Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy											Date: May 2017	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602747N *I Undersea Warfare Applied Res*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	151.844	126.313	56.094	-	56.094	58.008	57.298	57.439	58.588	Continuing	Continuing
0000: *Undersea Warfare Applied Res*	0.000	125.679	126.313	56.094	-	56.094	58.008	57.298	57.439	58.588	Continuing	Continuing
9999: *Congressional Adds*	0.000	26.165	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	26.165

A. Mission Description and Budget Item Justification

The efforts described in this Program Element (PE) are based on investment directions as defined in the Naval S&T Strategic Plan approved by the S&T Corporate Board (Sep 2011). This strategy is based on needs and capabilities from Navy and Marine Corps guidance and input from the Naval Research Enterprise (NRE) stakeholders (including the Naval enterprises, the combatant commands, the Chief of Naval Operations (CNO), and Headquarters Marine Corps). It provides the vision and key objectives for the essential science and technology efforts that will enable the continued supremacy of U.S. Naval forces in the 21st century. The Strategy focuses and aligns Naval S&T with Naval missions and future capability needs that address the complex challenges presented by both rising peer competitors and irregular/asymmetric warfare.

This PE funds applied research efforts in undersea target detection, classification, localization, tracking, and neutralization. Technologies being developed within this PE are aimed at enabling Sea Shield, one of the core operational concepts detailed in the Naval Transformational Roadmap. Associated efforts focus on new Anti-Submarine Warfare (ASW) operational concepts that promise to improve wide-area surveillance, detection, localization, tracking, and attack capabilities against quiet adversary submarines operating in noisy and cluttered shallow water environments. Related efforts are aimed at leveraging technologies that will protect the country's current capital investment in surveillance, submarine, surface ship, and air ASW assets. Research focused on understanding the impacts on marine mammals of manmade underwater sound is also conducted in the Program Element , as well as continuing support to research vessels of the U.S. Academic Research Fleet for operations and maintenance that enable applied research at sea.

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

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602747N *I Undersea Warfare Applied Res*

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	150.839	126.313	100.501	-	100.501
Current President's Budget	151.844	126.313	56.094	-	56.094
Total Adjustments	1.005	0.000	-44.407	-	-44.407
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	4.970	0.000			
• SBIR/STTR Transfer	-3.965	0.000			
• Program Adjustments	0.000	0.000	-44.407	-	-44.407
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2016	FY 2017
Project: 9999: *Congressional Adds*		
Congressional Add: *Undersea Warfare Research*	17.958	0.000
Congressional Add: *Underwater Energetics Research*	8.207	0.000
Congressional Add Subtotals for Project: 9999	26.165	0.000
Congressional Add Totals for all Projects	26.165	0.000

Change Summary Explanation

The funding decrease from FY 2017 to FY 2018 reflects the realignment of the Innovative Naval Prototype (INP) Forward Deployed Energy & Communications Outpost (FEDCO), the INP Anti-Submarine Warfare Mission Package (ASW MP), and the INP Large Displacement Unmanned Underwater Vehicle (LDUUV) to the new PE 0602792N Innovative Naval Prototypes Applied Research.

Technical: Not applicable.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602747N / *Undersea Warfare Applied Res*	Project (Number/Name) 0000 / *Undersea Warfare Applied Res*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
0000: *Undersea Warfare Applied Res*	0.000	125.679	126.313	56.094	-	56.094	58.008	57.298	57.439	58.588	Continuing	Continuing

A. Mission Description and Budget Item Justification

This PE funds applied research efforts in undersea target detection, classification, localization, tracking, and neutralization. Technologies being developed within this project are aimed at enabling Sea Shield which is one of the core operational concepts detailed in the Naval Transformational Roadmap. Associated efforts focus on new ASW operational concepts that promise to improve wide-area surveillance, detection, localization, tracking, and attack capabilities against quiet adversary submarines operating in noisy and cluttered shallow water environments. Related efforts are aimed at leveraging technologies that will protect the country's current capital investment in surveillance, submarine, surface ship, and air ASW assets.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: ANTI-SUBMARINE WARFARE (ASW) DISTRIBUTED SEARCH	20.829	29.906	15.274	0.000	15.274
Description: ASW Distributed Search focuses on the development of technologies for the non-covert tactical search for undersea targets ranging from hours to weeks, using automated sensor systems deployed around operating areas, including along key transit routes to protect naval/maritime forces, around temporarily fixed sea base regions and naval force operating areas, or around fixed defensive regions and areas of interest, such as key US/Allied ports. "Non-covert" implies availability of airborne assets for sensor deployment (although other means may also be used), and the ability to employ active sonar along with passive and non-acoustic methods. "Search" is conducted in concentrated areas, typically exploiting cues received from surveillance systems. The submarine target must be detected beyond its weapons release range. The objective is to develop rapidly deployable systems employing automated detection and classification capabilities for use in both shallow and deep water operating environments. Distributed Search supports the ASW protected passage Maritime Shield operational constructs. Related efforts include the development of distributed systems employing optimization as well as active acoustic sensing and processing techniques, navy-unique transduction and underwater networking technology. Efforts also include the development of Unmanned Undersea Vehicle-based and affordable off-board deployable sensing systems employing persistent detection concepts and components. These efforts provide an extended reach of organic platform-based systems through the use of new sensor concepts, improved materials for advanced sensors, optimized deployment, employment, and automated operation of distributed sensor fields. The cornerstone of Distributed Search is the development of rapidly deployable, long-endurance active sensors with automated processing suitable for use in a wide variety of operational environments.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Funding increase from FY 2016 to FY 2017 is due to the increase in the number of objective experiments and the demonstration at the end of FY17 for the FDECO program and the associated integration events associated with the FDECO program. Funding decreases from FY 2017 to FY 2018 due to the move of the Forward Deployed Energy & Communications Outpost (FDECO) INP Program to a new innovative naval prototype PE 0602792N Innovative Naval Prototypes Applied Research. ***FY 2016 Accomplishments:*** - Furthered development of "intelligent" algorithms aimed at improving ASW performance of distributed multistatic sonar systems. - Completed development of a thermophone acoustic projector technology for use in sonar applications. - Completed effort to develop compressive beamforming algorithms for vector sensor towed arrays. - Completed development/improvement of multi-static signal processing techniques for systems employing coherent sound sources. - Completed research into the characterization and classification of deep-ocean clutter sources to improve active sonar system performance in Convergence Zone (CZ) and other deep-ocean propagation conditions. - Initiated development of signal and information processing algorithms for improved ASW performance of high duty cycle active sonar systems. - Initiated the Forward Deployed Energy & Communications Outpost (FDECO) INP project. ***FY 2017 Plans:*** - Continue all efforts of FY 2016, less those noted as complete above. ***FY 2018 Base Plans:*** Undersea Warfare Applied research focused on technologies that enable both platform-based and off-board systems to detect and classify the ultra-quiet, low-Doppler submarine threat in complex operating environments. The capability to provide non-covert ASW tactical search for both shallow and deep water operational areas against all submarine threats requires improved sensor technology to extend the capabilities of platform-based systems; innovative sensor technology for off-board and rapidly deployable systems; characterization of and signal processing to control reverberation, clutter, and noise; characterization of target radiation and scattering physics for all					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
threat submarines; physics-based detection and classification algorithms with automation where possible; and knowledge and exploitation of the complex operational environment. Conduct Signal processing-related research which focuses on multistatic active sonar concepts that operate in convergence zone environments, high duty cycle active sonar, and developing concepts for next-generation active sonar system automation. Complete effort to develop a new generation of target detection algorithms that use advanced simulations of small targets floating on a dynamic sea surface. Complete effort to develop and demonstrate real time onboard processing for a UUV to detect, classify, and track submarines using active sonar. Complete effort to develop a new class of magnetic sensor with ultra-low power consumption to enable persistent magnetic field sensing as a surveillance technology. ***FY 2018 OCO Plans:*** N/A					
Title: ANTI-SUBMARINE WARFARE (ASW) PRECISION LOCALIZATION ***Description:*** Precision Localization focuses on the development and demonstration of technologies which use information from surveillance or search systems to determine an area of uncertainty (AOU) relative to target range, bearing, and depth adequate to handoff to an attack system. Precision Localization employs non-acoustic techniques such as magnetic and optical sensing to highly localize submerged threats. The objective is to increase magnetic sensor range and robustness, enable deployment on Unmanned Air Vehicles (UAVs), and increase optical sensing search rates. Efforts include the development of non-traditional tracking and advanced magnetic and electric field sensors and processing. These technologies will provide a decreased AOU size thus enabling the effective use of smaller, more versatile torpedoes as well as increased performance gain in detection, targeting, tracking/trailing, and homing via target acquisition and covert prosecution. ***FY 2016 Accomplishments:*** - Continued effort to develop improved electrodes and signal processing techniques to improve detection range using undersea electric field sensors. - Continued development of non-traditional tracking methods and systems for deployment on air vehicles. - Continued development of low-cost, platform based sensor networks. - Continued development of quantum sensor technologies for Magnetic Anomaly Detector (MAD). - Continued development of a non-traditional tracking system for deployment on undersea vehicles. - Continued testing of a non-traditional tracking system.	3.281	3.415	3.452	0.000	3.452

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Continued development of alternative active optical sources and sensor devices for Non-Acoustic ASW systems. - Continued an effort to extend the technology base for blue laser sources for Undersea Warfare applications including underwater communications. - Continued an effort to extend the technology base for high performance electro-optic detectors and filters suitable for Undersea Warfare applications including underwater communications. - Continued an effort to develop consistent and comprehensive modeling and simulation tools for photonic Undersea Warfare and underwater communications components and systems. - Continued an effort to develop optical signal processing and hybrid computing technology appropriate for Undersea Warfare and underwater communications systems. - Continued development of ASW sensor technologies capable of being deployed by a gun or missile launcher.					
FY 2017 Plans: - Continue all efforts of FY 2016, unless noted as completed above. - Complete effort to develop improved electrodes and signal processing techniques to improve detection range using undersea electric field sensors.					
FY 2018 Base Plans: Magnetic and Electric Field Sensing Conduct basic research related to critical S&T for Precision Localization using magnetic and electric field sensing technologies. Executed research into novel methods to develop smaller and power efficient, high performance magnetic and electric field sensors. Pursued research on advanced concepts for processing arrays of independent sensors to create adaptive magnetic and electric field sensor systems. Expanded research to include remote methods of sensing magnetic fields. Optical Sensing Conduct basic research related to critical S&T for Precision Localization using optical sensing technologies. Executed research to better exploit the information capacity available in photonic systems toward development of higher performance optical sensors. Pursued information theoretic optical sampling and telemetry characteristics to better support sensor performance and data integrity. Extend the effectiveness that photonic sensors to operate across the air-water interface. Extend the distance optical sensors can effectively operate within the water column.					
FY 2018 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Title: ANTI-SUBMARINE WARFARE (ASW) SURVEILLANCE	85.852	77.223	21.617	0.000	21.617
Description: ASW Surveillance focuses on dramatically improving detection, classification, and localization capabilities in large ocean areas relative to the capabilities of legacy ASW surveillance systems. The related technologies support the conduct of covert, wide-area surveillance ranging from one day to six months. The objectives are to develop and demonstrate technologies that provide clandestine indications and warnings in far forward and contested operating areas, and in complex operational environments against all submarine threats, including new threats with unknown target signatures and tactics. Covertness implies use of non-observable platforms and/or deployed automated sensors employing passive sonar, or other non-detectable methods. The surveillance process includes initial detection and classification. Efforts include the development of Unmanned Undersea Vehicle-based and affordable, off-board deployable sensing systems employing a wide variety of surveillance concepts and components. These efforts focus on alternative detection phenomena, vector/tensor sensors, automated acoustic processing, more compact and longer lasting power sources, and high bandwidth, acoustic communications links. The decrease from FY 2016 to FY 2017 due to the completion of a portion of the Innovative Naval Prototype (INP) -Large Displacement Unmanned Underwater Vehicle (LDUUV) effort to development an Autonomous Underwater Vehicle (AUV)-deployable bottom surveillance array networked by low complexity acoustic modems. FY 2017 to FY 2018 funding decreases due to the INP-Large Displacement Unmanned Underwater Vehicle (LDUUV) & INP Anti Submarine Warfare Mission Packages (ASW MP) moving into a new innovative naval prototype PE 0602792N Innovative Naval Prototypes Applied Research. ***FY 2016 Accomplishments:*** - Completed development an Autonomous Underwater Vehicle (AUV) - deployable bottom surveillance array networked by low complexity acoustic modems. - Completed development of next generation (non-Penetrating) Power and communications technologies for underwater operations. - Initiated Select UUV for ASW mission and measure it's characteristics Leap Ahead (LA) MGMT-NEW START PREPARATIONS					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Initiated LA Management - New Start Preparations - Conduct technology analysis and studies to support the development and validation of technology performance specifications to ensure new Leap Ahead investments are able to commence execution every other year in a timely manner. LA MGMT-SUPPORT/OPS ANALYSIS - Initiated LA Management - Support/OPS Analysis - Conduct warfighter sustainment applied research and analysis, including technology management of Leap Ahead investments supporting Department of the Navy RDT&E Corporate Board priorities for new disruptive technologies. ***FY 2017 Plans:*** - Continue all efforts of FY 2016, less those noted as complete above. LA MGMT-NEW START PREPARATIONS - Continue Leap Ahead (LA) Management - Preparations - Conduct technology analysis and studies to support the development and validation of technology performance specifications to ensure new Leap Ahead investments are able to commence execution every other year in a timely manner. LA MGMT-SUPPORT/OPS ANALYSIS - Continue LA Management - Support/OPS Analysis - Conduct warfighter sustainment applied research and analysis, including technology management of Leap Ahead investments supporting Department of the Navy RDT&E Corporate Board priorities for new disruptive technologies. - Complete effort to develop ultra-low power, high sensitivity, miniature, optically pumped scalar magnetometers for undersea surveillance. - Complete effort to develop improved electrodes and signal processing techniques to improve detection range using undersea electric field sensors. - Initiate new passive sonar signal processing technology designed to detect, classify and track next-generation nuclear submarines. ***FY 2018 Base Plans:*** Undersea Warfare Conduct applied research focused on technologies that enable detection and classification of ultra-quiet, low-Doppler submarines in complex operating environments. It emphasizes developments leading to non-platform-based and clandestine systems. The capability to provide ASW clandestine indications and warnings in far-forward and contested areas against all submarine threats requires new sensor concepts to provide improved performance in smaller packages; automated passive acoustic and non-acoustic detection and classification algorithms to eliminate the dependence on traditional ASW platforms; novel power sources and					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
power-harvesting; underwater communications; networking of distributed autonomous sensors; and knowledge and exploitation of the complex operational environment. Conduct Signal processing related research that focuses on combining information from multiple arrays in a distributed field that exploit new acoustic signatures, improve detection of weak acoustic sources obscured by clutter, and new sensor and signal processing concepts that exploit underwater acoustic propagation physics to improve the detection of weak acoustic sources in high clutter environments. ***FY 2018 OCO Plans:*** N/A					
Title: MARINE MAMMALS ***Description:*** The Marine Mammals and Biology program focus is to better understand and characterize the effects of underwater sounds produced by Navy sources (especially sonar) on marine mammals. Efforts include research on Integrated ecosystems, effects of sound exposure on marine mammals, and improving the monitoring and detection of marine mammals. The research in this program supports Navy environmental compliance information needs and facilitates acquiring LOAs from NOAA that enable all Navy training and testing operations, and the development of appropriate state-of-the-art mitigation measure. The marine mammals research conducted in this Program Element (PE) represents part of a total effort executed in coordination with complementary research performed in PE 0602435N Ocean Warfighting Environment Applied Research. This Activity has been created specifically to address the work associated with determining and mitigating the effects on the behavior of marine mammals of manmade sound transmitted underwater. ***FY 2016 Accomplishments:*** - Continued development of new technologies for detection and localization of marine mammals, including (but not restricted to) gliders equipped with passive acoustic sensors, radar and thermal imagery. - Continued research examining hearing sensitivity of marine mammals (including temporary and permanent threshold shifts). - Continued research efforts examining distributions and abundances of marine mammals relative to prey fields and basic oceanographic parameters.	2.794	2.579	2.510	0.000	2.510

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Continued development of and evaluate models that predict time- and space-dependent sound fields produced by anthropogenic noise sources and mammal responses to the noise. - Continued development and testing of multi-frequency acoustic technologies for detection, identification and enumeration of fish. - Continued research on effects of chronic physiological stress related to acoustic exposure of marine mammals in the wild. - Completed development and testing of multi-frequency acoustic technologies for detection, identification and enumeration of fish. ***FY 2017 Plans:*** - Continue all efforts of FY 2016, less those noted as complete above. ***FY 2018 Base Plans:*** Integrated Ecosystem Research: Conduct research using animal tagging and passive acoustic monitoring to study behaviors and distributions of marine mammals relative to key environmental properties (biotic and abiotic). This includes providing a context for interpreting behavioral responses to external stimuli (i.e. anthropogenic sound), and providing basic knowledge needed for predictive models of species of concern. Effects of Sound: Conduct research on behavioral effects to potentially population-level consequences of sound exposure on marine life. Initiate research to characterize the gas management and kinetics (stores and use) in marine mammals. Conduct research into the mechanisms that enable marine mammals to dive to deep depths for long durations while mitigating, if not avoiding, health threats. Initiated research to advance our understanding of sound reception mechanisms in mysticetes (large whales) will require a thorough exploration of the anatomy surrounding the ear and the whole head combined with modeling sound propagation through various tissues of whale heads and/or bodies. Conduct research to develop an understanding of the natural variation of stress markers, better understand and characterize acute and chronic effects of the stress response on individuals and populations of marine mammals. Continue research on potential effects of Navy sources on marine mammal behavior, life functions (e.g. feeding, breeding, migrating), vital rates (e.g. adult survival, reproduction), and population level effects. Understanding the effects of naval activities on species or stocks of marine mammals, including effects on annual rates of recruitment and survival. Monitoring and Detection: Continue research and development of technology for detection, classification, and localization of marine mammals. Continue the development and testing of new autonomous hardware platforms					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
using technology to detect and classify marine mammals using a variety of fixed, towed, floating, and profiling platforms. Models & Databases: Conduct research to provide tools to support environmental compliance efforts and decision-making related to how marine mammals are affected by anthropogenic sounds. ***FY 2018 OCO Plans:*** N/A					
Title: UNDERSEA WEAPONRY ***Description:*** Undersea Weaponry focuses on the development of enabling technologies to counter threat submarines and surface vessels by increasing Probability of Kill and platform survivability, as well as developing technologies for unmanned undersea vehicles. Research performed within Undersea Weaponry supports several Naval S&T Focus Areas including Power Projection & Integrated Defense, Assure Access to Maritime Battlespace, Autonomy & Unmanned Systems, and Power & Energy. Weapon technology focus areas include: Explosives and Warheads, Guidance and Control (G&C), Simulation Based Design, Propulsion, Power Sources, Supercavitation, and Counter Weapons/Counter Measures. The ultimate goal of this activity is to provide revolutionary capabilities needed to fill Sea Shield and Sea Strike Warfighter Capability Gaps, to accommodate unique payload limitations through the development of modular and reduced sized undersea weapons based on common technology enablers (where possible), to provide improved platform pre-engagement positioning and fire-control solutions for effective weapon-to-target engagement, and provide countermeasures and counterweapons against current and next-generation undersea weapons. ***FY 2016 Accomplishments:*** - Continued limited collection and evaluation of small supercavitating vehicle. - Continued concept designs for advanced warheads. - Continued design/formulation and early-stage testing of propulsion system components for advanced undersea platforms. - Continued development and testing of technologies for rapid reaction defense against undersea threats. ***FY 2017 Plans:*** - Continue all efforts of FY 2016. ***FY 2018 Base Plans:***	12.923	13.190	13.241	0.000	13.241

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602747N / *Undersea Warfare Applied Res*	**Project (Number/Name)** 0000 / *Undersea Warfare Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Conduct applied research related to critical S&T for supercavitation, advanced warheads, propulsion systems for undersea platforms and defense against undersea threats. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	125.679	126.313	56.094	0.000	56.094

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

The overall metrics of applied research in undersea warfare are to develop technologies aimed at improving target detection, classification, localization, tracking, increasing attack capabilities against quiet adversary submarines operating in noisy and cluttered shallow water environments, countering enemy torpedoes, providing the ability to conduct long-range engagements, increasing weapons load-out, providing multi-platform connectivity, increasing endurance/survivability, and reducing size and power requirements.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602747N / *Undersea Warfare Applied Res*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	26.165	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	26.165

A. Mission Description and Budget Item Justification

Related efforts include novel approaches to remote detection of ocean acoustic fields, enhanced understanding of ocean acoustic structure, new transduction materials, and novel anti-submarine warfare detection methods.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017
Congressional Add: Undersea Warfare Research ***FY 2016 Accomplishments:*** Test instrument designed/constructed for remote detection of acoustic fields. Upper ocean acoustic structure characterized in open ocean test. High strain textured ceramics tested for sonar use. Initiated advanced undersea mission autonomy field effort. Initiated studies on metamaterials and acoustic flow noise processes. ***FY 2017 Plans:*** N/A	17.958	0.000
Congressional Add: Underwater Energetics Research ***FY 2016 Accomplishments:*** -Initiate assessment of global developments in energetic materials. ***FY 2017 Plans:*** N/A	8.207	0.000
Congressional Adds Subtotals	26.165	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

The overall metrics of applied research in undersea warfare are to develop technologies aimed at improving target detection, classification, localization, tracking, increasing attack capabilities against quiet adversary submarines operating in noisy and cluttered shallow water environments, countering enemy torpedoes, providing the ability to conduct long-range engagements, increasing weapons load-out, providing multi-platform connectivity, increasing endurance/survivability, and reducing size and power requirements.