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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 0603123N / <i>Force Protection Advanced Technology</i>
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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	35.010	59.933	29.512	-	29.512	29.721	29.520	28.030	18.463	Continuing	Continuing
2912: <i>Force Protection Advanced Technology</i>	0.000	18.577	14.374	26.912	-	26.912	27.056	26.856	25.344	15.723	Continuing	Continuing
3049: <i>Force Protection</i>	0.000	2.436	2.559	2.600	-	2.600	2.665	2.664	2.686	2.740	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	13.997	43.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	56.997

A. Mission Description and Budget Item Justification

This PE addresses advanced technology development associated with providing the capability of Platform and Force Protection for the U.S. Navy. This program supports the development of technologies associated with mission capable, persistent and survivable Naval platforms (surface, subsurface, terrestrial and air) in the areas of Platform Design & Engineering, Power, Energy & Propulsion, and Materials. The program develops technologies for enhanced capability of Naval aviation aircraft platforms in terms of mission effectiveness, platform range, responsiveness, survivability, observability, readiness, safety and life cycle cost. It also develops new Naval air vehicle concepts and high impact, scalable Naval air vehicle technologies. The program also develops advanced technologies, critical to protecting naval installations, to provide seamless full spectrum protection against asymmetric attack by improving the ability to: detect and identify developing and immediate threats; shape our responses through improved situational awareness and decision making; shield personnel, mission critical facilities, infrastructure, and operating fleet assets; maintain essential functions; and sustain and restore critical services in the aftermath of an incident.

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.

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.

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B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	36.161	16.933	17.262	-	17.262
Current President's Budget	35.010	59.933	29.512	-	29.512
Total Adjustments	-1.151	43.000	12.250	-	12.250
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	43.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.151	0.000			
• Program Adjustments	0.000	0.000	12.250	-	12.250
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 9999: Congressional Adds

Congressional Add: *Power electronics building block*

Congressional Add: *Carbon nanotube energy storage flywheel*

Congressional Add: *Laser peening of jet engines*

Congressional Add: *High-energy & high power density i-ion battery magazines (HEBM) in defense appl.*

Congressional Add: *Ultra-efficient power gen. & energy storage tech. for next gen. USV*

Congressional Add: *Design and simulation for additive technologies*

Congressional Add: *Deployable additive manufacturing of composite UUVs*

Congressional Add Subtotals for Project: 9999

Congressional Add Totals for all Projects

	FY 2022	FY 2023
	5.792	6.000
	3.861	0.000
	4.344	5.000
	0.000	8.000
	0.000	10.000
	0.000	10.000
	0.000	4.000
Congressional Add Subtotals for Project: 9999	13.997	43.000
Congressional Add Totals for all Projects	13.997	43.000

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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 0603123N / Force Protection Advanced Technology			Project (Number/Name) 2912 / Force Protection Advanced Technology				
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
2912: Force Protection Advanced Technology	0.000	18.577	14.374	26.912	-	26.912	27.056	26.856	25.344	15.723	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project addresses advanced technology development associated with providing the capability of Platform and Force Protection for the U.S. Navy. This project supports the development of technologies associated with mission capable, persistent and survivable Naval platforms (surface, subsurface, terrestrial, and air) in the areas of Platform Design & Engineering, Power, Energy & Propulsion, and Materials. This project develops technologies for enhanced capability of Naval aviation aircraft platforms in terms of mission effectiveness, platform range, responsiveness, survivability, observability, readiness, safety and life cycle cost. It also develops new Naval air vehicle concepts and high impact, scalable Naval air vehicle technologies.

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Surface Ship and Submarine Hull Mechanical and Electrical (HM&E)	12.522	8.051	20.462	0.000	20.462
Articles:	-	-	-	-	-
Description: This project addresses advanced technology development associated with providing the capability of Platform and Force Protection for the U.S. Navy. This project supports the development of technologies associated with mission capable, persistent and survivable manned/unmanned naval platforms (surface, subsurface and terrestrial) in the areas of Platform Design & Engineering, Power, Energy & Propulsion and Materials. The primary research efforts within this activity are focused on Development of Advanced Manufacturing & Sustainment Technologies, Advanced Naval Power Systems Development, and Advanced Platform Development.					
FY 2023 Plans:					
- Complete Autonomous Unmanned Surface Vessel (USV): expand advanced research related to the development of planing hull platforms. The technologies resulting from these efforts are being further developed for use on unmanned surface vessels.					
- Initiate development of Advanced Manufacturing & Sustainment Technologies: Next-Gen Naval Platforms will require new materials, at a high manufacturing readiness level, to meet the required platform performance requirements and power and energy density for advanced systems, as well as cost, manufacturability, resiliency, and to reduce the sustainment burden.					

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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 0603123N / <i>Force Protection Advanced Technology</i>	Project (Number/Name) 2912 / <i>Force Protection Advanced Technology</i>

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 Advanced Naval Power Systems: New Naval Platforms will require very high energy density, integrated power systems that require very low maintenance (people and cost), as well as operate in a resilient fashion.</p> <p>- Initiate development of Advanced Platforms: This effort will focus on developing a framework and integrating component technologies into a mature platform design capability and subsystems for next generation fully autonomous platforms and reduced crew size to reduce the logistics burden and increase warfighting capability.</p> <p>FY 2024 Base Plans:</p> <p>- Continue development of Advanced Naval Power Systems: Crewed and Uncrewed Naval Platforms demand high power/energy density, integrated modular power systems that require very low maintenance (people and cost), low fuel consumption, and highly resilient operation for extended mission duration. Cross-platform application is of interest, and forward-fit/back-fit application of the technology will be addressed.</p> <p>-Continue development of Advanced Platforms: This effort focuses on developing a framework and integrating component technologies into a mature platform design capability and subsystems for next generation fully autonomous platforms and reduced crew size to reduce the logistics burden and increase warfighting capability.</p> <p>- Continue development of Advanced Manufacturing & Sustainment Technologies: Next-Gen Naval Platforms will require new materials, at a high manufacturing readiness level, to meet the required platform performance requirements and power and energy density for advanced systems, as well as cost, manufacturability, resiliency, and to reduce the sustainment burden.</p> <p>-Initiate efforts on Advanced Platform Autonomy focusing on the integration of Hull, Mechanical, & Electrical and Autonomous Systems and component technologies designed to improve warfighter and platform performance and efficiencies.</p> <p>-Initiate effort on Advanced Platform Resiliency focusing on the integration of technologies necessary to improve the efficiency and resiliency of manned and unmanned naval platforms.</p> <p>FY 2024 OCO Plans:</p>					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
N/A					
FY 2023 to FY 2024 Increase/Decrease Statement: The funding increase from FY 2023 to FY 2024 is required for increased investment in supporting improved Ship Efficiencies.					
Title: Aircraft Technology					
Articles:					
Description: The Aircraft Technology activity develops technologies for enhanced capability of Naval aviation aircraft platforms in terms of mission effectiveness, platform range, responsiveness, survivability, observability, readiness, safety and life cycle cost. It also develops new Naval air vehicle concepts and high impact, scalable Naval air vehicle technologies, such as helicopter and tiltrotor rotor drive systems, aerodynamics, propulsion systems, materials and structures for future and legacy air vehicles. This activity directly supports the Naval Research and Development Framework Priorities of Operational Endurance and Scalable Lethality.					
FY 2023 Plans: Continue Conduct technology development and maturation through Next Generation Propulsion Enablers (NGP-E) with major engine manufacturers on the highest priority, long lead propulsion, power and thermal management technologies, including: - Advanced, adaptive and modular controls. - Advanced casing treatments and compression systems for increased operability and efficiency. - More compact combustion and augmentation systems, utilizing rotating detonation combustion. - More thermally efficient variable displacement fuel pumps - Enable "hot" fuels as an additional heat sink and provide improved energy.					
Complete Due to unanticipated schedule delays, efforts to further develop future Navy carrier aircraft enabling technologies are being extended into and will complete in FY23. Critical Technology development efforts are focused on major engine manufacturers developing highest priority, long lead propulsion system turbine engine technologies."					
FY 2024 Base Plans:					
	6.055	6.323	6.450	0.000	6.450
	-	-	-	-	-

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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>Continue:</p> <p>Conduct technology development and maturation through Next Generation Propulsion Enablers (NGP-E) with major engine manufacturers on the highest priority, long lead propulsion, power and thermal management technologies, including:</p> <ul style="list-style-type: none"> - Advanced, adaptive and modular controls. - Advanced casing treatments and compression systems for increased operability and efficiency. - More thermally efficient variable displacement fuel pumps. <p>Complete:</p> <ul style="list-style-type: none"> - More compact combustion and augmentation systems, utilizing rotating detonation combustion. - Enable "hot" fuels as an additional heat sink and provide improved energy. <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 between FY 2023 and FY 2024.</p>					
Accomplishments/Planned Programs Subtotals	18.577	14.374	26.912	0.000	26.912

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

N/A

Remarks

D. Acquisition Strategy

N/A

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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 0603123N / Force Protection Advanced Technology	Project (Number/Name) 3049 / Force Protection
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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
3049: Force Protection	0.000	2.436	2.559	2.600	-	2.600	2.665	2.664	2.686	2.740	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Develop advanced technologies, critical to protecting naval installations, to provide seamless full spectrum protection against asymmetric attack by improving the ability to: detect and identify developing and immediate threats; shape our responses through improved situational awareness and decision making; shield personnel, mission critical facilities, infrastructure, and operating fleet assets; maintain essential functions; and sustain and restore critical services in the aftermath of an incident. Technologies developed will also seek to reduce the required manpower and skill levels devoted to the force protection mission, improving performance and reducing costs for the Navy.

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Emerging Threats	2.436	2.559	2.600	0.000	2.600
Articles:	-	-	-	-	-
Description: Naval Installations are a critical component in support of Navy global force projection. These installations, and the Navy ships, submarines, and aircraft located on them, are under increasing risk from asymmetric attack, including from new threat vectors such as unmanned air, surface, and subsurface vehicles. This project is focused on the development advanced technologies necessary for the protection of Naval Installations. Technical efforts address the detect -to-engage-to-assess requirements for Naval Installations by improving the ability to: sense and identify threats; support improved situational awareness and decision making; and develop effective countermeasures. Technologies developed will also seek to reduce the required manpower and skill levels devoted to the force protection mission.					
FY 2023 Plans:					
- Continue Autonomous Maritime Asset Protection System (AMAPS): conduct final demonstration of autonomous assessment and response UAS capability to evaluate Unauthorized Access events on naval installation land and waterside perimeters.					
- Continue Day/night all weather sensors: conduct final demonstration of capability to detect, track, and identify small unmanned air threats using multi-static radar, Active Millimeter Wave (AMMW) and Dual Band Infrared electro-optic sensors. Optimize sensor performance and operator effectiveness using Automated Target Recognition algorithms.					

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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>- Continue Automated Target Recognition algorithms: develop and demonstrate improved harbor security sonar capabilities to detect Unmanned Underwater Vehicles (UUVs) to include; increased volumetric coverage, passive detection and tracking algorithms, and new classification algorithms to address more capable threats. Develop capability to track and assess multiple simultaneous threat UUVs in harbors and approach channels.</p> <p>- Complete development and conduct final demonstration of the RPG-S kinetic response capability to interdict threat Unmanned Underwater Vehicles (UUV) detected in naval installation harbors.</p> <p>FY 2024 Base Plans:</p> <p>- Complete Autonomous Maritime Asset Protection System (AMAPS).</p> <p>- Complete development and demonstration of day/night all weather sensors designed to detect, track, and identify small air and surface threats to Naval Installations.</p> <p>- Continue Automated Target Recognition algorithms for small air, surface, and subsurface threats.</p> <p>- Continue harbor security sonar capability improvements to detect Unmanned Underwater Vehicles (UUVs) to include; increased volumetric coverage, passive detection and tracking algorithms, and new classification algorithms to address more capable threats.</p> <p>- Continue development of the capability to track, assess, and mitigate multiple simultaneous threat UUVs in harbors and approach channels.</p> <p>- Initiate an expeditionary demonstration of capabilities in an operational environment.</p> <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: There is no significant funding change between FY 2023 and FY 2024.</p>					
Accomplishments/Planned Programs Subtotals	2.436	2.559	2.600	0.000	2.600

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

N/A

Remarks

D. Acquisition Strategy

N/A

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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 0603123N / <i>Force Protection Advanced Technology</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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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
9999: <i>Congressional Adds</i>	0.000	13.997	43.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	56.997
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2022	FY 2023
Congressional Add: Power electronics building block	5.792	6.000
FY 2022 Accomplishments: Conduct power electronics building block advanced technology development		
FY 2023 Plans: Conduct power electronics building block advanced technology development.		
Congressional Add: Carbon nanotube energy storage flywheel	3.861	0.000
FY 2022 Accomplishments: Conduct carbon nanotube energy storage flywheel advanced technology development		
FY 2023 Plans: N/A		
Congressional Add: Laser peening of jet engines	4.344	5.000
FY 2022 Accomplishments: Conduct Laser peening of jet engines advanced technology development.		
FY 2023 Plans: Conduct Laser peening of jet engines advanced technology development.		
Congressional Add: High-energy & high power density i-ion battery magazines (HEBM) in defense appl.	0.000	8.000
FY 2022 Accomplishments: N/A		
FY 2023 Plans: Conduct high-energy & high-power density i-ion battery magazines (HEBM) in defense applications research.		
Congressional Add: Ultra-efficient power gen. & energy storage tech. for next gen. USV	0.000	10.000
FY 2022 Accomplishments: N/A		
FY 2023 Plans: Conduct ultra-efficient power generation and energy storage technology for next generation Unmanned Surface Vehicles (USV) research.		
Congressional Add: Design and simulation for additive technologies	0.000	10.000

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: N/A		
FY 2023 Plans: Conduct design and simulation for additive technologies research.		
Congressional Add: Deployable additive manufacturing of composite UUVs	0.000	4.000
FY 2022 Accomplishments: N/A		
FY 2023 Plans: Conduct deployable additive manufacturing of composite Unmanned Underwater Vehicles (UUV) research.		
Congressional Adds Subtotals	13.997	43.000

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

N/A

Remarks

D. Acquisition Strategy

N/A