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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603782N / <i>Mine and Expeditionary Warfare Advanced Technology</i>							
COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	0.000	1.922	2.007	2.048	-	2.048	2.050	2.090	2.133	2.166	Continuing	Continuing
2917: <i>Shallow Water MCM Demos</i>	0.000	1.922	2.007	2.048	-	2.048	2.050	2.090	2.133	2.166	Continuing	Continuing

A. Mission Description and Budget Item Justification

Explosive ordnance disposal is a critical naval mission vital to the safety of service members and civilians. Highly trained Sailors and Marines utilize their knowhow and courage combined with state-of-the-art technology to remove unexploded ordnance, land/sea mines and even chemical, biological and nuclear weapons. The Department of Defense (DoD) Directive 5160.62 "DoD Executive Agent for Military Explosive Ordnance Disposal Technology & Training" guides research in this Program Element (PE). Unique needs and capabilities identified by the Joint Requirements Oversight Council (JROC) and the DoD EOD Program Board are also addressed by this PE, and provide the vision and key objectives for the essential science and technology efforts that will enable the continued supremacy of U.S. Naval and Joint EOD forces in the 21st century. The strategy focuses and aligns Naval S&T with Naval missions, DoD EOD S&T with Joint EOD missions and future capability needs that address the complex challenges presented by both rising peer competitors and irregular/asymmetric warfare.

This PE primarily develops and demonstrates prototype Mine Countermeasures (MCM), Expeditionary Warfare and Joint EOD system components that support capabilities enabling Naval and Joint EOD Forces to influence operations ashore. Adversarial nations have the capability to procure, stockpile and rapidly deploy all types of naval mines, including new generation mines having sophisticated performance characteristics, throughout the littorals. They also have the capability to develop or modify explosive devices such as mines and unexploded ordnance to construct Improvised Explosive Devices (IEDs) for the purpose of targeting Joint Forces. Real world operations have demonstrated the requirement to quickly counter the mine threat. Current operations have also demonstrated the requirement to quickly counter the threat from explosive hazards and IEDs during DoD operations. Advanced technologies must rapidly detect and neutralize all mine types, from deep water to the inland objective. Advanced technologies must enable Joint EOD forces to detect/locate, gain access, diagnose, render safe, neutralize, recover, exploit and dispose of a broad spectrum of explosive hazards including unexploded ordnance and IEDs. This program supports the advanced development and integration of sensors, processing, warheads, and delivery vehicles to demonstrate improved Naval Warfare capabilities. It supports the advanced development and integration of sensors and tools for standoff capabilities such as detection and location of IEDs (particularly in dismounted operations), dismounted diagnosis of buried munitions and other explosive hazards, precision render safe and neutralization of surface munitions and other explosive hazards, and enhanced access to IEDs. It supports the MCM-related FNC Enabling Capabilities (ECs).

Today's Sailors and Marines are enabled by naval Science and Technology (S&T). Since 1946, the Office of Naval Research (ONR) has fostered scientific research related to the maintenance of maritime superiority and national defense. ONR manages the Department of the Navy's (DON) portfolio of naval Basic and Applied research, and Advanced Technology Development investments to ensure naval forces can effectively deter conflict, but when called upon, fight, win and come home safe. Current investments hedge against uncertainty, providing solutions to commanders today, and options for the future. The Naval S&T budget supports higher guidance defined by the National Defense Strategy, and responds to requirements identified by the Secretary of the Navy through research priorities set by the Chief of Naval Research, coordinated across the Naval Research Enterprise (NRE), and outlined in the Naval R&D Framework.

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This Program Element (PE) funds Advanced Technology Development (ATD) that includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment. Efforts in this PE generally have Technology Readiness Levels (TRL) of 4 (component and/or breadboard validation in laboratory environment.), 5 (component and/or breadboard validation in relevant environment.), or 6 (system/subsystem model or prototype demonstration in a relevant environment).

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

B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	1.981	2.007	2.048	-	2.048
Current President's Budget	1.922	2.007	2.048	-	2.048
Total Adjustments	-0.059	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.059	0.000			

Change Summary Explanation

Funding: No significant change.

Technical: No significant change.

Schedule: No significant change

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy										Date: March 2023		
Appropriation/Budget Activity 1319 / 3					R-1 Program Element (Number/Name) PE 0603782N / Mine and Expeditionary Warfare Advanced Technology				Project (Number/Name) 2917 / Shallow Water MCM Demos			
COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
2917: <i>Shallow Water MCM Demos</i>	0.000	1.922	2.007	2.048	-	2.048	2.050	2.090	2.133	2.166	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops and demonstrates prototype technology for Mine Countermeasures (MCM), US Naval sea mining, and Expeditionary Warfare and Joint EOD system components that support capabilities enabling Naval and Joint EOD Forces to influence operations ashore. Adversarial nations have the capability to procure, stockpile and rapidly deploy all types of naval mines, throughout the littorals including new generation mines having sophisticated performance characteristics. They also have the capability to develop or modify explosive devices such as mines and unexploded ordnance to construct Improvised Explosive Devices (IEDs) for the purpose of targeting Joint Forces. Real world operations have demonstrated the requirement to quickly counter the mine threat. Current operations have also demonstrated the requirement to quickly counter the threat from explosive hazards and IEDs during DoD operations. Advanced technologies must rapidly detect and neutralize all mine types, from deep water to the inland objective. Advanced technologies must enable Joint EOD forces to detect/locate, gain access, diagnose, render safe, neutralize, recover, exploit and dispose of a broad spectrum of explosive hazards including unexploded ordnance and IEDs. This program supports the advanced development and integration of sensors, processing, warheads, and delivery vehicles to demonstrate improved Naval Warfare capabilities.

This Project supports the advanced development and integration of sensors and tools for standoff capabilities such as detection and location of IEDs (particularly in dismantled operations), dismantled diagnosis of buried munitions and other explosive hazards, precision render safe and neutralization of surface munitions and other explosive hazards, and enhanced access to IEDs. It supports advanced development for battlespace shaping weapons including advanced undersea weapons. It supports the MCM related FNC Enabling Capabilities (ECs).

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Joint EOD Demos	1.922	2.007	2.048	0.000	2.048
Articles:	-	-	-	-	-
Description: This activity focuses on developing and demonstrating technologies to support a standoff or remote capability for detection and location, diagnosis, render safe, neutralization and enhanced access. Efforts include: electromagnetic, electro-optical, radiographic and advanced sensors and systems for detection of explosive threat components including explosives, device housings/containers, and triggering mechanisms, standoff identification and confirmation of trace explosives, fusion of multi-sensor input for high confidence detection and diagnosis of buried and surface threats, highly dexterous manipulators and imitative controllers for lightweight, efficient (strength/weight ratio) dual manipulator systems integrated onto EOD robots for enhanced access, enhanced robotic autonomy to support EOD missions, data compression and visualization					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>techniques to support precise render safe and neutralization, and neutralization devices containing reactive materials to neutralize devices with low collateral damage and rapid clearance of operational areas. This S&T investment supports the Joint Requirements Oversight Council (JROC) and DoD EOD Program Board validated requirements for Joint EOD missions. This S&T investment provides critical S&T transitions to acquisition programs. This investment in Joint EOD S&T is reported annually to the DoD EOD Program Board. This S&T investment is documented in the DoD EOD Technology and Training Plan which is reviewed as a decision brief annually by the DoD EOD Program Board.</p> <p>FY 2023 Plans:</p> <ul style="list-style-type: none"> - Continue Joint Explosive Ordnance Disposal (JEOD), Advanced Technology: continue development and demonstration for JEOOD functional areas including detect, access, diagnose, and render safe/neutralize. - Continue Joint Explosive Ordnance Disposal (JEOD), Detection: continue efforts in the detection functional area. Specific efforts will include development and demonstration of advanced electro-optical and spectroscopic sensors for detection of explosives. The objective is to remotely detect bulk and trace explosives. - Continue Joint Explosive Ordnance Disposal (JEOD), Remote Access: continue efforts the access functional area. Specific efforts will include robotic manipulators, end effectors and haptics. The objective is to enable remote access to explosive threats and unexploded ordnance. - Continue Joint Explosive Ordnance Disposal (JEOD), Acoustic Sensor: continue detection of buried explosive threats with seismic- acoustic sensor. Specific effort includes demonstration of a robot mounted seismic acoustic sensor. The objective is to enable standoff detection of buried explosive threats with improved detection and classification statistics. - Continue Joint Explosive Ordnance Disposal (JEOD), Man-Portable Prototypes: continue efforts in diagnose and render safe/ neutralize functional areas. Specific efforts will include the development and demonstration of man-portable prototypes. The objective is to assess the status of explosive threats and ordnance and render safe/neutralize at standoff. - Continue Joint Explosive Ordnance Disposal (JEOD), Rapid Large Area Clearance advanced technology development for rapid large area clearance of explosive threats. Specific effort includes collective demonstration of multiple prototypes for experimentation. The objective is to enable rapid large area clearance operations 					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

including detection of explosive threats, classification statistics and clearance of munitions from the operational area and render safe/neutralize at standoff.

FY 2024 Base Plans:

- Continue Joint Explosive Ordnance Disposal (JEOD), Advanced Technology: continue development and demonstration for JEOOD functional areas including detect, access, diagnose, render safe/neutralize and disposal.
- Continue Joint Explosive Ordnance Disposal (JEOD), Detection: continue efforts in the detection functional area. Specific efforts will include development and demonstration of advanced sensors, sensor fusion and signal processing (optical, electro-magnetic induction, ground penetrating radar, advanced magnetometers, acoustic and spectroscopic) for detection of explosives. The objective is to remotely detect surface and buried targets as well as bulk and trace explosives.
- Continue Joint Explosive Ordnance Disposal (JEOD), Remote Access: continue efforts the access functional area. Specific efforts will include robotic manipulators, end effectors, haptics and robotic digging capabilities. The objective is to enable remote access to explosive threats and unexploded ordnance.
- Continue Joint Explosive Ordnance Disposal (JEOD), Acoustic Sensor: continue detection of buried explosive threats with seismic- acoustic sensor. Specific effort includes demonstration of a robot mounted seismic acoustic sensor. The objective is to enable standoff detection of buried explosive threats with improved detection and classification statistics.
- Continue Joint Explosive Ordnance Disposal (JEOD), Man-Portable Prototypes: continue efforts in diagnose and render safe/ neutralize functional areas. Specific efforts will include the development and demonstration of man-portable prototypes. The objective is to assess the status of explosive threats and ordnance and render safe/neutralize at standoff.
- Continue Joint Explosive Ordnance Disposal (JEOD), Rapid Large Area Clearance advanced technology development for rapid large area clearance of explosive threats. Specific effort includes collective demonstration of multiple prototypes for experimentation. The objective is to enable rapid large area clearance operations including detection of explosive threats, classification statistics and clearance of munitions from the operational area and render safe/neutralize/disposal at standoff.

FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Initiate development of Silent Saber, Compact Laser for EOD Neutralization, a tripod mounted directed energy capability that provides for low & high order surface target neutralization. Specific efforts include development and demonstration of a dismounted Silent Saber capability that can be vehicle mounted for rapid large area clearance.</p> <p><i>FY 2024 OCO Plans:</i> N/A</p> <p><i>FY 2023 to FY 2024 Increase/Decrease Statement:</i> There is no significant funding change from FY 2023 to FY 2024</p>					
Accomplishments/Planned Programs Subtotals	1.922	2.007	2.048	0.000	2.048

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

N/A

Remarks

D. Acquisition Strategy

N/A