-2 Activity have been moved into the activities of the restructed FNC Program. ***FY 2018 Plans:*** FNC: STK-FY13-01 LONG RANGE RF FIND, FIX AND ID - Complete Long Range Find, Fix and ID - Improve Long Range ID algorithm performance within unanticipated maritime phenomenology. FNC: STK-FY13-03 ANTI-SURFACE WARFARE (ASUW) WEAPON UPGRADE - Complete Anti-Surface Warfare (ASuW) Weapon Upgrade - Develop and verify algorithms for Phase II. FNC: STK-FY13-04 AIM-9X ENABLERS (AXE) - Complete SMOKE - Evaluate and model advanced kinematic technology improvements for a future air-to-air missile. FNC: STK-FY14-03 INTELLIGENT COLLABORATIVE ENGAGEMENT (ICE) - Complete Collaborative Anti-Surface Warfare Engagement (CASE) - Design, develop, and improve weapon-to-weapon communications, coupled with algorithms for limited weapon autonomy addressing the surface warfare mission area. - Continue Collaborative Electronic Attack (CEA) - Perform applied research in cognitive electronic warfare to produce next generation electronic jamming effects. FNC: STK-FY15-01 SYNTHETIC APERTURE RADAR ELECTRONIC PROTECTION (SAREP) - Continue Synthetic Aperture Radar Electronic Protection - Implement real-time electronic protection improvements within the airborne test bed. FNC: STK-FY15-02 ROTOR-CRAFT ADVANCED PROTECTION FROM IR/EO/RPG (RAPIER)					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- 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 - Refine, test and finalize Infra-Red Countermeasures (IRCM) Electro-Optic/Infra-Red (EO/IR) techniques for flares and jammers using simulation and laboratory tests. FNC: STK-FY15-03 EXTENDED RANGE MODULAR UNDERSEA HEAVYWEIGHT VEHICLE (ER MUHV) - Continue MUHV Autonomy Suite - Continue implementation and refinement of the autonomy architecture and algorithms for mission planning, waypoint navigation and vehicle health. - Continue MUHV Sensors, Navigation and Guidance - Continue development and maturation of multiband and hybrid sonar, inertial navigation, and fiber-optic systems. FNC: STK-FY16-01 EXTENDED-RANGE TARGETING (E-RAT) - Complete Extended-Range Targeting (E-RAT) - Design, develop, and improve prototypes and processes that address extended range targeting and fire control. FNC: STK-FY16-02 REACTIVE ELECTRONIC ATTACK MEASURES (REAM) - Continue Reactive Electronic Attack Measures (REAM) - Implement and assess real-time reactive electronic attack algorithms in a representative environment. FNC: STK-FY17-04 ALPO - Complete ALPO - Establish the initial feasibility and practicality solution for an advanced signal-processing system. FNC: STK-FY18-01 PRECISION ELECTRONIC ATTACK TECHNOLOGIES (PEAT) - Continue Multi-platform Retrodirective EW - Continue analyzing synchronized Electronic Warfare (EW) effects across multiple platforms and EW systems. - Continue Single Platform Coherent Arrays - Continue analyzing synchronized EW effects across intra-platform EW components. *FY 2019 Base Plans:* N/A *FY 2019 OCO Plans:*					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The decrease from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: EMW AND COMBATING TERRORISM	0.000	0.000	7.163	0.000	7.163
Description: The objective of this activity, new for FY19, is to develop and mature technologies in asymmetric and irregular warfare, distributed operations, information dominance, survivability and self-defense to a point where they can be proposed and continued as Future Naval Capabilities in PE 0603673N, Future Naval Capabilities Advanced Tech Div. ***FY 2018 Plans:*** N/A ***FY 2019 Base Plans:*** The technologies being pursued under this activity include, but are not limited to, investments that: improve warfighter effectiveness in command, control, computers and communication for small unit naval expeditionary warfighters; enhance fires capabilities so warfighters employed in small, distributed units will have the tools they need to locate and decisively destroy larger enemy forces; improve force protection for small units and individual warfighters against a myriad of enemy attack modes; improve human performance by developing new training technologies, knowledge products, architectures, and systems that can accelerate mental, emotional and cognitive decision-making skill; mature emerging technologies for future intelligence, surveillance and reconnaissance systems; develop and mature new maintenance technologies for expeditionary combat systems; develop new expeditionary energy technologies that support distributed operations from the individual Marine to small units; develop novel technologies and innovative concepts that will improve the maneuverability of the Marine Corps Air Ground Task Force by enhancing the movement of troops and equipment from shipboard to inland objectives; and mature new technologies that will improve the standoff detection and neutralization of improvised explosive devices. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The increase from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: C4ISR AND SPECIAL PROJECTS	0.000	0.000	71.913	0.000	71.913

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Description: The objective of this activity, new for FY19, is to develop and mature technologies in data science, mathematical optimization, computational and information sciences, quantum information sciences, electronics, command and control and combat systems, communications, cyber security, cyber operations, electronic warfare, sensing and surveillance, and precision timing and navigation, as well as technologies for surface and airborne vehicles, low observable (LO) technology, weapons system counter low observable (CLO) technology, and cruise missile defense weapons to a point where they can be proposed and continued as Future Naval Capabilities in PE 0603673N,Future Naval Capabilities Advanced Tech Div. *FY 2018 Plans:* N/A *FY 2019 Base Plans:* The technologies being pursued under this activity include, but are not limited to, investments that: advance techniques and algorithms for information processing and integration, information operations, information assurance, cyber protection , communications and networking, computational decision-making, and command and control technologies with a specific focus on enabling rapid, accurate decision making; exploit advancements in electronics, sensors and network technologies enabling new and innovative uses of the electromagnetic spectrum in areas of surface and aerospace surveillance, communications, electronic combat, and precision time and navigation; improve adaptive persistent surveillance capabilities; develop new digital radio frequency technologies supporting active aperture, phased arrays capable of performing multiple functions simultaneously; improve soft-kill performance and real-time assessment, as well as provide multiple means to detect and measure incoming threats. *FY 2019 OCO Plans:* N/A *FY 2018 to FY 2019 Increase/Decrease Statement:* The increase from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: OCEAN BATTLESPACE SENSING *Description:* The objective of this activity, new for FY19, is to develop and mature technologies in the areas of oceanographic and meteorological observations, modeling and prediction in the battlespace environment; submarine detection and classification, and mine warfare to a point where they can be proposed and continued as Future Naval Capabilities in PE 0603673N, Future Naval Capabilities Advanced Tech Div.	0.000	0.000	21.904	0.000	21.904

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 Plans: N/A ***FY 2019 Base Plans:*** The technologies being pursued under this activity include, but are not limited to, investments that: improve the detection and neutralization of mines in both the ocean and littoral environment; exploit advancements in maritime sensing, ocean engineering, marine systems, and undersea signal processing, and improve our understanding of the environment and the limits of predictability by maturing technologies in fields ranging from the littoral geosciences to high latitude dynamics. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The increase from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: SEA WARFARE AND WEAPONS ***Description:*** The objective of this activity, new for FY19, is to develop and mature technologies that enable superior warfighting capabilities for surface and sub-surface naval platforms and undersea weaponry to a point where they can be proposed and continued as Future Naval Capabilities in PE 0603673N, Future Naval Capabilities Advanced Tech Div. ***FY 2018 Plans:*** N/A ***FY 2019 Base Plans:*** The technologies being pursued under this activity include, but are not limited to, investments that: reduce the total life cycle cost of naval platforms and minimize the energy footprint of naval forces by exploiting advancements in hydrodynamics, survivability, electrical and thermal systems, platform structures and autonomy for unmanned surface vehicles; develop new functional and structural materials, materials processing and systems to fulfil the unique requirements of marine and military applications; develop concepts and technologies which enable flexible resilient logistics and maintenance: develop new guidance, control, autonomy, sensors, signal processing, undersea distributed network, energy conversion, propulsion and vehicle technologies that improve the capabilities of sea weapons; improve protection against corrosion and anti-fouling coatings; develop new battery, fuel cell, liquid and solid fuels, and motors for weapons and autonomous vehicles;	0.000	0.000	18.060	0.000	18.060

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
exploit renewable energy resources and energy efficiency technologies for sea warfare; develop concepts and technologies which enable flexible resilient logistics; develop improved and new acoustic sensors, and related processing and autonomy algorithms, to support long-range undersea weapons; and develop primary battery technology for long-range undersea weapons. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The increase from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: WARFIGHTER PERFORMANCE *Description:* The objective of this activity, new for FY19, is to develop and mature technologies that enhance warfighter effectiveness and efficiency through bioengineered and bio-robotic systems, medical technologies, improved manpower, personnel, training systems design to a point where they can be proposed and continued as Future Naval Capabilities in PE 0603673N, Future Naval Capabilities Advanced Tech Div. ***FY 2018 Plans:*** N/A ***FY 2019 Base Plans:*** The technologies being pursued under this activity include, but are not limited to, investments that: mature computational, neuroscience, bioscience, bio-mimetic, social/organizational, training, human factors, and decision making technologies to improve warfighter performance and decision making in all environments; exploit advancements in biomaterials, biomedical technologies, expeditionary and undersea medicine, physiology and biophysics, and immunology to increase the survival of casualties through intermediate, life-saving treatments and stabilization techniques and to prevent personnel injuries caused by the stresses of demanding Naval occupations and environments; and develop new manpower, personnel, training, and education technologies that prepare sailors and Marines to fight and win in an information rich, distributed battlespace, get the right warfighters into the right job at the right time with the right tools, and provide a 21st century learning environment designed to deliver the right training. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:***	0.000	0.000	8.756	0.000	8.756

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
The increase from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Title: NAVAL AIR WARFARE AND WEAPONS	0.000	0.000	19.975	0.000	19.975
Description: The objective of this activity, new for FY19, is to develop and mature technologies in directed energy, energetic materials, autonomy, electromagnetic launch, and high speed conventional air and surface weapons to a point where they can be proposed and continued as Future Naval Capabilities in PE 0603673N,Future Naval Capabilities Advanced Tech Div. **FY 2018 Plans:** N/A **FY 2019 Base Plans:** The technologies being pursued under this activity include, but are not limited to, investments that enhance the offensive and defensive capabilities of tactical missiles and missile systems by developing and maturing new technologies in the areas of high threat time-critical strike, countermeasures to advanced seekers and hostile fire, air vehicle performance, air platform survivability, total ownership cost, operational availability, hypersonic missile defense, naval fires, non-kinetic warfare, unmanned naval aviation, warhead and propulsion energetics and design, navigation, autonomy, airframes, power and energy, propulsion design, sensors, seekers, targeting, directed energy, collaborative operations, advanced manufacturing and maintenance reduction. **FY 2019 OCO Plans:** N/A **FY 2018 to FY 2019 Increase/Decrease Statement:** The increase from FY18 to FY19 was due to the Navy's restructuring of the FNC Program.					
Accomplishments/Planned Programs Subtotals	152.427	156.805	147.771	0.000	147.771

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

D. Acquisition Strategy
 N/A

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E. Performance Metrics

The performance metric for this PE and the research thrusts it funds can be measured by the number of successfully FNCs that are able to be proposed and selected in the FNC BA 3 PE.