Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Defense Advanced Research Projects Agency	Date: March 2023
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 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	-	654.001	673.562	885.425	-	885.425	941.270	843.609	549.919	499.976	-	-
NET-01: *JOINT WARFARE SYSTEMS*	-	122.771	66.507	110.335	-	110.335	98.703	107.842	132.918	157.341	-	-
NET-02: *MARITIME SYSTEMS*	-	165.682	176.097	160.050	-	160.050	154.410	209.574	265.588	300.324	-	-
NET-06: *NETWORK-CENTRIC WARFARE TECHNOLOGY*	-	365.548	430.958	615.040	-	615.040	688.157	526.193	151.413	42.311	-	-

A. Mission Description and Budget Item Justification

The efforts described in this Program Element (PE) address the Advanced Technology Development associated with the Network-Centric Warfare Technology Program that 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 PE 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 2024 Defense Advanced Research Projects Agency	Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	668.271	678.562	771.075	-	771.075
Current President's Budget	654.001	673.562	885.425	-	885.425
Total Adjustments	-14.270	-5.000	114.350	-	114.350
• Congressional General Reductions	0.000	-5.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	4.464	0.000			
• SBIR/STTR Transfer	-18.734	0.000			
• TotalOtherAdjustments	-	-	114.350	-	114.350

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
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 2022: Decrease reflects SBIR/STTR transfer offset by reprogrammings.
FY 2023: Decrease reflects a Congressional reduction.
FY 2024: Increase reflects initiation of the Banyan and Osprey programs as well as the scaling up of efforts in the Autonomous Multi-domain Adaptive Swarms-of-Swarms (AMASS), Assault Breaker II (ABII), Advanced Propulsors and Experimental (APEX), and classified programs.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency			Date: March 2023
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 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
NET-01: *JOINT WARFARE SYSTEMS*	-	122.771	66.507	110.335	-	110.335	98.703	107.842	132.918	157.341	-	-
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 2022	FY 2023	FY 2024
Title: Assault Breaker II (ABII)	35.754	36.515	60.097
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 2023 Plans: - Identify kill web architectures and effects.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
- Demonstrate model and simulation fully operational capability. - Test and evaluate multi-domain, multi-level security environment. - Execute large scale experimentation campaign utilizing VFDE and Distributed Experimentation Environment (DE2) capabilities. - Participate in large scale exercise-based experiment. - Integrate battle management tools into VFDE. ***FY 2024 Plans:*** - Design kill web architecture study-based scenarios for M&S and experimentation validation. - Conduct final model and simulation execution and analysis. - Complete validation of multi-level security environment. - Complete validation of architectures in experimentation environment. - Transition experimentation environment and battle management capabilities to the Services. - Transition M&S system to the Services. - Complete final recommendations for validated warfighting architectures. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 increase reflects the completion of the system demonstrations and a shift to complete system verification and validation for operational use and transition to the Services.			
Title: Air Combat Evolution (ACE)	22.666	21.652	14.627
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), surrogate, 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 2023 Plans:*** - Refine and implement WVR algorithms onto surrogate aircraft with progression from test to 1v1 and 2v1 scenarios. - Conduct surrogate aircraft trust assessment event.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
- Extend combat autonomy to more complex campaign scenarios with additional realism. - Conduct surrogate aircraft flight evaluations of combat autonomy. ***FY 2024 Plans:*** - Conduct flight test of WVR algorithms on full-scale aircraft with progression from 2v1 to 2v2 scenarios. - Integrate combat autonomy for more complex campaign scenarios with real world data. - Conduct full-scale aircraft flight evaluations of combat autonomy. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects a shift from algorithm development and flight testing to integration and evaluation.			
Title: Systems of Systems-Enhanced Small Units (SESU) ***Description:*** The Systems of Systems-Enhanced Small Units (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 transition to the Services. ***FY 2023 Plans:*** - 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 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects program completion.	14.351	4.340	-
Title: Autonomous Multi-domain Adaptive Swarms-of-Swarms (AMASS) ***Description:*** Autonomous Multi-domain Adaptive Swarms-of-Swarms (AMASS) builds on the successes of SESU (budgeted in this PE/Project) and on related Service programs to create a scalable, robust, and interoperable system-of-systems, capable of defeating adversary Anti-Access/Area Denial (A2/AD) capabilities at the theatre level. The SESU program leveraged a large number of cost-imposing, autonomous drones with a small footprint in order to degrade, disrupt, deceive, or destroy an adversary's A2/AD capabilities at the operational level. The program focused on command and control (C2) to plan and execute	-	4.000	35.611

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
mission level effects (e.g., open corridors for conventional force employment) in contested environments, swarm behaviors, and control of payloads required to sense and effect. The AMASS C2 software and architecture will coordinate the operations of a heterogenous mix of autonomous air, ground, and surface assets, developed by different Services and vendors, running different swarm behavior software, with different payloads, in order to deliver distributed sensing, kinetic and non-kinetic effects, information operations, and other hybrid effects. AMASS planning and execution software will enable disparate autonomous platforms to collaborate and negotiate with each other to complete complex counter-A2/AD missions and to dynamically adapt to changes in the environment such as attrition, targeting errors, and unanticipated adversary actions, as well as changes in missions or target sets. AMASS provides an unprecedented capability, allowing autonomous platforms developed for specific purposes to contribute to various missions without the need for redesign. AMASS will be conducted in partnership with the Services to leverage their swarm technology investments. The planned transition partners for the capability are Service Programs of Record. ***FY 2023 Plans:*** - Develop architecture to support swarm (airborne, waterborne (surface), and ground-based) behaviors and performance understanding for a common C2. ***FY 2024 Plans:*** - Enhance SESU C2 to support planning and execution of missions leveraging multiple disparate airborne, waterborne (surface), and ground-based drone swarms. - Design and develop C2 software enabling swarms (airborne, waterborne (surface), and ground-based) to negotiate with each other in order to achieve mission objectives. - Integrate AMASS C2 and swarm behavior software with Service Force-on-Force simulation environments for conducting simulated wargames and assessing performance. - Design and develop algorithms that enable sensors and effectors from different manufacturers, residing on different swarms, to achieve greater performance than they would independently. - Apply AMASS technologies to new threats and geographies in simulation. - Conduct simulations to assess software performance and make improvements using Service Force-on-Force simulation environments and other simulation tools. - Update C2 architecture based on simulation results to support different swarm (airborne, waterborne (surface), and ground-based) behaviors. - Update C2 planning and execution software based on simulation results. - Update C2 software that enables swarms to negotiate with each other based on simulation results. - Update sensor and effector algorithms based on simulation results. ***FY 2023 to FY 2024 Increase/Decrease Statement:***			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
The FY 2024 increase reflects a shit from architecture development to software and algorithm development.			
Accomplishments/Planned Programs Subtotals	72.771	66.507	110.335

	FY 2022	FY 2023
Congressional Add: ABII Acceleration - Congressional Add ***FY 2022 Accomplishments:*** Accelerated and expanded multi-domain capabilities.	50.000	-
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 2024 Defense Advanced Research Projects Agency			Date: March 2023
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 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
NET-02: *MARITIME SYSTEMS*	-	165.682	176.097	160.050	-	160.050	154.410	209.574	265.588	300.324	-	-
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 2022	FY 2023	FY 2024
Title: No Manning Required Ship (NOMARS)	30.600	36.000	27.548

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 Navy.

FY 2023 Plans:

- Conduct detailed design for NOMARS demonstrator vessel.
- Complete Critical Design Review for NOMARS demonstrator vessel.
- Conduct subsystem risk reduction demonstrations.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
- Initiate integrated system-level fabrication. ***FY 2024 Plans:*** - Complete subsystem verification and validation. - Complete build of the demonstrator vessel. - Conduct Test Readiness Reviews. - Perform ship-level verification and validation activities. - Initiate at-sea demonstrations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects a shift from design and procurement to fabrication and testing.			
Title: Manta Ray ***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 Navy. ***FY 2023 Plans:*** - Conduct at-sea demonstration of key subsystems. - Conduct testing of small-scale vehicle in controlled maritime environments. - Complete testing of vehicle software and autonomy in simulation and surrogate environments. - Complete fabrication and continue integration of full-scale vehicle. ***FY 2024 Plans:*** - Complete integration of full-scale vehicle. - Conduct preliminary testing of full-scale vehicle in controlled maritime environments. - Conduct at-sea demonstration of full-scale vehicle performing full range of behaviors and capabilities. - Refurbish full-scale vehicle in preparation for follow-on long endurance testing. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	29.500	36.069	19.800

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
The FY 2024 decrease reflects the shift from fabrication and integration activities to testing.			
Title: Timely Information for Maritime Engagements (TIMEly) ***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 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 2024 Plans:*** - Conduct end-to-end demonstration with operational mission partners. - Conduct post-test analysis to evaluate TIMEly operational effectiveness. - Transition TIMEly hardware and software products to the Navy. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects a shift from manufacturing and integration to an end-to-end demonstration and operational analysis.	16.500	14.500	12.500
Title: Sea Train ***Description:*** The Sea Train program is supporting the delivery of masses of Unmanned Surface Vessels (USVs) 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 USVs. The Sea Train concept enables vessels that are efficient for transoceanic transport while enabling dispersed operations as individual vessels. The Sea Train program	37.185	35.650	5.949

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
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 2023 Plans:*** - Complete development and fabrication of four one-third scale demonstrator systems. - Conduct one-third 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 demonstration models to the Navy for follow-on testing to support emerging Medium Unmanned Surface Vehicles (MUSV) operations and designs. ***FY 2024 Plans:*** - Conduct demonstration of fleet representative missions to include aggregation, disaggregation and operations within complex seaways. - Conduct objective system Concept Design Review update. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects the shift from fabrication and assembly to model testing.			
Title: Goblin ***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 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 Navy. ***FY 2023 Plans:***	18.200	22.378	9.500

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
- Conduct risk reduction activities supporting development of demonstrator systems. - Complete demonstrator development and test in a representative maritime environment. - Finalize designs and complete full system integration. ***FY 2024 Plans:*** - Test full system in a representative maritime environment. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects shift from completion of full system integration to maritime testing.			
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 Propulsor, 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 Advanced Maritime Defense Technologies Concepts budgeted in PE 0602702E, Project TT-03. The anticipated transition is to the Navy. ***FY 2023 Plans:*** - Initiate mechanical design space exploration (DSE) feasibility studies. - Initiate development of a 1/20th scale demonstrator. - Complete System Requirements Review (SRR). ***FY 2024 Plans:*** - Complete development of 1/20th scale demonstrator. - Complete Concept Design Review (CoDR) for objective system. - Conduct hydrodynamic and maneuvering testing with demonstrator in laboratory environment. - Complete Preliminary Design Review (PDR) for demonstrator system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 increase reflects a shift from the design and development of the demonstrator to testing of the demonstrator and completion of the preliminary design review.	-	14.000	36.300
Title: Willow ***Description:*** The Willow program will develop innovative payloads to conduct Acoustic Warfare (AW) to counter active surface sonars using a unique combination of acoustic hardware and waveforms provided by advanced sonar signal processing algorithms. Based on technology developed in the DARPA TIMEly program (budgeted in this PE/Project), Willow will provide a	-	5.000	30.002

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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 2022	FY 2023	FY 2024
robust capability to help the Navy respond to active sonar threats. No current method exists to challenge adversary active sonars. Willow will use advanced hardware-in-the-loop simulations, Independent Verification and Validation (IV&V), and stressing at-sea testing to create this capability. Technology developed under this program will transition to the Navy. ***FY 2023 Plans:*** - Conduct concept study for additional Willow deployments. ***FY 2024 Plans:*** - Define operational concepts based on selected performer systems. - Develop prototype acoustic projector payload hardware commensurate with operational concepts. - Develop software and waveforms to provide acoustic effects to support counter sonar capabilities. - Conduct end-to-end performer software simulations to provide interim analysis against program metrics. - Conduct IV&V to verify performer simulations, hardware, and waveforms. - Conduct in-water engineering tests of critical hardware components. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 increase reflects a shift from conceptual studies to development and testing.			
Title: Osprey ***Description:*** The Osprey program is exploring advanced anti-surface warfare (ASuW) and anti-submarine warfare (ASW) weapons concepts. The Osprey program will conduct detailed design, risk reduction, and development of the weapons concepts culminating in final demonstrations against representative targets. ***FY 2024 Plans:*** - Perform trade studies on weapons concepts. - Complete a conceptual design review. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 increase reflects program initiation.	-	-	6.451
Title: Banyan ***Description:*** The goal of the Banyan program is to develop novel approaches to monitor the maritime environment using advanced opto-acoustic sensing techniques on existing undersea cables. Continuing the environmental monitoring initiatives established in Ocean of Things (budgeted in this PE/Project), Banyan will advance the United Nations Science Monitoring And Reliable Telecommunications (SMART) Cable Initiatives in detecting events in maritime environments such as seismic activity, tsunami activity, and ocean temperature deviations. DARPA will examine the ability of phase and/or polarization changes in fiber	-	-	12.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency		Date: March 2023
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 2022	FY 2023	FY 2024
optic signals to monitor these phenomena. Banyan will develop advanced signal processing to measure how these phenomena impart changes to the refractive coefficient of optical fiber in existing data cables to both detect and localize these events. Banyan will ultimately transition to the Services. ***FY 2024 Plans:*** - Conduct laboratory experimentation and signal characterization. - Collect signal and environmental data to inform initial algorithm development. - Design initial hardware concept and design software. - Conduct data collection efforts and analyze results. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 increase reflects program initiation.			
Title: Multi-Azimuth Defense Fast Intercept Round Engagement System (MAD-FIRES) ***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, miniature, hit-to-kill, guided projectile and the associated fire sequencing and control system MAD-FIRES will demonstrate the capability to defeat large threat raids of high speed, highly maneuverable targets. MAD-FIRES advances fire control technologies, medium-caliber projectile technologies, and guided hit-to-kill technologies enabling the multiple, simultaneous target, kinetic engagement mission at greatly expanded raid sizes. MAD-FIRES will achieve lethality overmatch through hit-to-kill accuracy rather than warhead size, thus expanding the role of smaller combat platforms into missions where they have been traditionally held at risk. MAD-FIRES miniaturization 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. This program is also funded in PE 0602702E, Project TT-03. ***FY 2023 Plans:*** - Validate lethality model through analysis of impact results. - Refine software and hardware-in-the-loop simulations for engagement of targets. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects program completion.	6.000	6.500	-
Title: Hunter ***Description:*** The Hunter program is developing 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	6.294	6.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency		Date: March 2023
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 2022	FY 2023	FY 2024
completely new capabilities previously delivered only by manned platforms. 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 2023 Plans:*** - Conduct end-to-end at-sea mission demonstration with alternate payloads. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The FY 2024 decrease reflects program completion.			
Title: Ocean of Things ***Description:*** The goal of the Ocean of Things program was to advance oceanographic sensing and maritime awareness using low-power microelectronics and advanced data analytics. Ocean of Things developed large numbers of heterogeneous sensing floats to cover large ocean areas, while incorporating environmentally friendly construction materials. These platforms leveraged satellite communications to populate a large data repository with sensor outputs for shared processing. Ocean of Things applied advanced analysis techniques to the stored data to synthesize and discover new signals and behaviors in the ocean environment. The program researched the spatio-temporal composability of sensors and developed applications for distributed platform behavior using an internet of things (IoT) architecture deployed across the world's oceans. Further research examined additional platform capabilities and system impacts of communication rate and edge processing. The Ocean of Things program improved ocean awareness and provided persistent coverage to areas between existing platforms. Technologies developed in Ocean of Things transitioned to the Navy and the National Oceanic and Atmospheric Administration (NOAA).	10.403	-	-
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 improved 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 included 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.	8.000	-	-
Title: Cross Domain Maritime Surveillance and Targeting (CDMaST)	3.000	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency		Date: March 2023
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 2022	FY 2023	FY 2024
Description: The Cross Domain Maritime Surveillance and Targeting (CDMaST) program identified and implemented 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 developed an advanced, integrated undersea and above sea warfighting capability. The CDMaST program established an analytical and experimental environment to explore architecture combinations in terms of operational effectiveness as well as engineering feasibility and robustness. The program leveraged enabling technologies needed for command, control, and communication (C3) between physical domains in order to support the architecture constructs. Through experimentation, the program not only demonstrated integrated system performance, but also developed new tactics that capitalize on features created by the heterogeneous architecture. The CDMaST program invested in technologies that reduce cost, manage complexity, and improve reliability. Technologies from this program transitioned to the Navy.			
Accomplishments/Planned Programs Subtotals	165.682	176.097	160.050

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency			Date: March 2023
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 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
NET-06: *NETWORK-CENTRIC WARFARE TECHNOLOGY*	-	365.548	430.958	615.040	-	615.040	688.157	526.193	151.413	42.311	-	-
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 2022	FY 2023	FY 2024
Title: Classified DARPA Program	332.048	430.958	615.040
Description: This project funds Classified DARPA Programs. Details of this submission are classified.			
FY 2023 Plans: Details will be provided under separate cover.			
FY 2024 Plans: Details will be provided under separate cover.			
FY 2023 to FY 2024 Increase/Decrease Statement: Details will be provided under separate cover.			
Accomplishments/Planned Programs Subtotals	332.048	430.958	615.040

	FY 2022	FY 2023
Congressional Add: Deployable Surveillance Systems - Congressional Add ***FY 2022 Accomplishments:*** Details will be provided under separate cover.	21.000	-
Congressional Add: Ukraine Supplemental - Congressional Add ***FY 2022 Accomplishments:*** Details will be provided under separate cover.	12.500	-
Congressional Adds Subtotals	33.500	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Defense Advanced Research Projects Agency		Date: March 2023
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