Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Defense Advanced Research Projects Agency	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	628.540	668.271	678.562	-	678.562	771.075	654.200	620.609	447.955	-	-
NET-01: *JOINT WARFARE SYSTEMS*	-	152.136	161.089	68.007	-	68.007	69.731	120.790	169.195	177.918	-	-
NET-02: *MARITIME SYSTEMS*	-	161.728	149.127	179.397	-	179.397	196.094	186.260	208.914	270.037	-	-
NET-06: *NETWORK-CENTRIC WARFARE TECHNOLOGY*	-	314.676	358.055	431.158	-	431.158	505.250	347.150	242.500	0.000	-	-

A. Mission Description and Budget Item Justification

The Network-Centric Warfare Technology Program Element is budgeted in the Advanced Technology Development budget activity because it addresses high payoff opportunities to develop and rapidly mature advanced technologies and systems required for today's network-centric warfare concepts. It is imperative for the future of the U.S. forces to operate flawlessly with each other, regardless of which services and systems are involved in any particular mission. The overarching goal of this program element is to enable technologies at all levels, regardless of service component, to operate as one system.

The objective of the Joint Warfare Systems project is to create enabling technologies for seamless joint operations, from strategic planning to tactical and urban operations. Joint Warfare Systems leverage current and emerging network, robotic, and information technology and provide next generation U.S. forces with greatly increased capability, lethality, and rapid responsiveness. Critical issues facing this project are: (1) U.S. opponents using systems that are flexible, robust, and difficult to neutralize; and (2) U.S. doctrine that limits the use of firepower to lessen the impact of operations on noncombatants. These problems are magnified in urban and semi-urban areas where combatants and civilians are often co-located and in peacekeeping operations where combatants and civilians are often indistinguishable. Meeting these challenges places a heavy burden on joint war planning. Understanding opponent networks is essential so that creative options can be developed to counter their strategies. Synchronization of air and ground operations to apply force only where needed and with specific effects is required. This project supports all levels of the force structure including: (1) the strategic/operational level by generating targeting options against opponents' centers of gravity that have complex networked relationships; (2) the tactical/operational level by managing highly automated forces with tight coupling between air and ground platforms; and (3) the focused tactical level by developing platforms and tools, which acquire targets of opportunity and cue network-based analysis of likely enemy operations thus maximizing the effectiveness of ground forces in stability and support operations.

The Maritime Systems project is identifying, developing and rapidly maturing critical advanced technologies and system concepts for the naval forces' role in today's network centric warfare concept. Improvements in communications between and among submarines, surface ships and naval aircraft have allowed these forces to operate seamlessly with each other and with other Service's network centric systems. Naval forces will play an ever-increasing role in network centric warfare because of their forward deployed nature, their unique capability to operate simultaneously in the air, on the sea and under the sea, and their versatile ability to provide both rapid strike and project-sustained force. The technologies developed under this project will capitalize on these attributes, improve them and enable them to operate with other network centric forces.

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Defense Advanced Research Projects Agency	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603766E *I NETWORK-CENTRIC WARFARE TECHNOLOGY*

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	641.158	584.771	0.000	-	0.000
Current President's Budget	628.540	668.271	678.562	-	678.562
Total Adjustments	-12.618	83.500	678.562	-	678.562
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	83.500			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	8.026	0.000			
• SBIR/STTR Transfer	-20.644	0.000			
• Adjustments to Budget Year	-	-	678.562	-	678.562

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: NET-01: *JOINT WARFARE SYSTEMS*		
Congressional Add: *ABII Acceleration - Congressional Add*	-	50.000
Congressional Add Subtotals for Project: NET-01	-	50.000
Project: NET-06: *NETWORK-CENTRIC WARFARE TECHNOLOGY*		
Congressional Add: *Deployable Surveillance Systems - Congressional Add*	-	21.000
Congressional Add: *Ukraine Supplemental - Congressional Add*	-	12.500
Congressional Add Subtotals for Project: NET-06	-	33.500
Congressional Add Totals for all Projects	-	83.500

Change Summary Explanation

FY 2021: Decrease reflects SBIR/STTR transfer offset by reprogrammings.
FY 2022: Increase reflects Congressional adds for Program Increase-deployable surveillance systems, ABII acceleration, and Ukraine Supplemental.
FY 2023: FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	Project (Number/Name) NET-01 / *JOINT WARFARE SYSTEMS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
NET-01: *JOINT WARFARE SYSTEMS*	-	152.136	161.089	68.007	-	68.007	69.731	120.790	169.195	177.918	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The objective of the Joint Warfare Systems project is to create enabling technologies for seamless joint operations, from strategic planning to tactical and urban operations. Joint Warfare Systems leverage current and emerging network, robotic, and information technology and provide next generation U.S. forces with greatly increased capability, lethality, and rapid responsiveness. Critical issues facing this project are: (1) U.S. opponents using systems that are flexible, robust, and difficult to neutralize; and (2) U.S. doctrine that limits the use of firepower to lessen the impact of operations on noncombatants. These problems are magnified in urban and semi-urban areas where combatants and civilians are often co-located and in peacekeeping operations where combatants and civilians are often indistinguishable. Meeting these challenges places a heavy burden on joint war planning. Understanding opponent networks is essential so that creative options can be developed to counter their strategies. Synchronization of air and ground operations to apply force only where needed and with specific effects is required. This project supports all levels of the force structure including: (1) the strategic/operational level by generating targeting options against opponents' centers of gravity that have complex networked relationships; (2) the tactical/operational level by managing highly automated forces with tight coupling between air and ground platforms; and (3) the focused tactical level by developing platforms and tools, which acquire targets of opportunity and cue network-based analysis of likely enemy operations thus maximizing the effectiveness of ground forces in stability and support operations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Assault Breaker II (ABII)	80.287	57.833	36.515
Description: Assault Breaker II (ABII) seeks to change the current warfighting paradigm of reliance on a Service-specific and platform centric force that executes prescribed kill chains to a highly adaptable and capability-based force. This new paradigm operates as a disaggregated kill web able to execute rapidly composable, joint, and all domain kill chains. Building upon technologies developed in the Cross Domain Maritime Surveillance and Targeting (CDMaST) program, budgeted in PE 0603766E, Project NET-02, ABII will exploit both existing and emerging technologies across the Services to address known capability gaps, opportunities, and threats. ABII will conduct mission-centric, multi-Service and multi-domain analyses, modeling & simulation (M&S), and experimentation to inform research and development and program of record recommendations. ABII will build an enduring, multi-service M&S environment to support complex mission level kill web analysis. ABII will also design and develop a Vanguard Force DevOps Environment (VFDE) and battle management enclave with physical nodes that will enable the transition of ABII technologies, concepts and architectures to the Services.			
FY 2022 Plans: - Initiate studies for the finalization of kill web architectures and effects.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-01 / *JOINT WARFARE SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Execute model development for the M&S environment. - Demonstrate model and simulation initial operating capability. - Demonstrate completed modules for the multi-domain, multi-level security environment. - Execute experimentation campaign utilizing VFDE and Distributed Experimentation Environment (DE2) capabilities. - Perform preliminary design for large scale exercise-based experiment. - Demonstrate completed modules of battle management command and control tool sets. - Demonstrate operational capability of VFDE and execute initial integration of battle management tools. ***FY 2023 Plans:*** - Identify kill web architectures and effects. - Evaluate mission scenario operability of the model catalogue within the M&S environment. - Demonstrate model and simulation fully operational capability. - Test and evaluate multi-domain, multi-level security environment. - Execute experimentation campaign utilizing VFDE and DE2 capabilities. - Participate in large scale exercise-based experiment. - Integrate battle management tools into VFDE. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects the completion of the infrastructure stand up and shift to full modeling and simulation capabilities and execution of large-scale experiments.			
Title: Air Combat Evolution (ACE)	28.601	27.666	23.152
Description: As the Services develop new Joint Multi-Domain Battle warfighting concepts, there is a strong demand for innovative ways to assess architectures, advance technology, and support operators developing advanced multi-domain tactics. Based upon technologies developed in the System of Systems Integration Technology and Experimentation (SoSITE) program, budgeted in this PE/Project, the Air Combat Evolution (ACE) program will apply technologies and principles of distributed autonomy and artificial intelligence (AI) to aerial within-visual-range (WVR) maneuvering, colloquially known as a dogfight, in modeling and simulation (M&S), sub-scale, and ultimately full-scale vehicles. The program will deliver an initial instantiation of a scalable AI controller enabling aircraft autonomy at levels ranging from an advanced tactical autopilot for dynamic maneuver to a form of multi-domain mosaic battle management controller. Experiments will explore both augmentation of existing manned platforms and enhanced future unmanned systems. ACE will provide an early opportunity to build operator trust in combat autonomy and demonstrate adaptive human-machine teaming tools and architectures. Technology developed by this program will transition to the Services. ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-01 / *JOINT WARFARE SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Refine and implement WVR algorithms onto sub-scale commercial unmanned aerial vehicles (UAVs) and test in 1v1, 2v1, and 2v2 scenarios. - Implement Human Machine Interfaces (HMIs) for full-scale aircraft trust assessments. - Conduct trust assessment events in M&S environment in more complex 2v1 and 2v2 scenarios. - Conduct extension of combat autonomy to more complex campaign scenarios. - Prepare for full-scale aircraft testing of combat autonomy. ***FY 2023 Plans:*** - Refine and implement WVR algorithms onto full-scale aircraft with progression from test to 1v1 and 2v1 scenarios. - Conduct full-scale aircraft trust assessment event. - Extend combat autonomy to more complex campaign scenarios with additional realism. - Conduct full-scale aircraft flight evaluations of combat autonomy. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects a shift from major autonomy development activities to implementation and test.			
Title: Systems of Systems-Enhanced Small Units (SESU)	18.487	17.560	8.340
Description: The System of Systems-Enhanced Small Unit (SESU) program is developing and demonstrating capabilities based on system-of-systems architecture that could enable a small unit to destroy, deceive, and/or disrupt the adversary's Anti-Access / Area Denial (A2/AD) capabilities in order to enable joint and coalition multi-domain operations at appropriate times and locations. SESU-developed capabilities will provide the small unit with improved awareness of enemy force composition, disposition, and intent. Technologies to accomplish this include command and control (C2) that operates in a contested environment; distributed sensing, including the ability to leverage indigenous information sources; hybrid effects that include a mix of kinetic, non-kinetic, and information operations capabilities; and autonomous systems to deliver effects and conduct sensing. A Campaign of Learning (CoL) will be conducted in partnership with the Army, and technologies produced by this program will be transitioned to the Services. ***FY 2022 Plans:*** - Conduct live and virtual demonstrations of full SESU capabilities of autonomous platforms, sensors, and effectors. - Conduct live, virtual, constructive experiments for government-provided missions in realistic environments to demonstrate the ability of the system to support new missions and transition. - Apply SESU technologies to new threats and geographies in live, virtual, and constructive experiments. - Conduct independent SESU system overall performance and operational analysis in SESU's ability to destroy, disrupt, degrade, and/or delay aspects of an adversary's A2/AD capabilities. ***FY 2023 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-01 / *JOINT WARFARE SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Analyze and report results from the Army's Project Convergence 2022 and other experimentation events. - Transition the SESU Program to the Army for continued operational experimentation, capability development, and incorporation of spin-out technologies into existing programs of record. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects a shift from technology refinement and experimentation to program transition to the Army.			
Title: Prototype Resilient Operations Testbed for Expeditionary Urban Systems of Systems (PROTEUS)	13.136	8.030	-
Description: The Prototype Resilient Operations Testbed for Expeditionary Urban Systems of Systems (PROTEUS) program is demonstrating that a dynamically composable Mosaic warfare approach provides superior performance and adaptability in the dynamic, uncertain environment imposed on U.S. warfighters by urban combat operations. PROTEUS will be adaptive to an inherently dynamic and fluid environment that will account for the environmental influence of non-combatants in urban combat as well as kinetic warfighting. Technologies will be integrated using systems of systems principles developed under the System of Systems Integration Technology and Experimentation (SoSITE) program, budgeted in this PE/Project. To support concept development, testing, and warfighter interaction, the program will also develop a supporting virtual testbed. Technologies from this program will be transitioned to the Services. ***FY 2022 Plans:*** - Document and transition software to Marine Corps for future use. - Support development of program software features requested by the Marine Corps. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.			
Title: System of Systems Integration Technology and Experimentation (SoSITE)	11.625	-	-
Description: The System of Systems Integration Technology and Experimentation (SoSITE) program implemented an architecture framework capable of assessing and demonstrating potential operational benefits of integrating various system capabilities to improve mission success in contested environments. Such assessments optimized system-level trades of requirements and architectures to leverage an integrated set of system characteristics and capabilities. The demonstration assessment metrics measured individual and combined system performance to streamline resource allocation to maximize operational impact. In addition, providing a modeling and simulation (M&S) environment to assess complex systems enabled greater utility of emerging system technologies, since they can be assessed in near-real-world simulations without the real-world costs of testing fully integrated systems. The program also developed system synthesis and integration technologies that enabled rapid assimilation of new and off-the-shelf technologies into the system of systems architecture. These technologies are breaking down current barriers to entry that new technologies face in system of systems using formal methods, compositional reasoning,			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
and automated design space exploration. Technologies from this program transitioned to the U.S. Air Force's Spectrum Warfare Wing and SAF/AQL (Secretary of the Air Force/Special Programs).			
Accomplishments/Planned Programs Subtotals	152.136	111.089	68.007

	FY 2021	FY 2022
Congressional Add: ABII Acceleration - Congressional Add	-	50.000
FY 2022 Plans: Accelerate and expand multi-domain capabilities.		
Congressional Adds Subtotals	-	50.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	Project (Number/Name) NET-02 / *MARITIME SYSTEMS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
NET-02: *MARITIME SYSTEMS*	-	161.728	149.127	179.397	-	179.397	196.094	186.260	208.914	270.037	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Maritime Systems project is identifying, developing and rapidly maturing critical advanced technologies and system concepts for the naval forces' role in today's network-centric warfare concept. Improvements in communications between and among submarines, surface ships and naval aircraft have allowed these forces to operate seamlessly with each other and with other Service's network-centric systems. Naval forces will play an ever-increasing role in network centric warfare because of their forward deployed nature, their unique capability to operate simultaneously in the air, on the sea and under the sea, and their versatile ability to provide both rapid strike and project sustained force. The technologies developed under this project will capitalize on these attributes, improve them and enable them to operate with other network-centric forces.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Manta Ray	23.562	29.500	38.569

Description: The Manta Ray program is developing and demonstrating a new class of long-duration, long-range unmanned underwater vehicles (UUVs) at an acquisition and lifecycle cost significantly less than current payload-capable UUVs. This new class of UUV will give the combatant commander an amplification of capacity without disrupting current operations by remaining independent of manned vessels and ports once deployed. The primary goal of the Manta Ray program is to open a design space for future UUVs capable of both long duration missions and large payload capacity. A secondary goal of the program is to advance key technologies benefiting other naval designs such as low lifecycle cost UUV operations, energy management technologies to enable long-duration operations, biofouling reduction technologies, and long-duration navigational enablers. The anticipated transition partner is the U.S. Navy.

FY 2022 Plans:
- Continue risk reduction testing of subsystems in controlled maritime environments.
- Conduct testing of vehicle software and autonomy in simulation and surrogate environments.
- Conduct scaled testing of integrated vehicle in controlled maritime environments.
- Commence fabrication and integration of full-scale vehicle.

FY 2023 Plans:
- Conduct at-sea demonstration of key subsystems.
- Complete fabrication and integration of full-scale vehicle.
- Conduct preliminary testing of full-scale vehicle in controlled maritime environments.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-02 / *MARITIME SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Conduct at-sea demonstration of full-scale vehicle performing full range of behaviors and capabilities. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects a shift from technology demonstrations to integrated platform fabrication and full systems testing.			
Title: No Manning Required Ship (NOMARS) ***Description:*** No Manning Required Ship (NOMARS) is developing small, low-cost, disaggregated naval platforms to demonstrate the ability to perform persistent power projection and force application combat missions currently conducted from large, high-value capital ships. The NOMARS program will design a ship that can operate autonomously for long durations at sea, enabling a ship design process that eliminates considerations associated with crew. NOMARS focuses on exploring novel approaches to the design of the sea frame (the ship without mission systems) while accommodating representative payload size, weight, and power. The goal of the program is to demonstrate the feasibility of Unmanned Surface Vessels (USVs) that operate autonomously for months to years without human intervention, in large numbers, with only periodic, depot-based maintenance. This capability will enable disaggregated persistent USVs, allowing the surface fleet to credibly threaten peer adversaries and negate their investments in high-cost weapon systems designed to counter large naval targets such as aircraft carriers. A successful NOMARS program will prove feasibility of a small unmanned ship with significantly improved reliability and functional performance over current USVs providing a pathway to allow a distributed lethality concept to become viable: small ships, in large numbers, each of which is individually low-cost and low-value, but in aggregate presents a significant deterrent. The anticipated transition partner is the U.S. Navy. ***FY 2022 Plans:*** - Continue preliminary design of multiple concept vessels. - Conduct Preliminary Design Review of NOMARS concept vessels. - Initiate demonstrator vessel development. ***FY 2023 Plans:*** - Conduct detailed design for NOMARS demonstrator vessel. - Complete Critical Design Review for NOMARS demonstrator vessel. - Conduct subsystem risk reduction demonstrations. - Initiate integrated system-level fabrication. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects a shift to detailed design of the selected concept vessel(s), procurement of long lead items, sub-system integration and initial development of the demonstrator vessel.	24.000	30.600	38.500
Title: Sea Train	27.707	33.000	35.650

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: The Sea Train program is supporting the delivery of masses of unmanned surface vessels into theater, without reliance on large, manned capital assets. The Sea Train program is developing and demonstrating approaches to exploit the efficiencies of longer slender hulls, while enabling a distributed fleet of tactical Unmanned Surface Vessels (USVs). The Sea Train concept enables vessels that are efficient for transoceanic transport while enabling dispersed operations as individual vessels. The Sea Train program is developing and demonstrating connectors and approaches to couple the vessels, the control laws required to drive the vessel in open ocean conditions, sensor approaches to understand the wave environment to efficiently navigate the vessel, and the autonomy required to connect and disconnect the vessels without human intervention. The goal of this effort is to improve transport efficiency over what can be achieved with current monohull designs. This allows for the efficient transport of smaller vessels into and out of theater, an operation that is normally accomplished today by carrying smaller vessels on board larger vessels or reliance on at-sea refueling of smaller vessels. The anticipated transition partner is the Navy. ***FY 2022 Plans:*** - Conduct scaled model testing, analysis, and simulation to inform the follow on one-quarter scale model design and demonstrator system Preliminary Design Review. - Conduct objective system Concept Design Review update. - Begin development of a one-quarter scale demonstrator system to support in-water testing of the fully assembled, self-powered vehicle. - Initiate demonstrations to evaluate control laws and autonomy behaviors of aggregated formations in high sea-state conditions. ***FY 2023 Plans:*** - Conduct one-quarter scale open water model testing, analysis and simulation to inform the demonstrator system conceptual and Preliminary Design Reviews. - Conduct objective system Concept Design Review update. - Initiate transition of Sea Train models to the Navy for follow on testing to support emerging Medium Unmanned Surface Vehicles (MUSV) operations and designs. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects minor program repricing.			
Title: Goblin	-	14.200	22.378
Description: The undersea domain has significant importance to national security and military operations, but manned missions are restricted in their operational ranges. The Goblin program will enhance U.S. autonomous capabilities in the challenging undersea domain by developing and demonstrating complex underwater systems able to search, locate, and execute mission objectives without the need for human control. Navigation approaches will focus on the use of commercial, low-cost navigation hardware combined with environmental feature-based algorithm approaches to eliminate reliance on the Global Positioning			

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Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-02 / *MARITIME SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
System (GPS) for long duration missions. Key Goblin technical challenges include sensing techniques that provide high-resolution navigation without GPS, perception and effector strategies for objects with unknown parameters, long-duration autonomy approaches to support mission execution, and autonomy approaches that do not rely on human interaction. The anticipated transition is to the U.S. Navy. ***FY 2022 Plans:*** - Begin subsystems design, long-lead purchase items, and initial subsystems integration. - Test subsystems in a representative maritime environment. - Conduct risk reduction activities supporting preliminary development of fully integrated test system. ***FY 2023 Plans:*** - Conduct risk reduction activities supporting development of demonstrator systems. - Begin demonstrator development and continue subsystem integration. - Test demonstrator systems in a representative maritime environment. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects a shift from subsystem design to full demonstrator development.			
Title: Timely Information for Maritime Engagements (TIMEly)	23.259	16.500	16.000
Description: Integration of undersea elements for joint cross-domain operations is critical for developing the most effective distributed kill webs. The Timely Information for Maritime Engagements (TIMEly) program is creating a heterogeneous underwater network architecture that will span the ocean and bridge to other operating domains. Building upon technologies learned in the Positioning System for Deep Ocean Navigation (POSYDON) program, (previously budgeted in this PE/Project), TIMEly will provide an adaptive, heterogeneous, scalable communications capability to link undersea and cross-domain assets together into kill webs with minimal operator burden. The program will focus on developing architectures with the capability to transfer the right information to its intended recipient. TIMEly will work within commonly understood limitations, with a focus on protocols, quality of service, and information exchange. The program will leverage developments demonstrating short-range and long-range acoustic communications at higher bandwidth and greater reliability, while minimizing detectability. The program will also leverage recent developments in network interoperability to manage heterogeneous undersea and cross-domain networks. Technology developed by this program will transition to the Navy. ***FY 2022 Plans:*** - Fabricate prototype TIMEly nodes for in-water demonstration. - Refine data management architecture and TIMEly communication protocols. - Develop networking and node autonomy behaviors.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Conduct end-to-end testing of TIMEly architectures to evaluate performance. ***FY 2023 Plans:*** - Design and manufacture form-fit prototype hardware for demonstration. - Refine networking and autonomy behaviors. - Develop network user interface. - Conduct test preparations and integration for end-to-end demonstration with mission partners. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects a shift from fabrication to manufacturing and integration.			
Title: Multi-Azimuth Defense Fast Intercept Round Engagement System (MAD-FIRES)	-	6.000	8.300
Description: The Multi-Azimuth Defense Fast Intercept Round Engagement (MAD-FIRES) program is developing a point defense system against today's most stressing threats by developing a highly maneuverable, medium caliber, guided projectile, fire sequencing and control system capable of neutralizing large threat raids of high speed, highly maneuverable targets. Leveraging recent advancements in gun hardening, miniaturization of guided munition components, and long-range sensors, MAD-FIRES advances fire control technologies, medium caliber gun technologies, and guided projectile technologies enabling the multiple, simultaneous target, kinetic engagement mission at greatly reduced costs. MAD-FIRES will achieve lethality overmatch through accuracy rather than size, thus expanding the role of smaller combat platforms into missions where they have been traditionally outgunned. MAD-FIRES, sized as a medium caliber system, enhances flexibility for installment as a new ship self-defense system. This phase of the program is focused on demonstrating end-to-end system performance against surrogate supersonic targets. Prior to FY 2022, this program was funded in PE 0602702E, Project TT-03. ***FY 2022 Plans:*** - Initiate enhanced lethality study to refine threat defeat predictions. - Initiate development of software and hardware-in-the-loop simulations to improve fidelity of tactical models. ***FY 2023 Plans:*** - Validate lethality model through analysis of impact results. - Refine software and hardware-in-the-loop simulations for engagement of targets. - Initiate design cycle to mature projectile towards tactical capability against threats. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increase reflects activities leading up to at sea testing of a fully integrated demonstrator.			
Title: Hunter	12.863	6.924	6.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-02 / *MARITIME SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: The Hunter program seeks to develop novel concepts for Extra Large Unmanned Undersea Vehicles (XLUUVs) to deliver complex payloads. The program will explore efficient encapsulation and buoyancy control concepts to be implemented with advanced fiber handling capabilities for high bandwidth communications in order to create a highly modular and adaptable ocean interface. This interface will give XLUUVs significantly increased payload handling ability and allow them to deliver completely new capabilities previously delivered only by manned platforms. Building upon research conducted under the Cross Domain Maritime Surveillance and Targeting (CDMaST) program budgeted in this PE/Project, the Hunter program will establish a new capability for integration into maritime system of systems warfare architectures. Technologies developed under the Hunter program will transition to the Navy. ***FY 2022 Plans:*** - Upgrade Hunter carriage to accommodate hosting and deployment of alternate payloads. - Complete coordinated in-water system of systems testing. ***FY 2023 Plans:*** - Conduct end-to-end mission demonstration. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects the transition from system integration and test to final mission demonstration.			
Title: Advanced Propulsors, Experimental (APEX) ***Description:*** Current submarine propulsor and propeller designs have reached the technical limits of achieving significant improvements, constrain ship layouts, and maneuvering capabilities. The Advanced Propulsors, Experimental (APEX) program is developing and demonstrating a new generation of submarine propulsor designs enabling revolutionary improvements in submarine design, maneuverability, speed, and quieting that will transform future submarine designs. The APEX program is building upon technologies developed in the Maritime Defense program budgeted in PE 0602702E, Project TT-03. The anticipated transition is to the U.S. Navy. ***FY 2023 Plans:*** - Initiate mechanical design feasibility studies. - Complete the hydrodynamic design. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects program initiation.	-	-	14.000
Title: Cross Domain Maritime Surveillance and Targeting (CDMaST)	11.326	3.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-02 / *MARITIME SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: The Cross Domain Maritime Surveillance and Targeting (CDMaST) program seeks to identify and implement architectures consisting of novel combinations of manned and unmanned systems to execute long-range kill chains and develop a robust "kill web" against submarines and ships over large contested maritime areas. By exploiting promising new developments in unmanned platforms, seafloor systems, and emerging long-range weapon systems, the program will develop an advanced, integrated undersea and above sea warfighting capability. The CDMaST program will establish an analytical and experimental environment to explore architecture combinations in terms of operational effectiveness as well as engineering feasibility and robustness. The program will leverage enabling technologies needed for command, control, and communication (C3) between physical domains in order to support the architecture constructs. Through experimentation, the program will not only demonstrate integrated system performance, but also develop new tactics that capitalize on features created by the heterogeneous architecture. The CDMaST program will invest in technologies that will reduce cost, manage complexity, and improve reliability. Technologies from this program will transition to the Navy. ***FY 2022 Plans:*** - Complete the analysis of the final experimentation event and provide a report of program experimentation results. - Complete transition of hardware, software, and reports to the Navy. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.			
Title: Ocean of Things	13.011	5.403	-
Description: The goal of the Ocean of Things program is to advance oceanographic sensing and maritime awareness using low-power microelectronics and advanced data analytics. Ocean of Things builds upon advances made in the Cross Domain Maritime Surveillance and Targeting (CDMaST) program, budgeted in this PE/Project. Ocean of Things will develop large numbers of heterogeneous sensing floats to cover large ocean areas, while incorporating environmentally friendly construction materials. These platforms will leverage satellite communications to populate a large data repository with sensor outputs for shared processing. Ocean of Things will apply advanced analysis techniques to the stored data to synthesize and discover new signals and behaviors in the ocean environment. The program will research the spatio-temporal composability of sensors and develop applications for distributed platform behavior using an internet of things (IoT) architecture deployed across the world's oceans. Further research will examine additional platform capabilities and system impacts of communication rate and edge processing. The Ocean of Things program will improve ocean awareness and provide persistent coverage to areas between existing platforms. Technologies developed in Ocean of Things will transition to the Navy. ***FY 2022 Plans:*** - Develop advanced algorithms and automated performance.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-02 / *MARITIME SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Integrate analytic and ocean modeling products into Navy applications. - Test advanced algorithms on large-scale data. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.			
Title: Angler ***Description:*** The undersea domain has significant importance to national security and military operations. Yet it is a challenging domain in which to operate due to extreme water pressures, restricted communications, ever changing bottom environments, and marine fouling and corrosion. The Angler program will improve U.S. operations in this domain by enabling underwater robotic systems significantly ahead of the state-of-the-art. These robotic systems would be able to search and manipulate objects autonomously, even in dark, turbulent, and semi-opaque sea conditions without the need for human control and without reliance on the Global Positioning System (GPS). Key Angler technical challenges include sensing techniques that provide high-resolution navigation without GPS, perception and manipulation strategies for objects with unknown parameters, long duration autonomy approaches to support mission execution, and autonomy approaches that do not rely on human intervention. This program was initiated in an applied research effort budgeted in FY 2020 PE 0602702E, Project TT-03. ***FY 2022 Plans:*** - Complete program closeout activities. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.	26.000	4.000	-
Accomplishments/Planned Programs Subtotals	161.728	149.127	179.397

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	Project (Number/Name) NET-06 / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
NET-06: *NETWORK-CENTRIC WARFARE TECHNOLOGY*	-	314.676	358.055	431.158	-	431.158	505.250	347.150	242.500	0.000	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project funds classified DARPA programs that are reported in accordance with Title 10, United States Code, Section 119(a)(1) or its successor.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Classified DARPA Program	314.676	324.555	431.158
Description: This project funds Classified DARPA Programs. Details of this submission are classified.			
FY 2022 Plans: Details will be provided under separate cover.			
FY 2023 Plans: Details will be provided under separate cover.			
FY 2022 to FY 2023 Increase/Decrease Statement: Details will be provided under separate cover.			
Accomplishments/Planned Programs Subtotals	314.676	324.555	431.158

	FY 2021	FY 2022
Congressional Add: Deployable Surveillance Systems - Congressional Add	-	21.000
FY 2022 Plans: Details will be provided under separate cover.		
Congressional Add: Ukraine Supplemental - Congressional Add	-	12.500
FY 2022 Plans: Details will be provided under separate cover.		
Congressional Adds Subtotals	-	33.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603766E / *NETWORK-CENTRIC WARFARE TECHNOLOGY*	**Project (Number/Name)** NET-06 / *NETWORK-CENTRIC WARFARE TECHNOLOGY*

D. Acquisition Strategy

N/A