Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
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 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	59.644	78.049	57.075	-	57.075	57.197	58.334	59.529	60.724	Continuing	Continuing
0000: *Undersea Warfare Applied Res*	0.000	54.816	58.049	57.075	-	57.075	57.197	58.334	59.529	60.724	Continuing	Continuing
9999: *Congressional Adds*	0.000	4.828	20.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.828

A. Mission Description and Budget Item Justification

This Program Element (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.

The activities described in this program element PE address future Navy and Marine Corps capabilities needed to maintain maritime superiority and ensure national security. They are based on input from Naval Research Enterprise stakeholders (including the Naval enterprises, the combatant commands, OPNAV and Headquarters Marine Corps) and are designed to exploit breakthroughs in science and technology in order to deliver maximum warfighting benefit to our sailors and marines. These efforts are aligned with shared priorities throughout the whole of RDT&E in order to quickly advance new capabilities from discovery to deployment across the warfighting domains.

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: PB 2020 Navy	Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	56.094	58.049	57.324	-	57.324
Current President's Budget	59.644	78.049	57.075	-	57.075
Total Adjustments	3.550	20.000	-0.249	-	-0.249
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	20.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.450	0.000			
• Program Adjustments	0.000	0.000	-0.249	-	-0.249
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Add Adjustments	5.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Program Increase*	4.828	20.000
Congressional Add Subtotals for Project: 9999	4.828	20.000
Congressional Add Totals for all Projects	4.828	20.000

Change Summary Explanation

Schedule: Not applicable.

Technical: Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0000: *Undersea Warfare Applied Res*	0.000	54.816	58.049	57.075	-	57.075	57.197	58.334	59.529	60.724	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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: ANTI-SUBMARINE WARFARE (ASW) DISTRIBUTED SEARCH	14.974	15.154	15.455	0.000	15.455
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: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 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 threat submarines; physics-based detection and classification algorithms with automation where possible; and knowledge and exploitation of the complex operational environment. Continue 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. Undersea Warfare Conceptualize and perform laboratory measurements, field measurements, and theoretical/numerical analysis 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 such as: advancing sensing, onboard processing/decision making, and information sharing capabilities to enable multi-static ASW using multiple autonomous, coordinated and cooperating AUVs; the development of a new kind of underwater chemical sound source; and efforts that capitalize on structural acoustic features of UUVs and advance sonar design, sensing, and processing/decision making to enable high performance detection and classification of adversarial UUVs. ***FY 2020 Base Plans:*** Undersea Warfare Applied research is 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 Anti-Submarine Warfare (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 threat submarines; physics-based detection and classification algorithms with automation where possible; and knowledge and exploitation of the complex operational environment. Continue sensor development and signal processing-related research which focuses on multistatic active sonar concepts that operate in convergence zone environments, high duty cycle active					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
sonar, and developing concepts for next-generation active sonar system automation. Initiate non-acoustic, orthogonal concepts that complement and augment active sonar concepts. Undersea Warfare Conceptualize and perform laboratory measurements, field measurements, and theoretical/numerical analysis focused on technologies that enable both platform-based and off-board systems to detect and classify the ultra-quiet, low-Doppler submarine threats in complex operating environments such as: advancing sensing, onboard processing/decision making, and information sharing capabilities to enable multi-static ASW using multiple autonomous, coordinated and cooperating autonomous underwater vehicles (AUVs); the development of a new types of underwater sound sources; and efforts that capitalize on structural acoustic features of unmanned underwater vehicles (UUVs) and advance sonar design, sensing, and processing/decision making to enable high performance detection and classification of adversarial UUVs. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
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 2019 Plans:*** Continue focus on Magnetic and Electric Field Sensing applied research related to critical S&T for Precision Localization using magnetic and electric field sensing technologies. Execute research into novel methods to develop smaller and power efficient, high performance magnetic and electric field sensors. Pursue research	3.225	3.544	3.468	0.000	3.468

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
on advanced concepts for processing arrays of independent sensors to create adaptive magnetic and electric field sensor systems. Expand research to include remote methods of sensing magnetic fields. Optical Sensing will conduct basic research related to critical S&T for Precision Localization using optical sensing technologies. Execute research to better exploit the information capacity available in photonic systems toward development of higher performance optical sensors. Pursue information theoretic optical sampling and telemetry characteristics to better support sensor performance and data integrity. Extend the effectiveness that photonic sensor operate across the air-water interface. Extend the distance optical sensors can effectively operate within the water column. ***FY 2020 Base Plans:*** Shift focus from classical magnetic and electric field sensing toward other modalities and sampling approaches. Investigate alternative methods for Precision Localization leveraging magnetic and electric field sensing technologies and incorporating alternative technologies and approaches. Execute research into novel methods to develop smaller and power efficient, high performance magnetic, electric field and novel sensors. Pursue research on advanced concepts for processing arrays of independent sensors to create adaptive information theoretic sensor systems. Continue research into remote methods of sensing target signatures. Expand Optical Sensing research related to critical Science and Technology (S&T) for Precision Localization. Execute research to better exploit the information capacity available in photonic systems toward development of higher performance optical sensors. Pursue information theoretic optical sampling and telemetry characteristics to better support sensor performance and data integrity. Extend the effectiveness that photonic sensors operate across the air-water interface. Extend the distance optical sensors can effectively operate within the water column. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Title: ANTI-SUBMARINE WARFARE (ASW) SURVEILLANCE	21.117	22.980	22.288	0.000	22.288
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,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
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. ***FY 2019 Plans:*** Undersea Warfare will continue 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 power-harvesting; underwater communications; networking of distributed autonomous sensors; and knowledge and exploitation of the complex operational environment. Conducting 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. Continuing support to research vessels of the U.S. Academic Research Fleet for operations and maintenance that enable science at sea. Undersea Warfare Conceptualize and perform laboratory measurements, field measurements, and theoretical/numerical analysis leading to non-platform-based and clandestine systems to provide ASW clandestine indications and warnings in far-forward and contested areas such as: 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; undersea communications; secure and robust networking of distributed autonomous sensors; and knowledge and exploitation of the complex operational environment. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete 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. Initiate signal processing related research to develop artificial intelligence technology providing optimized sonar system line-ups that adjust themselves in real time to the current undersea environment. Begin to investigate applicable non-acoustic methods of detection and classification of ultra-quiet, low-Doppler submarines in complex operating environments. Laboratory measurements, field measurements, and theoretical/numerical analysis leading to non-platform-based and clandestine systems to provide ASW clandestine indications and warnings in far-forward and contested areas such as: new sensor concepts to provide improved performance in smaller packages; automated passive acoustic and non-acoustic detection and classification algorithms; undersea communications; acoustically quiet UUV propulsion; and knowledge and exploitation of the complex operational environment. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
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.	2.459	2.519	2.464	0.000	2.464

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
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 2019 Plans:*** Integrated Ecosystem Research: Further research using animal tagging and passive acoustic monitoring to study behaviors, movement and distribution of marine mammals relative to key environmental properties (biotic and abiotic). Effects of Sound: Continue 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. Continue research into the mechanisms that enable marine mammals to dive to deep depths for long durations while mitigating, if not avoiding, health threats. Continue 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. Continue 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 using technology to detect and classify marine mammals using a variety of fixed, towed, floating, and profiling platforms. Models & Databases: Continue research to provide tools to support environmental compliance efforts and decision-making related to how marine mammals are affected by anthropogenic sounds. ***FY 2020 Base Plans:*** Extramural Marine Mammals and Biology - Areas of research include monitoring and detection, integrated ecosystem, and effects of sound on marine mammals. Integrated Ecosystem Research: Further research using animal tagging and passive acoustic monitoring to study behaviors, movement and distribution of marine mammals relative to key environmental properties (biotic and abiotic).					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
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. Conduct 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. Continue 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. Conduct 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. Models & Databases: Continue research to provide tools to support environmental compliance efforts and decision-making related to how marine mammals are affected by anthropogenic sounds. Initiate research using increase in funds to characterize and quantify the cumulative effects of multiple stressors on marine mammal populations. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Title: UNDERSEA WEAPONRY	13.041	13.852	13.400	0.000	13.400
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,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
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 2019 Plans:*** Continue applied research related to critical S&T for supercavitation, advanced warheads, propulsion systems for undersea platforms and defense against undersea threats. ***FY 2020 Base Plans:*** Conduct applied research related to critical Science and Technology (S&T) for supercavitation, advanced warheads, new torpedo fuel formulations, small-scale weapon concepts, and propulsion systems for undersea vehicles and platforms. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Accomplishments/Planned Programs Subtotals	54.816	58.049	57.075	0.000	57.075

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

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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the ability to conduct long-range engagements, increasing weapons load-out, providing multi-platform connectivity, increasing endurance/survivability, and reducing size and power requirements.

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COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	4.828	20.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.828

A. Mission Description and Budget Item Justification

Efforts for Undersea Warfare Applied Research

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Program Increase	4.828	20.000
FY 2018 Accomplishments: Efforts for Undersea Warfare Applied Research		
FY 2019 Plans: Efforts for Undersea Warfare Applied Research		
Congressional Adds Subtotals	4.828	20.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A