Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Navy	Date: March 2023
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602123N *I Force Protection Applied Res*

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	215.913	345.576	142.148	-	142.148	137.376	139.999	142.674	145.291	Continuing	Continuing
0000: *Force Protection Applied Res*	0.000	119.861	133.426	142.148	-	142.148	137.376	139.999	142.674	145.291	Continuing	Continuing
9999: *Congressional Adds*	0.000	96.052	212.150	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	308.202

A. Mission Description and Budget Item Justification

America is a maritime nation with global responsibilities that require U.S. naval forces be respected around the world and decisive when it matters. The Office of Naval Research (ONR) was established to guide ongoing research to ensure the technical superiority of the U.S. Navy and Marine Corps. This Program Element (PE) addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. This program supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. The goal is to provide the ability to deter, or avoid engagements, and if necessary, fight and win against adversary naval platforms or weapons. In the event of conflict, naval platforms must be able to resist and control damage while preserving operational capability. Research is focused on providing technologically superior defense of naval assets and delivering warfighting capabilities at reduced total ownership costs for surface and subsurface platforms through investments in applied research in: a) Power, Energy & Propulsion b) Platform Design and Engineering and c) new technology innovation from identification to prototype to scaling. . This program identifies and develops technologies for reduced observables technology and enhanced capability of naval aviation aircraft platforms in terms of mission effectiveness, platform range, responsiveness, survivability, observability, readiness, safety and life cycle cost. The program addresses innovation in technology development to provide substantial improvements in energetic material systems and subsystems, primarily in terms of performance, but also addressing safety, reliability, and affordability concerns. The program supports mission-driven design think problem solving within the Naval Research and Development Establishment (NR&DE) and academia in support of culture changes to agile and rapid prototyping development driven by well defined and effective innovation process and operations.

Today's Sailors and Marines are enabled by naval Science and Technology (S&T) and the business of innovation. 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, as well as the NavalX office, to ensure naval forces can effectively deter conflict, but when called upon, fight, win and come home safe. Current investments, combined with innovation operations, 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 Applied Research, which is the systematic study to understand the means to meet a recognized and specific need. Most of the work in this PE can be classified between Technology Readiness Level (TRL) 2 (technology concept and/or application formulation) and TRL 4 (component and/or breadboard validation in laboratory environments).

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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	222.388	133.426	135.956	-	135.956
Current President's Budget	215.913	345.576	142.148	-	142.148
Total Adjustments	-6.475	212.150	6.192	-	6.192
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	212.150			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-6.475	0.000			
• Program Adjustments	0.000	0.000	6.192	-	6.192
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: 9999: *Congressional Adds*		
Congressional Add: *Alternative Energy Research*	0.000	30.000
Congressional Add: *Advanced Energetics Research*	2.896	6.000
Congressional Add: *Talent and technology for Navy power and energy systems*	10.136	10.500
Congressional Add: *Energy resilience efforts*	6.757	8.000
Congressional Add: *Coastal environmental research*	4.827	5.000
Congressional Add: *Direct Air Capture and Blue Carbon Removal Technology*	9.654	10.000
Congressional Add: *Additive Manufacturing of Unmanned Maritime Systems*	5.792	10.000
Congressional Add: *Navy Alternative Energy Research*	26.547	0.000
Congressional Add: *relative position of autonomous platforms*	2.896	5.000
Congressional Add: *Bonded metal matric composit repair*	4.827	5.000
Congressional Add: *Resilient innovative sustainable economies via university partnerships*	7.240	9.000
Congressional Add: *Titanium metal and wire domestic production demonstration*	14.480	0.000
Congressional Add: *high speed/hypersonic test capability development*	0.000	4.000

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Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Congressional Add: *Resilient autonomous systems research and diversity programs*	0.000	8.500
Congressional Add: *Seawater to jet fuel demo*	0.000	20.000
Congressional Add: *Arctic energy resiliency*	0.000	10.000
Congressional Add: *Cavitation erosion*	0.000	5.000
Congressional Add: *Corrosion control coating and material*	0.000	5.000
Congressional Add: *Cyberphysical security resilency*	0.000	7.000
Congressional Add: *Intelligent data managment for distributed Naval platforms*	0.000	10.500
Congressional Add: *Materials by design for Navy aircraft sustainment*	0.000	5.000
Congressional Add: *sUAS degraded enviorment facility*	0.000	12.650
Congressional Add: *Universal achemetal titanium process*	0.000	12.000
Congressional Add: *Unmanned surface vehicle*	0.000	5.000
Congressional Add: *High-entropy materials for hypersonics*	0.000	9.000
Congressional Add Subtotals for Project: 9999	96.052	212.150
Congressional Add Totals for all Projects	96.052	212.150

Change Summary Explanation

Funding: $6.192M increase for Support Equipment Electrification.

Technical: not applicable

Schedule: not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy			Date: March 2023
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602123N / *Force Protection Applied Res*	Project (Number/Name) 0000 / *Force Protection Applied Res*	

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
0000: *Force Protection Applied Res*	0.000	119.861	133.426	142.148	-	142.148	137.376	139.999	142.674	145.291	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. It supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. Research is focused on providing technologically superior defense of naval assets and delivering warfighting capabilities at reduced total ownership costs for surface and subsurface platforms through investments in applied research in: a) Power, Energy, Propulsion, Engineering and Design. This project develops technologies for reducing detectable signatures, while enhancing the mission effectiveness of naval platforms (surface, subsurface, terrestrial, and air) through improvements in platform range, responsiveness, survivability, observability, readiness, safety and life cycle cost. The project addresses technology development that provides substantial performance improvements in energetic material systems and subsystems, while addressing safety, reliability, and affordability concerns.

This project is broken out into five primary areas of study: Aircraft Technology, Fleet Force Protection and Defense Against Undersea Threats, Advanced Energetics, Surface Ship and Submarine Hull Mechanical & Electrical (HM&E), and Naval Research Enterprise/Innovation Operations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Aircraft Technology	35.606	35.485	36.317	0.000	36.317
Description: The Aircraft Technology activity develops technologies for reduced observables technology and enhanced capability of naval aviation aircraft platforms in terms of mission effectiveness, platform range, operational energy, expeditionary capability, responsiveness, survivability, observability, readiness, safety and life cycle cost. It also develops new Naval air vehicle concepts and high impact, saleable naval air vehicle technologies, such as - autonomous air vehicle command and control, helicopter and tilt rotor systems, aerodynamics, propulsion systems, materials, structures and flight controls for future and legacy air vehicles. The Sea-Based Aviation National Naval Responsibility (SBA NNR) Structures and Materials program will develop the next generation structural capability and material response science for aircraft technology in fixed and rotary wing, manned and unmanned airframe technology to achieve reduced weight, increased durability, strength, streamlined manufacturability, reduced life-cycle cost and maintenance/readiness gaps improvements. Program payoffs include increased availability/readiness, reduced sustainment requirements, fatigue/loads life enhancement, reduced weight and improved range, and advanced prognostics design tools.					

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
These efforts address unique attributes to propulsion, power and thermal management technologies for Naval Aviation, as well as those having higher importance to Naval Aviation and some that are more pervasive to all of military aviation. Related basic research efforts are addressed under 0601153N Defense Research Sciences. ***FY 2023 Plans:*** Research related to Sea Based Aviation National Naval Responsibility (SBA NNR) priorities in Aviation, Aerodynamics, Flight Dynamics & Control, Propulsion, and Structures & Materials. Research in Aircraft Science & Technology includes: Continuing Efforts - Advanced analytical methods for achieving guaranteed performance in multibody control systems. - Control law synthesis methods to expand the recovery envelope and reduce touchdown loads. - Advanced modeling and analysis methods for ship/aircraft aerodynamic interface. - Air vehicle flying qualities and control. - High lift aerodynamics and control. - Vertical/Short Take-off and Landing (V/STOL) science & technology. - Automated launch and recovery technology. - Mechanical/environmental failure prediction research. - Advanced dynamics and topology of coupled human/machine systems. - Precise relative navigation science & technology. - Integrated development environment for cyber secure avionics. - Infrastructure for rapid development, analysis, and experimentation with advanced flight science and technology across academia, government and industry. - Manned/unmanned teaming technology. Applied research in Flight Dynamics & Control will develop theory, analysis and experimental data to better understand and exploit the natural dynamics of both conventional and unconventional air vehicles operating in the marine environment. Efforts include: Continuing Efforts - Multibody control systems and the ability to demonstrate guaranteed performance relative to a desired end state.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Robust and precise control in the presence of highly turbulent flow fields to increase operational capability and reduce structural requirements for ship-based operations; - Algorithms and sensors to enable precise ship-relative navigation in GPS-denied environments; - Control effectors and vehicle configurations to enable platforms with VTOL utility and fixed-wing efficiency. - Collaborative research to improve our knowledge of control system interactions between piloted aircraft and human performance. Applied Aerodynamics research for aircraft and weapons platforms will include: Continuing Efforts - Advanced computational methods addressing the Navy-unique challenge of a fully coupled aerodynamic interface between ships and aircraft; - Advanced methods for reduced-order modeling of complex flow fields to enable real-time, high-fidelity simulations of ship-based aircraft operations. - Advanced methods for manipulating and more precisely controlling the flow fields around air vehicles operating in the maritime environment. - Novel diagnostics and techniques for in situ measurement ship airwake dynamics and its coupling to ship motions (sea states) and environmental flow field. - Advanced technologies for improved weapons aerodynamics enabling increased range and maneuverability. - Innovative concepts for compact, highly-integrated inlets for air-breathing weapons. Initiating Efforts - Innovative concepts for launch and recovery of unmanned aerial systems. - Understanding aerodynamics of novel air vehicle configurations, including the effects of multi-rotor systems and operational environments. Applied research in aircraft Propulsion, Power and thermal management concepts for high speed, long endurance and responsiveness include: Continuing Efforts - Cooling and thermal management for engines and auxiliary systems. - Diagnostics, prognostics and control for Integrated Power, Propulsion and Thermal Management. - Highly integrated Propulsion inlets, exhausts.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Sand, Salt and Dust Ingestion research: including modeling, separating, deposition, coatings and sensing.; - Next Generation Propulsion Enablers includes applied research in propulsion, power and thermal management, advanced casing treatments, advanced compression system technologies and engine robustness in austere sand and salt environments. - Enabling the use of 'hot' fuels as a heat sink and provide additional energy. - Highly loaded efficient Turbomachinery with improved operability. - Advanced materials and coatings for austere environments. - Hybrid propulsion system component technologies for small to mid-size VTOL capable UAS. Research related to Autonomy includes the following efforts: Continuing Efforts - High confidence/Safe Autonomous single and multi-vehicle control in naval environments and human interaction with advanced autonomy such decentralized heterogeneous naval systems and interactive machine learning. - New theory-based methods and processes for rapid and safe adoption of new autonomy capabilities including Verification and Validation, safety, risk management, human systems integration, and robustness within complex naval, adversarial environments. - Safe perception based autonomous control in complex naval environments with limited communications and on autonomy to support combined unmanned and manned air systems/units. Structures and Materials Research includes: Continuing Efforts - Structural remediation: development of materials and processes for extending and restoring operational life. - Hybrid nano-Composites - extend basic research investments in aligned carbon nano-tubes to develop damage tolerant composite structures for composites airframes. - Lightweight flight and transparent armor - Transparent armor with improved performance than those currently fielded. - Lightweight multifunctional structures Completing Efforts					

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Composites Characterization: development of composites characterization and validation methods for current and next generation composites for rapid certification and sustainment. - Galvanic compatibility tool development for assessing galvanic capability of metals in operational environment. Initiating Efforts - Structural Power Research - Thermoplastic composites - Out of Autoclave and Out of Oven Composites Manufacturing. - Automated Composites Manufacturing - AI/ML applications for reducing composites defects -High Fidelity/ Unitized/ Optimized Structures for Aircraft and Weapons.					
FY 2024 Base Plans: Research related to Sea Based Aviation National Naval Responsibility (SBA NNR) priorities in Aviation, Aerodynamics, Flight Dynamics & Control, Propulsion, Autonomy, and Structures & Materials. Research in Aircraft Science & Technology includes: Continuing Efforts - Advanced analytical methods for achieving guaranteed performance in multibody control systems. - Control law synthesis methods to expand the recovery envelope and reduce touchdown loads. - Advanced modeling and analysis methods for ship/aircraft aerodynamic interface. - Air vehicle flying qualities and control. - High lift aerodynamics and control. - Vertical/Short Take-off and Landing (V/STOL) science & technology. - Automated launch and recovery technology. - Mechanical/environmental failure prediction research. - Advanced dynamics and topology of coupled human/machine systems. - Precise relative navigation science & technology. - Integrated development environment for cyber secure avionics. - Infrastructure for rapid development, analysis, and experimentation with advanced flight science and technology across academia, government and industry.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Manned/unmanned teaming technology. Applied research in Flight Dynamics & Control will develop theory, analysis and experimental data to better understand and exploit the natural dynamics of both conventional and unconventional air vehicles operating in the marine environment. Continuing Efforts - Multibody control systems and the ability to demonstrate guaranteed performance relative to a desired end state. - Robust and precise control in the presence of highly turbulent flow fields to increase operational capability and reduce structural requirements for ship-based operations; - Algorithms and sensors to enable precise ship-relative navigation in GPS-denied environments; - Control effectors and vehicle configurations to enable platforms with VTOL utility and fixed-wing efficiency. - Collaborative research to improve our knowledge of control system interactions between piloted aircraft and human performance. Applied Aerodynamics research for aircraft and weapons platforms will include: Continuing Efforts - Advanced computational methods addressing the Navy-unique challenge of a fully coupled aerodynamic interface between ships and aircraft. - Advanced methods for reduced-order modeling of complex flow fields to enable real-time, high-fidelity simulations of ship-based aircraft operations. - Advanced methods for manipulating and more precisely controlling the flow fields around air vehicles operating in the maritime environment. - Novel diagnostics and techniques for in situ measurement ship airwake dynamics and its coupling to ship motions (sea states) and environmental flow field. - Advanced technologies for improved weapons aerodynamics enabling increased range and maneuverability. - Innovative concepts for compact, highly-integrated inlets for air-breathing weapons. - Innovative concepts for launch and recovery of unmanned aerial systems. - Understanding aerodynamics of novel air vehicle configurations, including the effects of multi-rotor systems and operational environments.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Applied research in aircraft Propulsion, Power and thermal management concepts for high speed, long endurance and responsiveness include: Continuing Efforts - Cooling and thermal management for engines and auxiliary systems. - Diagnostics, prognostics and control for Integrated Power, Propulsion and Thermal Management. - Highly integrated Propulsion inlets, exhausts. - Sand, Salt and Dust Ingestion research: including modeling, separating, deposition, coatings and sensing. - Next Generation Propulsion Enablers includes applied research in propulsion, power and thermal management, advanced casing treatments, advanced compression system technologies and engine robustness in austere sand and salt environments. - Enabling the use of 'hot' fuels as a heat sink and provide additional energy. - Highly loaded efficient Turbomachinery with improved operability. - Advanced materials and coatings for austere environments. - Hybrid propulsion system component technologies for small to mid-size VTOL capable UAS. Initiating Efforts - Resin Transfer Molding for High Temperature Polyimide Composites - EMI mitigation for future electric generators - New Suite of Insulations for High Power Density Electrical Generators Research related to Autonomy includes the following efforts: Continuing Efforts - High confidence/Safe Autonomous single and multi-vehicle control in naval environments and human interaction with advanced autonomy such decentralized heterogeneous naval systems and interactive machine learning. - New theory-based methods and processes for rapid and safe adoption of new autonomy capabilities including Verification and Validation, safety, risk management, human systems integration, and robustness within complex naval, adversarial environments. - Safe perception based autonomous control in complex naval environments with limited communications and on autonomy to support combined unmanned and manned air systems/units.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Aerospace Structures and Materials Research includes: Continuing Efforts - Structural remediation: development of materials and processes for extending and restoring operational life. - Lightweight flight and transparent armor - Transparent armor with improved performance than those currently fielded. - Lightweight multifunctional structures - Structural Power Research - Thermoplastic composites - Out of Autoclave and Out of Oven Composites Manufacturing. - Automated Composites Manufacturing - AI/ML applications for reducing composites defects - High Fidelity/ Unitized/ Optimized Structures for Aircraft and Weapons. Completing Efforts - Hybrid nano-Composites - extend basic research investments in aligned carbon nano-tubes to develop damage tolerant composite structures for composites airframes Initiating Efforts - Repair development for bismaleimide (BMI) composite airframes - Improved design of skin/stringer joints for airframes - Post buckled aircraft subcomponent demo - Self-sealing technologies for fuel bladders ***FY 2024 OCO Plans:*** N/A ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase from FY 2023 to FY 2024 is due to increased investment in energy focused Sea-Based Aviation related research.					
Title: Fleet Force Protection and Defense Against Undersea Threats ***Description:*** Fleet Force Protection and Defense against Undersea Threats efforts include applied research for complementary sensor and processing technologies for platform protection. Current small platforms	7.576	9.280	1.833	0.000	1.833

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
(surface, subsurface and airborne) have little to no situational awareness (SA) or self-protection against air, surface, and asymmetric threats. A goal of this activity is to provide these platforms with effective self-protection. The technology areas specific to platform protection will develop individual, multispectral electro-optical (EO), infrared (IR), radio frequency (RF), electro-magnetic (EM), visual and acoustic or chemical sensors/ biosensors and associated processing. To defend platforms from current and advanced threats in at-sea littoral environments and in port, these technologies must improve multispectral detection and distribution of specific threat information. ***FY 2023 Plans:*** Materials and Chemistry: - Continue designing and developing inexpensive, miniaturized, low power electrochemical sensors for use in autonomous and distributed sensor networks in order to provide real-time, stand-off detection of explosive hazards in expeditionary missions; developing real time, standoff, moving target, laser based detection for explosives and hazardous chemicals in littoral environment; and developing chemical vapor sensing strategy for application in littoral environment. - Continue the development of high bandwidth modularized airborne ground penetrating radar array and related components as well as integrated near-real-time ground tracking and detection algorithm. - Continue research and development of modular compact sensors and automated algorithms to rapidly assess, analyze, and report damage to infrastructure for repair following an attack or natural disaster particularly damage to runways, roads, piers, utilities, and buildings. - Initiate work on a low-cost, high performance, broadband infrared optics solution utilizing new materials. Undersea Warfare: - Continue developing acoustics technology and associated signal processing to detect and track small-unmanned aerial vehicles for force and infrastructure protection; developing a pressure tolerant, inexpensive hydrogen storage based on hydrogenated graphene to increase undersea storage capacity; and developing technologies for active control of acoustic scattering to increase stealth and survivability of unmanned undersea vehicles. - Continue efforts on safe-perception based autonomous control in complex naval environments and on autonomy to support combined unmanned and manned systems/units. ***FY 2024 Base Plans:*** Materials and Chemistry:					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Continue developing real time, standoff, moving target, laser based detection for explosives and hazardous chemicals in littoral environment. - Continue developing chemical vapor sensing strategy for application in littoral environment. - Complete efforts into designing and developing inexpensive, miniaturized, low power electrochemical sensors for use in autonomous and distributed sensor networks in order to provide real-time, stand-off detection of explosive hazards in expeditionary missions. - Initiate efforts into organically modified chalcogenide (ORMOCHALC) Polymers for Next-Generation IR Optics. Undersea Warfare: - Continue developing acoustics technology and associated signal processing to detect and track small-unmanned aerial vehicles for force and infrastructure protection. - Continue the development of a pressure tolerant, inexpensive hydrogen storage based on hydrogenated graphene to increase undersea storage capacity. - Complete the development technologies for active control of acoustic scattering to increase stealth and survivability of unmanned undersea vehicles. ***FY 2024 OCO Plans:*** N/A ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The funding decrease from FY 2023 to FY 2024 is due to higher demands for development of materials to provide hull mechanical & electrical support for Surface Ship and Submarines in terms of power, energy, and propulsion research as well as mission capable, persistent, and survivable Naval Platforms. Funds moved within PE 0602123N to Surface Ship Hull Mechanical and Electrical (HM&E) Activity.					
Title: Advanced Energetics ***Description:*** Advanced Energetics efforts address technology development to provide substantial improvements in energetic material systems and subsystems, primarily in terms of performance, but also addressing safety, reliability, and affordability concerns. Goals include: advanced energetic materials for warheads, propellants, and reactive material based subsystems for both defensive and offensive applications. Efforts include: development of new fuels, oxidizers, explosive ingredients and formulations; and reliable simulation tools and diagnostics to develop and design superior-performance, and/or reduced-vulnerability systems tailored to specific warfighter missions.	5.340	5.321	5.446	0.000	5.446

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
FY 2023 Plans: Overall, continue applied advanced energetic materials research efforts focused on longer range, reduced time-to-target, enhanced lethality/target effects, and cost savings pertaining to kinetic weapons without sacrificing insensitive munitions requirements. Continuing Efforts: -Applied research focused on development, scale up, and evaluation of novel explosive, propellant, and reactive composite ingredients and energetic formulations, in addition to dynamic diagnostic experimental and multi-scale theoretical efforts for development of next generation higher performing weapon systems. - Expanding research focused on ingredient chemistry and chemical processing technologies. This work includes: synthesis, scale up, and evaluation of new energetic (i.e. explosives, oxidizers, fuels) and other formulation-enabling ingredients (i.e. polymer binders, plasticizers), and exploration and adaptation of innovative mixing, formulation, and other novel manufacturing processes for agile progression of enhanced energetic formulations. - Expanding research in development and application of experimental diagnostics of novel energy conversion concepts to enhance performance, more efficiently exploit available energy, and more effectively couple energy to target for air, surface, and underwater warhead and propulsion applications. This work includes: explosive blast, reactive materials, and propulsion relevant combustion science, shock-wave/energetic formulation studies, advanced tactical propulsion concepts, and ingredient specific structure/property studies. - Expanding research in development and application of modeling, simulation, and computation to predict dynamic response and effects of energetic processes such as ignition, combustion/deflagration, shock, fragmentation, and detonation in order to predict weapon performance, lethality, and lifecycle for air, surface, and underwater weapon applications. Completing Efforts: - Discontinuing minor efforts in ingredient development, experimental diagnostics, and modeling that do not show promise. Initiating Efforts: - Research focused on new ingredients and processing technologies including incorporation of molecular design and particle morphology technology into synthetic scale-up and process development. New compliant					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
commodity ingredients, and new scale-up and formulation processes will be transitioned to the industrial base as appropriate. - Novel dynamic experimentation in support of design, evaluation and progression of enhanced lethality warhead concepts with focus on smaller form-factor without sacrificing effect on target; and advanced solid rocket motor, air-breathing, gun and other novel tactical propulsion concepts for extended range and reduced time-to-target. - Applied theory and model development for understanding complex lethality mechanisms and properly assessing target damage for emerging warhead concepts and materials (i.e. high-density reactive materials) in addition to modeling efforts that support progression and transition of advanced tactical propulsion (i.e. ram-jets, high performance solid rocket motor, detonation engines).					
FY 2024 Base Plans: Overall, continue applied advanced energetic materials research efforts focused on longer range, reduced time-to-target, enhanced lethality/target effects, and cost savings pertaining to kinetic weapons without sacrificing insensitive munitions requirements. Continuing Efforts: - Applied research focused on development, scale up, and evaluation of novel explosive, propellant, and reactive composite ingredients and energetic formulations, in addition to dynamic diagnostic experimental and multi-scale theoretical efforts for development of next generation higher performing weapon systems. - Expanding research focused on ingredient chemistry and chemical processing technologies. This work includes: synthesis, scale up, and evaluation of new energetic (i.e. explosives, oxidizers, fuels) and other formulation-enabling ingredients (i.e. polymer binders, plasticizers), and exploration and adaptation of innovative mixing, formulation, and other novel manufacturing processes for agile progression of enhanced energetic formulations. - Expanding research in development and application of experimental diagnostics of novel energy conversion concepts to enhance performance, more efficiently exploit available energy, and more effectively couple energy to target for air, surface, and underwater warhead and propulsion applications. This work includes: explosive blast, reactive materials, and propulsion relevant combustion science, shock-wave/energetic formulation studies, advanced tactical propulsion concepts, and ingredient specific structure/property studies. - Expanding research in development and application of modeling, simulation, and computation to predict dynamic response and effects of energetic processes such as ignition, combustion/deflagration, shock, fragmentation, and detonation in order to predict weapon performance, lethality, and lifecycle for air, surface, and underwater weapon applications.					

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Completing Efforts: - Discontinuing minor efforts in ingredient development, experimental diagnostics, and modeling that do not show promise. Initiating Efforts: - Research focused on new reactive material formulations and configurations for warhead use. New consolidated effort towards high performing explosive oxidizer materials, polymer binders, and new energetic material molecular configurations for simplistic, cost effective synthesis of potentially high temperature explosives. New compliant commodity ingredients, and new scale-up and formulation processes will be transitioned to the industrial base as appropriate. - Novel dynamic experimentation in support of design, evaluation and progression of enhanced lethality warhead concepts with focus on smaller form-factor without sacrificing effect on target; and advanced solid rocket motor, air-breathing, and other novel tactical propulsion concepts for extended range and reduced time-to-target with additional focus on throttling capability for extended range. - New methods toward applied theory and model development for shock interactions. New experimental and physics based sub-model development for incorporating novel damage effects into lethality codes. ***FY 2024 OCO Plans:*** N/A ***FY 2023 to FY 2024 Increase/Decrease Statement:*** There is no significant change from FY 2023 to FY 2024.					
Title: Surface Ship and Submarine Hull Mechanical and Electrical (HM&E) ***Description:*** Technology programs focused on providing technologically superior warfighting capabilities at reduced total ownership costs for surface and subsurface platforms through investments in applied research and advanced technology development of programs in: a) Power, Energy, Propulsion, Engineering and Design. This element also includes the National Naval Responsibility in Naval Engineering (NNR-NE). Specific research themes are: Power and Energy Technology: Efforts address electrical and auxiliary system and component technology to dramatically improve naval capabilities by providing energy and power resiliency through applied research into energy and power density, control, operating efficiency, operational endurance, recoverability from casualties,	66.813	74.149	89.161	0.000	89.161

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
and design tools. A major investment focus is providing the power, energy, and thermal management required for directed energy weapons and advanced sensor systems on current and future surface combatants. Significant investments are also focused on improving the energy performance of unmanned systems for the next generation surface fleet, subsea and seabed warfare, and expeditionary forces wherein the limited availability of power and energy are critical. Platform Design and Engineering Technology: This research area seeks to further the applied physics and mathematics necessary to increase force effectiveness by improving platform hydrodynamics, platform structures, platform resiliency/survivability, autonomy, and enabling digital technologies needed to improve naval warfighting capabilities as they relate to platforms/capabilities for use in expeditionary, surface and subsurface warfare. - Hydrodynamics: Critical design for naval platform hydrodynamics that is focused on the applied sciences, computation, laboratory experiments, and at-sea experimentation to develop the understanding and prediction capabilities for all hydrodynamic phenomena associated with naval sea-going platforms including, surface ships, submarines, unmanned vessels and manned small craft. Key research goals are to fully understand the physics of hydrodynamics of wakes, ship dynamics/control, propulsors and their effects on vessel performance and associated energy dissipation into the environment to provide science-based metrics for the evaluation of new design concepts to improve efficiency, signatures, and overall capabilities. - Platform Structures: Focused on all timescales of varying reliability of naval structures. Key applied research is focused on the analysis and prediction for a ship structural system with uncertainty quantification and propagation based on real world usage. - Unmanned Vehicles (UxV): Autonomy for UxVs and related mission functions aligned with Naval S&T strategic focus on autonomy and unmanned vehicles in support of surface, submarine, subsea/seabed naval warfare. - Sea Platform Resiliency: Aligned with survivability S&T strategic focus area, research investigates susceptibility, survivability, and recoverability of all naval platforms. Work in susceptibility of naval platforms concentrates on signature reduction across the acoustic and non-acoustic spectrums. Applied research on survivability seeks to improve the ability of naval platforms to survive under stressing combat conditions, before, during, and after being affected by adversarial actions from kinetic and/or non-kinetic effectors. Research in recoverability of naval platforms seeks to better understand the complex nature of modern damage control measures necessary to enable platforms to recover to capability states necessary to avoid mission kill. - Digital Engineering: Naval engineering and platform design efforts to increase the speed to field and capability resiliency in the engineering process across platform lifecycles through the enablement of virtual design/monitor/usage models to be better informed through improved modeling and data science. Concentration of effort is					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
placed on digitally linking all aspects of a platform lifecycle from ideation to destruction with identifiable metrics of military utility enabling fuller solution trade-space exploration. ***FY 2023 Plans:*** Power, Energy and Propulsion Technology: - Continue research efforts associated with High Temperature Superconducting Cables for flexible ship degaussing system design and sustainable deployment for new and existing surface ship and submarine programs. - Complete advanced energy systems research, which is focused on the analysis and optimization of resilient electrical grids and microgrids in the Pacific and across DON critical mission areas. Results from previous research will be used to evaluate and increase the energy resiliency of critically infrastructures on DON installations. Efforts include enhancing collaborations across academia, industry and DON beneficiaries. - Complete research associated with Advanced Power Systems, Combat Power Systems and Energy Resiliency to expand surface ship and submarine program efforts aimed at supporting electrical system reliability, as well as advanced power distribution and control to support both new and existing surface ship and submarine programs. This will be utilizing the Electric Ship Research and Development Consortium (ESRDC) to develop modeling and simulation tools, system analysis tools and models to provide critical design and operational capabilities for the all-electric ship program, accelerate development and demonstration of technologies, and to reduce risk of technology insertion. These efforts also address the national shortage of naval electrical power engineers. - Complete HM&E initiatives associated with Next Generation Integrated Power System (NGIPS) and Distribution/Control of Power Advanced Power Systems efforts focused on power and energy requirements for directed energy weapons and advance sensor systems on current and future surface combatants, as well as for unmanned naval platforms, including thermal modeling. - Initiate and focus prior research efforts on the Naval Enterprise Partnership Teaming with Universities for National Entrepreneurship (NEPTUNE) program. The effort is derived from previous efforts in the areas of advanced energy systems research, which was focused on enhancing collaborations across academia, industry and DON beneficiaries. The NEPTUNE program is focused on conducting research that provides Navy Energy Education & Training for students. - Initiate applied superconductivity research in support of future Naval HM&E and mission systems. - Initiate applied research in Thermal Management. - Initiate applied research in Medium Voltage Direct Current (MVDC) electrical architectures. - Initiate research efforts in support of climate resiliency and clean energy to include applied research on low Global Warming Potential (GWP) refrigerants & environmentally friendly refrigeration cycles, electromechanical					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
machinery applied research to reduce energy demand and improve component and power system energy conversion efficiencies, local generation of sustainable and zero-carbon fuels, DDG(X) advanced propulsion and to expand existing fuel efficiencies in the DDG-51 fleet, and design tools for uncrewed platform power architecture design, performance, and performance prediction Platform Design and Engineering Technology: - Complete research to develop and test autonomy for Unmanned Undersea Vehicle (UUV) missions including understanding of counter-UUV autonomy options; implementations and testing; autonomy development involving a shared world model and sensor feedback; and extensive in-water testing. - Complete applied research related to critical S&T that supports platform design and advanced capability efforts related to propulsor, surface, and subsurface hydrodynamics; platform performance, and platform structural reliability. - Complete applied research related to critical S&T to investigate efforts related to signature reduction; structural and machinery acoustics; machinery autonomy; and platform survivability (detectability and susceptibility); and acoustic and non-acoustic signatures. - Complete research efforts focused on the science and physics based signal detection technologies that, individually or as a system, can impact the security of the SSBN and submarines in general. - Complete research related to critical multidisciplinary autonomy challenges that cut across areas/domains, including air, sea, undersea and ground. This includes multi-disciplinary research into the science of autonomy focuses on four interrelated areas: scalable and robust distributed collaboration among autonomous systems; human/unmanned system collaboration; autonomous perception and intelligent decision-making; and intelligent architectures for autonomous systems. - Initiate and focus research efforts in the following areas: USV and UUV Applied Research, Vessel Dynamics with Propulsors, Submarine Wakes, Structural Reliability, EM Signature Reduction, Topside Signature Reduction, Machinery Autonomy, Platform Survivability, Structural Acoustic Signature Control, Top-Side Signature Development, Machine Learning, Digital Twins, Data Analytics Rapid Experimentation, and Submarine Security S&T-Susceptibility. These efforts are derived from previous efforts in the area of Platform Design and Engineering. - Initiate and focus research efforts focused on digital engineering, the digital framework, and the digital thread, particularly regarding design tools, in order to increase the reliability and resiliency across the lifecycle for surface and undersea platforms, both manned and unmanned. These efforts are derived from previous efforts in the area of Platform Design and Engineering.					

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Initiate and focus research efforts on the Tactical Submarine Evolution Plan, Integrated Permanent Magnet Motors, Submarine Future Technologies and Future Surface Ship and Unmanned Technologies that support their capability evolution plans. These efforts are derived from previous efforts in the area of Platform Design and Engineering. Spectrum Superiority: - Continue research efforts for passive and active long-range high-resolution detection and imaging for increased survivability and situational awareness even in degraded/contested environments. - Continue research efforts to demonstrate portable sensor technology and machine learning based algorithms capable of identifying and recognizing emitters based off of unique RF characteristics in a complex EM environment. - Continue research efforts exploring simultaneous full-spectrum (RF and optical) effects to enable full operations and signature control across the entire electromagnetic spectrum and conduct laboratory-based sub-system demonstrations of component technologies. - Initiate research efforts into coherent combination of optical, infrared, and mm-wave imagers for increased resolution and longer-range detection. - Initiate development of microelectronics system on a transient glass substrate for controlled destruction, which will allow sensitive software application use in hostile operations. - Initiate development of machine learning techniques for automated signal identification in order for own-forces to understand and adjust electromagnetic spectrum signature. Electronics: - Continue research to develop and explore new high voltage, high efficiency wide bandgap and ultra-wide bandgap power switches for electric propulsion and electric weapons. Current plans are to focus efforts on: Pioneering Vertical GaN High Power Switches; Ultra-Wide Bandgap Gallium Oxide Power Device Transformative Integrated GaN Power Technology Platform; and High-Voltage Ultra-Fast SiC Semiconductor Closing Switches. Materials and Chemistry: - Initiate research into the use of prototype ammonium borosulfate electrolyte fuel cells to increase power output in current commercial solid acid fuel cells. Undersea Warfare:					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Complete research to reduce the time and cost for Submarine hull inspections by creating technologies for non-destructive evaluation (NDE) of submerged elastic surfaces coated with highly absorptive layers.					
FY 2024 Base Plans: Power, Energy and Propulsion Technology: - Continue research efforts associated with superconducting cables for flexible ship degaussing system design and sustainable deployment for new and existing surface ship and submarine programs. Continue applied superconductivity research in support of future Naval HM&E and mission systems. - Continue research efforts on the Naval Enterprise Partnership Teaming with Universities for National Entrepreneurship (NEPTUNE) program. The effort is derived from previous efforts in the areas of advanced energy systems research, which was focused on enhancing collaborations across academia, industry and DON beneficiaries. The NEPTUNE program is focused on conducting research that provides Navy Energy Education & Training for students. - Continue applied research in Thermal Management to address directed energy, environmental control needs, and update Navy design tools to include advanced thermal modeling capability. - Continue applied research in Medium Voltage Direct Current (MVDC) electrical architectures to reduce risk on future platforms. - Continue research efforts in support of climate resiliency and clean energy to include applied research on low Global Warming Potential (GWP) refrigerants & environmentally friendly refrigeration cycles. Conduct research to study impact of climate on system performance. Address the areas of climate-informed decision-making, training and equipping for climate resilience, resilient built and natural infrastructure, supply chain resilience and innovation, and enhanced mitigation and adaptation through collaboration. - Continue electromechanical machinery applied research to reduce energy demand and improve component and power system energy conversion efficiencies. - Continue research on local generation of sustainable, net-zero, and zero-carbon fuels to include design tool development to understand the impact of alternative fuels on platforms and operational missions. - Complete DDG(X) advanced propulsion research, and improvement of fuel efficiencies in the DDG-51 fleet - Initiate research in support of safely integrating large-scale embedded energy storage onto Naval platforms. This includes containment and non-propagation research, and development of the knowledge needed to certify technologies. Electronics:					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Continue research to develop and explore new high voltage, high efficiency wide bandgap and ultra-wide bandgap power switches for electric propulsion and electric weapons. Current plans are to focus efforts on High-Voltage Ultra-Fast SiC Semiconductor Closing Switches. - Complete research on Pioneering Vertical GaN High Power Switches and Ultra-Wide Bandgap Gallium Oxide Power. - Initiate research on High-Voltage Planar Low Damage GaN Power Switch. Platform Design and Engineering Technology: - Continue applied research in hydrodynamics of surface and subsurface platforms and propulsion focusing on the prediction of innovative propulsion concepts and platform designs that improve control of dynamic behaviors to improve efficiency, speed, maintainability, and maneuverability, while reducing overall associated platform signatures, weight, and lifecycle cost - Continue applied research into resilient platform materials and structures focusing efforts on innovative that improve performance and lifecycle reliability in harsh marine environments that improve platform survivability in hostile environments - Continue applied research into general acoustic and electromagnetic signature prediction tools for ground, sea-surface, and subsurface platforms - Continue applied research in technologies to reduce exploitable acoustic signatures from manned and unmanned platforms ground, sea-surface, and subsurface platforms - Continue research efforts in Hull, Mechanical, and Electrical (HM&E) Technologies focusing on digital and data sciences as applied to naval platforms in support of naval objectives in its Digital Transformation, to include work in Digital Engineering, Digital Twins, Digital Threads, Machine Learning and Artificial Intelligence to increase the availability, reliability, and resiliency of all naval platforms across all domains and manning configurations. - Continue research efforts in support of on the Tactical Submarine Evolution Plan (TSEP) S&T, Submarine Detectability, Integrated Permanent Magnet Motors, and Submarine Future Technologies -Complete efforts in Top-Side signature control for undersea platforms -Initiate research on broad based countermeasures and signature improvement technologies associated with Non-Acoustic Undersea Warfare (NAUSW) -Initiate applied research program on Total Platform Resiliency that seeks to improve the resiliency and extensibility of complex platforms and systems of systems throughout their lifecycle					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
-Initiate efforts in applied research of manned platform autonomous systems, as well as autonomous surface (USV) and undersea platforms (UUV) focusing on the Resiliency of systems and system of systems for extended time between needed human intervention to extend range, time on station, signature reduction, warfighter efficiency, damage control, and adaptability in uncertain adversarial environments Spectrum Superiority: - Continue research efforts for passive and active long-range high-resolution detection and imaging for increased survivability and situational awareness even in degraded/contested environments. - Continue research efforts into coherent combination of optical, infrared, and mm-wave imagers for increased resolution and longer-range detection. - Continue research efforts to demonstrate portable sensor technology and machine learning based algorithms capable of identifying and recognizing emitters based off of unique RF characteristics in a complex EM environment. - Continue research efforts exploring simultaneous full-spectrum (RF and optical) effects to enable full operations and signature control across the entire electromagnetic spectrum and conduct laboratory-based sub-system demonstrations of component technologies. - Continue development of microelectronics system on a transient glass substrate for controlled destruction, which will allow sensitive software application use in hostile operations. - Continue development of machine learning techniques for automated signal identification in order for own-forces to understand and adjust electromagnetic spectrum signature. Explosive Hazard Defeat in Expeditionary Warfare: - Continue designing and developing inexpensive, miniaturized, low power electrochemical sensors for use in autonomous and distributed sensor networks in order to provide real-time, stand-off detection of explosive hazards in expeditionary missions; developing real time, standoff, moving target, laser based detection for explosives and hazardous chemicals in littoral environment; and developing chemical vapor sensing strategy for application in littoral environment. - Continue the development of high bandwidth modularized airborne ground penetrating radar array and related components as well as integrated near-real-time ground tracking and detection algorithm. - Continue research and development of modular compact sensors and automated algorithms to rapidly assess, analyze, and report damage to infrastructure for repair following an attack or natural disaster particularly damage to runways, roads, piers, utilities, and buildings. - Continue work on a low-cost, high performance, broadband infrared optics solution utilizing new materials.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Initiate research and development on the scalable precision neutralization of threat explosive hazards, mines, and kill chain components with lethal or non-lethal force from standoff distances to enable in-stride littoral movement and maneuver, designated ground corridors, at forward aviation points, littoral transition points, and in designated areas of interest. ***FY 2024 OCO Plans:*** N/A ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The funding increase from FY 2023 to FY 2024 is due to an increase in efforts associated with energy storage and naval platforms. This includes increased emphasis on development of materials to provide hull mechanical & electrical support for Surface Ship and Submarines in terms of power, energy, and propulsion research, as well as mission capable, persistent, and survivable Naval Platforms objectives. Funds realigned within 0602123N from Fleet Force Protection and Defense Against Undersea Threats Activity.					
Title: Naval Research Enterprise	4.526	9.191	9.391	0.000	9.391
Description: The Naval Research Enterprise (NRE), through NavalX, supports mission-driven design think problem solving within the Naval Research and Development Establishment (NR&DE) and academia in support of culture changes to agile and rapid prototyping development driven by well defined and effective innovation process and operations. This will promote common innovation processes to stimulate effective NR&DEv and industry wide collaborations and facilitation to accelerate the delivery of innovative capabilities to the warfighter. Activities are based on three foundational principles: (1) utilize innovative technical and business pathways that accelerate technology acquisition and deployment to the warfighter and pilot potential efforts as a result of this investigation; (2) leverage the commercial market and attract private investments to accelerate and reduce the cost for defense acquisition and deployment of technologies that provide capabilities to the warfighter; and (3) employ innovative best-practices in contracting that accelerate awards and provide flexibility and speed in technology and acquisition. The Independent Applied Research (IAR) Program focuses on solving a wide range of Naval Science and Technology (S&T) fleet issues utilizing unique Naval Warfare Center (WC) laboratory capabilities. Efforts under this activity address the full spectrum of the Naval Research and Development Framework using focus areas which engage Naval aviation, sea surface, undersea, space, weapons, communication, information, and human systems. The IAR Program provides participating WCs with in-house funding for applied research to support the execution of their assigned missions by: (1) developing and maintaining a cadre of active researchers who can					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
distill and extend results from worldwide research and apply them to solve Naval problems; (2) promoting the hiring and development of talented new scientists and engineers (S&E) with the assurance of proper mentoring with senior personnel; and (3) encouraging collaboration with universities, private industry, and other Navy and Department of Defense laboratories. Funded projects are chosen through rigorous internal competition by each WC's selection committee and typically last two to three years. IAR projects are generally designed to promote investment in high-risk/high- payoff research and also allow young S&Es to manage Navy relevant research projects. ***FY 2023 Plans:*** Naval Innovation Process Adoption (NIPA): - Continue/expand development of innovative prototypes at Warfare Centers, Naval Laboratories, NavalX Tech Bridges and related DON organizations solving key warfighter problems that are identified through the H4D innovation process pipeline. - Continue/expand efforts that will be carried out under the NIPA program to emphasize the implementation of a common process and language to promote collaborations and facilitate the use of best practices to accelerate the delivery of capabilities to the warfighter. - Continue NIPA Challenges that solicit and expand the DON industrial base, especially small businesses, to solve warfighter problems. The Challenges will employ the NavalX Tech Bridge network to reach the widest possible industrial base and to promote collaborations across the Naval R&D community. - Expand Naval sustainment efforts across Warfare Centers through cross-community NIPA/H4D Challenges and Small Business Innovative Research (SBIR) topics. - Support the Gordian Knot Center for National Security Innovation at Stanford University. Independent Applied Research (IAR): Initiate the following efforts: - Naval warfare centers and laboratories generate new two- to three-year research topics where priority is given to warfighter needs, technology alignment, high quality research, and the recruitment and retention of outstanding scientists and engineers. Topics cover a broad range of naval relevant research areas critical to supporting the missions of the warfare centers and laboratories.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
- Utilize peer review process to select and evaluate IAR topics and develop a diverse S&T research portfolio. - Establish mid-year and annual progress review meetings to ensure topic objectives are being accomplished and projected outcomes are being achieved. ***FY 2024 Base Plans:*** Independent Applied Research (IAR): Continue: - Further develop and maintain the Science and Engineering workforce by providing funding to Naval Warfare Centers and Laboratories to foster high risk/ high reward applied research initiatives of Naval interest. Each Naval site conducts peer reviews for existing research projects, assess the quality of the research, and determine if projects should continue. - Continue NIPA Challenges that solicit and expand the DON industrial base, especially small businesses, to solve warfighter problems. The Challenges will employ the NavalX Tech Bridge network to reach the widest possible industrial base and to promote collaborations across the Naval R&D community. - Expand Naval sustainment efforts across Warfare Centers through cross-community NIPA/H4D Challenges and Small Business Innovative Research (SBIR) topics. Complete: - Conclude two-year research topics that initiated in FY 2023. Assess opportunities for technology transition to larger programs through coordination with various resource sponsors. Transfer successful efforts to research, development, test, and evaluation-sponsored programs. Initiate: - The participating warfare centers or laboratories generate new two-year and three-year research topics where priority is given to warfighter needs, technology alignment, high quality research, and the recruitment and					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
retention of outstanding scientists and engineers. Topics cover a broad range of Naval relevant research areas critical to the support of warfare center and laboratory missions. ***FY 2024 OCO Plans:*** N/A ***FY 2023 to FY 2024 Increase/Decrease Statement:*** There is no significant change from FY 2023 to FY 2024.					
Accomplishments/Planned Programs Subtotals	119.861	133.426	142.148	0.000	142.148

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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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: *Congressional Adds*	0.000	96.052	212.150	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	308.202

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: Alternative Energy Research ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct Alternative Energy Research	0.000	30.000
Congressional Add: Advanced Energetics Research ***FY 2022 Accomplishments:*** Continue research towards the advanced demonstration of energetic materials in a variety of weapon system applications to include: high performance solid rocket and air breathing propulsion, reactive materials demonstrations and effects in advanced lethality and effectiveness models, advanced warhead concepts to include novel reactive shaped charge configurations, hybrid reactive material warhead demonstrations, and the development and demonstration of any necessary modeling and simulation capabilities for quantification of damage effects on adversary weapon systems, and other potential energetic technologies. ***FY 2023 Plans:*** Continue research towards the advanced demonstration of energetic materials in a variety of weapon system applications to include: high performance solid rocket and air breathing propulsion, reactive materials demonstrations and effects in advanced lethality and effectiveness models, advanced warhead concepts to include novel reactive shaped charge configurations, hybrid reactive material warhead demonstrations, and the development and demonstration of any necessary modeling and simulation capabilities for quantification of damage effects on adversary weapon systems, and other potential energetic technologies.	2.896	6.000
Congressional Add: Talent and technology for Navy power and energy systems ***FY 2022 Accomplishments:*** Continue efforts to develop autonomous command and control of ship power and energy systems, leveraging digital twin technology that protects the ship's power and energy grid. In	10.136	10.500

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
addition, designed and built a digital twin testbed for physical experimentation with power and energy controls technologies. ***FY 2023 Plans:*** Continue efforts to develop autonomous command and control of ship power and energy systems, leveraging digital twin technology that protects the ship's power and energy grid. In addition, designed and built a digital twin testbed for physical experimentation with power and energy controls technologies.		
Congressional Add: Energy resilience efforts ***FY 2022 Accomplishments:*** Conduct applied research supporting energy resilience efforts. ***FY 2023 Plans:*** Conduct applied research supporting energy resilience efforts.	6.757	8.000
Congressional Add: Coastal environmental research ***FY 2022 Accomplishments:*** Continue efforts to provided a complete, portable, and field-tested ocean electro-magnetic observatory capable of global deployment to observe the fluid dynamics and magnetic signature of the ocean in coastal environments. Installed, calibrated, and collected data for the Navy's Electro-Magnetic Observatory prototype. ***FY 2023 Plans:*** Continue efforts to provided a complete, portable, and field-tested ocean electro-magnetic observatory capable of global deployment to observe the fluid dynamics and magnetic signature of the ocean in coastal environments. Installed, calibrated, and collected data for the Navy's Electro-Magnetic Observatory prototype.	4.827	5.000
Congressional Add: Direct Air Capture and Blue Carbon Removal Technology ***FY 2022 Accomplishments:*** This funding will support direct air capture and blue carbon technology development. Advancements in these technologies and their integration with next generation fuel producing and material producing technologies will enhance DoN & DoD fuel energy security. ***FY 2023 Plans:*** This funding will support direct air capture and blue carbon technology development. Advancements in these technologies and their integration with next generation fuel producing and material producing technologies will enhance DoN & DoD fuel energy security.	9.654	10.000
Congressional Add: Additive Manufacturing of Unmanned Maritime Systems ***FY 2022 Accomplishments:*** This work will develop advanced composite structures for an unmanned surface vessel (USV) using additive manufacturing techniques. The final USV enabled is expected to provide higher performance, lower weight, lower cost and faster manufacturing times than achievable with conventional	5.792	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602123N / *Force Protection Applied Res*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
technologies. This contract will deliver the USV design, hull manufacturing process demonstrations, full scale hull sections and a sub-scale complete hull. ***FY 2023 Plans:*** This work will develop advanced composite structures for an unmanned surface vessel (USV) using additive manufacturing techniques. The final USV enabled is expected to provide higher performance, lower weight, lower cost and faster manufacturing times than achievable with conventional technologies. This contract will deliver the USV design, hull manufacturing process demonstrations, full scale hull sections and a sub-scale complete hull.		
Congressional Add: Navy Alternative Energy Research ***FY 2022 Accomplishments:*** Conduct applied research supporting Navy Alternative Energy technologies. ***FY 2023 Plans:*** N/A	26.547	0.000
Congressional Add: relative position of autonomous platforms ***FY 2022 Accomplishments:*** Conduct applied research in relative position of autonomous platforms. ***FY 2023 Plans:*** Conduct applied research in relative position of autonomous platforms.	2.896	5.000
Congressional Add: Bonded metal matric composit repair ***FY 2022 Accomplishments:*** Conduct applied research in bonded metal matric composite repair. ***FY 2023 Plans:*** Conduct applied research in bonded metal matric composite repair.	4.827	5.000
Congressional Add: Resilient innovative sustainable economies via university partnerships ***FY 2022 Accomplishments:*** Conduct applied research for resilient innovative sustainable economies via university partnerships. ***FY 2023 Plans:*** Conduct applied research for resilient innovative sustainable economies via university partnerships.	7.240	9.000
Congressional Add: Titanium metal and wire domestic production demonstration ***FY 2022 Accomplishments:*** Conduct applied research supporting titanium metal and wire domestic production demonstration. ***FY 2023 Plans:*** N/A	14.480	0.000
Congressional Add: high speed/hypersonic test capability development	0.000	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602123N / *Force Protection Applied Res*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: N/A ***FY 2023 Plans:*** Conduct high speed/hypersonic test capability development.		
Congressional Add: Resilient autonomous systems research and diversity programs ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct resilient autonomous systems and diversity programs research.	0.000	8.500
Congressional Add: Seawater to jet fuel demo ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct seawater to jet fuel demo.	0.000	20.000
Congressional Add: Arctic energy resiliency ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct arctic energy resiliency research.	0.000	10.000
Congressional Add: Cavitation erosion ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct cavitation erosion research.	0.000	5.000
Congressional Add: Corrosion control coating and material ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct corrosion control coating and material research.	0.000	5.000
Congressional Add: Cyberphysical security resiliency ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct cyberphysical security resiliency research.	0.000	7.000
Congressional Add: Intelligent data managment for distributed Naval platforms ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct intelligent data management for distributed Naval platforms research.	0.000	10.500
Congressional Add: Materials by design for Navy aircraft sustainment	0.000	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: N/A ***FY 2023 Plans:*** Conduct Materials by design for Navy aircraft sustainment research.		
Congressional Add: sUAS degraded enviorment facility ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** A new facility (Unmanned Systems Degraded Environment Facility (UxSDEF)) supporting research, development, and test of unmanned systems in challenging environments will be built at Naval Surface Warfare Center, Carderock Division's Memphis Detachment. This facility will enable large and full-scale testing of unmanned systems and autonomy technologies in a controlled environment.	0.000	12.650
Congressional Add: Universal achemetal titanium process ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct universal achemetal titanium process research.	0.000	12.000
Congressional Add: Unmanned surface vehicle ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct unmanned surface vehicle research.	0.000	5.000
Congressional Add: High-entropy materials for hypersonics ***FY 2022 Accomplishments:*** N/A ***FY 2023 Plans:*** Conduct research in high-entropy materials for hypersonics.	0.000	9.000
Congressional Adds Subtotals	96.052	212.150

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.