Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Navy	Date: March 2024
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603673N *I Future Naval Capabilities Advanced Tech Dev*

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	0.000	260.420	264.700	262.869	-	262.869	277.047	271.648	275.782	286.575	Continuing	Continuing
1161: *Expeditionary Maneuver Warfare (EMW)*	0.000	0.000	0.000	24.392	-	24.392	14.100	0.000	0.000	0.000	0.000	38.492
1162: *Air Warfare (AW)*	0.000	0.000	0.000	63.028	-	63.028	46.473	19.573	0.000	0.000	0.000	129.074
1163: *Information Warfare (IW)*	0.000	0.000	0.000	61.467	-	61.467	46.129	24.870	14.000	0.000	0.000	146.466
1164: *Surface Warfare (SW)*	0.000	0.000	0.000	48.563	-	48.563	46.490	37.035	19.400	0.000	0.000	151.488
1165: *Undersea Warfare (UW)*	0.000	0.000	0.000	60.249	-	60.249	36.362	18.345	0.000	0.000	0.000	114.956
3346: *Future Naval Capabilities Adv Tech Dev*	0.000	243.044	264.700	5.170	-	5.170	87.493	171.825	242.382	286.575	Continuing	Continuing
9999: *Congressional Adds*	0.000	17.376	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.376

A. Mission Description and Budget Item Justification

The Office of Naval Research (ONR) was established to ensure the technological advantage of U.S. Naval forces. ONR manages the Department of the Navy's science and technology (S&T) research portfolio (Basic, Applied and Advanced Technology Development investments). This work includes the Future Naval Capabilities (FNC) program, which delivers technology solutions to known requirements and accelerates innovative technology insertion into Programs of Record (PORs). In close and structured coordination with POR Stakeholders (Combat Capability Development organizations, Operating Forces, and acquisition organizations), FNC efforts create revolutionary technology for Programs of Record (PORs). ONR's S&T competencies create substantially higher levels of technology, trade space, and capability gain than acquisition can create within POR programmatic risk constraints. FNC projects create exponential technology improvement substantially cheaper than POR vendors do. The structured FNC process and its specific transition mechanisms manage technical risk and increase the likelihood that technologies systematically deploy to warfighters.

The efforts described in this Program Element (PE) 0603673N for FNC Advanced Technology Development use earlier research conducted in PE 0602750N for FNC Applied Research and have follow-on transition funding commitments in the receiving acquisition POR PEs. Using a competitive selection process, ONR and POR Stakeholders assess and select each effort in this PE based on its revolutionary technology payoff to the naval warfighter and prioritized operating force requirements. FNC requests from POR Stakeholders exceed funding available in the FNC Program and drive the competitive selection.

Due to the classified efforts in this PE, some have incomplete descriptions. ONR can provide additional information in classified documents.

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Navy	Date: March 2024
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603673N *I Future Naval Capabilities Advanced Tech Dev*

B. Program Change Summary ($ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	268.993	264.700	272.130	-	272.130
Current President's Budget	260.420	264.700	262.869	-	262.869
Total Adjustments	-8.573	0.000	-9.261	-	-9.261
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.000	0.000			
• SBIR/STTR Transfer	-5.573	0.000			
• Program Adjustments	0.000	0.000	-9.261	-	-9.261
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2023	FY 2024
Project: 9999: *Congressional Adds*		
Congressional Add: *Advanced Energetics Research*	4.827	0.000
Congressional Add: *Development of Submersible Air Revitalization*	7.723	0.000
Congressional Add: *Advanced carbon nanotube conductors for naval power systems*	4.826	0.000
Congressional Add Subtotals for Project: 9999	17.376	0.000
Congressional Add Totals for all Projects	17.376	0.000

Change Summary Explanation

Funding: The funding decrease is due to a reduction in S&T Advanced technology development to comply with the Defense Planning Guidance. A new project structure was created to promote greater transparency and execution oversight for the 6.3 Future Naval Capabilities in the Department of the Navy's annual budget request. Projects 1161-1165 were previously funded in this PE in Project 3346 and are not new starts.

Technical: No significant change.

Schedule: No significant change

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy			Date: March 2024
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 1161 / *Expeditionary Maneuver Warfare (EMW)*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
1161: *Expeditionary Maneuver Warfare (EMW)*	0.000	0.000	0.000	24.392	-	24.392	14.100	0.000	0.000	0.000	0.000	38.492
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Ongoing FNC investments in this Project were previously funded in this same PE 0603673N under the Expeditionary Maneuver Warfare (EMW) planned program of Project 3346 - Future Naval Capabilities Adv Tech Dev. This Project was created to promote greater transparency and execution oversight for EMW FNC investments in the Department of the Navy's budget request. This is not a new start.

A. Mission Description and Budget Item Justification

The Expeditionary Maneuver Warfare (EMW) Project focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in PE 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. The advanced technologies being developed under this Project include innovative naval mine, mine counter measures (MCM), mine delivery methods, low observable mine neutralization technologies, and other technologies supporting expeditionary maneuver warfare overall.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Expeditionary Maneuver Warfare	0.000	0.000	24.392	0.000	24.392
Articles:	-	-	-	-	-
Description: The Expeditionary Maneuver Warfare Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in PE 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. The advanced technologies being developed under this Project include innovative naval mine, mine counter measures (MCM), mine delivery methods, low observable mine neutralization technologies, and other technologies supporting expeditionary maneuver warfare overall.					
FY 2024 Plans: N/A					
FY 2025 Base Plans: Magnetic & Acoustic Generation Next Unmanned Superconducting Sweep (MAGNUSS) - Continue the MAGNUSS FNC advanced development model prototype construction and testing of magnetic, acoustic and command/control sub-systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1161 / *Expeditionary Maneuver Warfare (EMW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Conduct system integration to test asset and prepare for craft integration and on-water testing. Long-Range Over the Horizon (OTH) Communications at High Frequency (HF) Using a Nested, Electronically-Steered System (LOCH NESS) - Continue HF multifunction architecture development for greater resiliency. - Continue waveform design and beam forming/nulling with advanced algorithms and M&S validation. - Continue prototype development with pacing demonstration of capabilities. - Initiate final design review with stakeholders. Next Generation High Frequency (NGHF) - Continue the NGHF FNC by completing modeling and simulation of HF detection algorithms. - Implement candidate HF signal detection algorithms in hardware, then test with surrogate signal sources. - Initiate fabrication of relocatable HF test system. Cognitive Router (CR) - Complete the Cognitive Router FNC by completing the development of an Artificial Intelligence / Machine Learning (AI/ML) - based cognitive engine for autonomous in-situ decision making for network discovery, link parameters optimization, and link path optimization. Demonstrate the next increment of autonomous behaviors for cooperative Unmanned Undersea Vehicle (UUV) autonomy with focus on objective arbitration and threat avoidance. - Complete testing with Naval Special Warfare (NSW) relevant targets. - Complete the development of data exfiltration, path planning, obstacle and threat avoidances, and networking. - Characterize effectiveness of autonomy to perform the NSW tasks in multiple environments. - Complete the development of the Cognitive Router, which is a clandestine AI-enabled, autonomous, undersea, low-latency cross-domain network. - Demonstrate Gen1 Cognitive Router AI control and link management in a water data collection event in relevant environments. ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY2024 to FY 2025 increase is associate with the new project structure. These funds represent all selected Expeditionary Maneuver Warfare FNCs funded in this PE. These funds were moved from the Expeditionary					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1161 / *Expeditionary Maneuver Warfare (EMW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Maneuver Warfare (EMW) planned program of Project 3346 - Future Naval Capabilities Adv Tech Dev. Even though there is a funding increase due to the new project structure, there is a wind down of the Cognitive Router and Magnetic & Acoustic Generation Next Unmanned Superconducting Sweep (MAGNUSS) FNCs as they approach completion in FY25 and FY26 respectively.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	24.392	0.000	24.392

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy			Date: March 2024
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 1162 / *Air Warfare (AW)*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
1162: *Air Warfare (AW)*	0.000	0.000	0.000	63.028	-	63.028	46.473	19.573	0.000	0.000	0.000	129.074
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Ongoing FNC investments in this Project were previously funded in this same PE 0603673N under the Air Warfare (AW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev. This Project was created to promote greater transparency and execution oversight for AW FNC investments in the Department of the Navy's budget request. This is not a new start.

A. Mission Description and Budget Item Justification

The Air Warfare Project focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include human machine interfaces for unmanned platforms and payloads that will assist with delegation of resources from one operator to another, airframe corrosion protection, and a Carrier Air Wing performance assessment tool that uses live, virtual, and constructive data to improve pilot and aircrew performance in near real-time. Different software efforts address unique and specific requirements.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Air Warfare	0.000	0.000	63.028	0.000	63.028
Articles:	-	-	-	-	-
Description: The Air Warfare Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include human machine interfaces for unmanned platforms and payloads that will assist with delegation of resources from one operator to another, airframe corrosion protection, and a Carrier Air Wing performance assessment tool that uses live, virtual, and constructive data to improve pilot and aircrew performance in near real-time. Different software efforts address unique and specific requirements.					
FY 2024 Plans: N/A					
FY 2025 Base Plans: Advanced Autonomous Air-to-Air Refueling System (A4RS)					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1162 / *Air Warfare (AW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Continue to implement an Autonomous Aerial Refueling Modular Open System Architecture with component level and subsystem level build up and testing. The test articles will be used to conduct future surrogate demonstrations of a tanking MQ-25 with a podded aerial refueling store subsystem and a receiving MQ-25 with a computer vision-based navigation subsystem. Coordinated Advanced Distributed Radio Frequency (RF) Effects (CADRE) - Continue development of novel technology capabilities to enable advanced distributed and coordinated airborne electronic attack techniques to defeat advanced threats. - Continue development of firmware enhancements to enable coordinated techniques in the host platform. - Conduct hardware-in-the-loop experimentation to evaluate effectiveness of single platform enhancements. - Initiate development of multi-platform coordination capability. Modified Aircraft Gamma Inceptor Control Platform Recovery Optimization Program (MAGIC PROP) - Continue development of system architecture and detailed design of the prototype system for the E 2D CVN recovery improvements. - Develop, integrate, and test critical prototype functionality through the use of model-based engineering, simulation, and hardware component testing of flight control system components. - Initiate software integration with prototype hardware and develop detailed aircraft integration plan for flight demonstration. Digital Expanded Ultra-High Frequency (UHF) Multiple Input, Multiple Output (MIMO) Optimized Radar (DEUMOR) - Complete the DEUMOR FNC by finishing development of high-value signal processing, MIMO, Cognitive and Advanced Space-Time-Adaptive Processing (STAP) algorithms, and advanced antenna technologies for airborne surveillance platforms. - Complete flight testing of prototype hardware and software. - Validate exit criteria and technical performance parameters. - Deliver final design package for transition to the Program of Record. Prediction of Regional Operational Propagation of HF for EMSO Tactics (PROPHET) - Complete the PROPHET FNC by finalizing the refined prototype developed in FY24. Test the prototype against the exit criteria in a representative environment, document the verification and validation from those tests, and deliver the final software into Program of Record system.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1162 / *Air Warfare (AW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
UnderSea Advantage Block Upgrade (USABU) - Initiate development of a large, low-noise volumetric array that can be deployed in an A-size sonobuoy that will have superior detection performance against relevant targets. - Initiate receive sensor array validation and begin sonobuoy integration. - Initiate development of acoustic source array for an A-size sonobuoy that will have increased operational bandwidth. - Initiate source array validation and manufacture the first build of the prototype transmit arrays. Stick - Initiate the Stick FNC by conducting data collection and algorithm testing with a Wideband Receiver (WBR) surrogate. - Initiate implementation of OMS messaging needed for algorithm implementation into a tactical platform. - Initiate a target performance study of algorithms implemented in the Wideband Receiver. - Initiate analysis of the RF target data provided. - Initiate test flight planning. ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY2024 to FY 2025 increase is associated with the new project structure. These funds represent all selected Air Warfare FNCs funded in this PE. These funds were moved from the Air Warfare (AW) planned program of Project 3346 - Future Naval Capabilities Adv Tech Dev. The increase supports ramp up of the Advanced Autonomous Air-to-Air Refueling System (A4RS) and Modified Aircraft Gamma Inceptor Control Platform Recovery Optimization Program (MAGIC PROP) FNCs and the FY25 UnderSea Advantage Block Upgrade (USA Block Upgrade) and Stick FNCs.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	63.028	0.000	63.028

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1162 / *Air Warfare (AW)*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy			Date: March 2024
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 1163 / *Information Warfare (IW)*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
1163: *Information Warfare (IW)*	0.000	0.000	0.000	61.467	-	61.467	46.129	24.870	14.000	0.000	0.000	146.466
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Ongoing FNC investments in this Project were previously funded in this same PE 0603673N under the Information Warfare (IW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev. This Project was created to promote greater transparency and execution oversight for IW FNC investments in the Department of the Navy's Budget Request. This is not a new start.

A. Mission Description and Budget Item Justification

The Information Warfare Project focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts provide Information Warfare capabilities across several disparate uses and environments.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Information Warfare	0.000	0.000	61.467	0.000	61.467
Articles:	-	-	-	-	-
Description: The Information Warfare Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts provide Information Warfare capabilities across several disparate uses and environments.					
FY 2024 Plans: N/A					
FY 2025 Base Plans: 4 Leaf Clovers - Continue development of advanced detection and classification algorithms, and begin refinement of models/ simulations for distributed signal processing techniques. - Utilize cybersecurity analysis results to inform solutions for mitigating identified system vulnerabilities, and begin development of cyber tools.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1163 / *Information Warfare (IW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Federated Learning and Optimization for Wireless networks (FLOW) - Continue system engineering, Modeling and Simulation (M&S) for wireless network optimization with enhanced mission performance. - Initiate algorithm and protocol development for network optimization / control - Continue software prototype development. - Initiate final design review with stakeholders Measurement-Based Adaptive Response (M-BAR) - Continue development of technologies needed to enable real-time adaptive electronic attack techniques to defeat modern anti-ship missile threats. - Continue development of real-time processing algorithms that can enhance legacy system performance. - Continue development and testing of techniques that can dynamically reconfigure current processing pipelines to increase system agility. - Continue development and integration of an EW testbed needed to evaluate new electronic attack techniques. Data Framework for Maritime Operations Center of the Future (DF-MOTF) - Complete the DF-MOTF FNC by demonstrating three different battle management aids (Common Track Manager, DARPA's Alchemy, and PMW-120's Horizon) in a multi-level security environment. - Complete multi-level security battle management aid reference architecture documentation. - Complete battle management aid Application Programming Interface (API) that allows an exterior battle management aid to communicate with a multi-level security system. SLQ 32 Signal Identification Improvements (SI^2) - Complete the SI^2 FNC, which was extended into FY25 due to delays in FY24 development. - Complete updating SI^2 functionality based upon FY24 experimentation findings. - Complete evaluating the technology against its exit criteria in a representative environment by testing machine learning based electronic warfare classification systems and their improvements in detection and characterization of modern emitters. - Deliver final reports and technology for incorporation into Program of Record (POR) systems. Data on the Move (DotM) - Complete the DotM FNC by demonstrating the hardware solution constrained to a hardened Pelican size case. - Complete reference implementation documentation.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1163 / *Information Warfare (IW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Demonstrate DotM hardware running a PEO C4I PMW-120 sponsored battle management aid at the given classification level. MAGICO - Complete MAGICO FNC development and conduct lab and field tests to validate capability performance against key parameters and system requirements. - Continue the transition process with the Program of Record (POR) through an integrated demonstration that optimizes outputs to shorten decision cycles, while meeting operational intent. Environmental Satellite Characterization and Algorithm Processor Enhancements (ESCAPE) - Initiate porting of legacy software capabilities, including satellite readers, product specifications, and enhancement suites to demonstrate equivalent capability and continuity from previous system. - Initiate development of new features, including organizational database to streamline production time and graphical user interface upgrades to emphasize program requirements and incorporate current user survey desires. - Conduct initial feature prototype transition and testing in an end-to-end laboratory system. Multi-objective Automated Routing for Ships ALgorithm (MARSHAL) - Initiate the MARSHAL FNC by, which will develop a secure, multi-enclave, cloud-based capability to replace the legacy Fleet Weather Center (FWC) Optimum Track Ship Routing (OTSR) system with a much higher degree of automation and multi-objective optimization, enabling safe and effective physical maneuver in Distributed Maritime Operations for the Hybrid manned and unmanned surface fleet. - Initiate a cloud-computing based Ship Tracker that links to Fleet Command and Control, and scheduling, and includes automated and multi-objective options to provide more frequent, more accurate, and longer lead time guidance to avoid hazardous weather and operate effectively. Spectrum Operations Coordinator for Combat System Electromagnetic Radiation (SOCCER) - Initiate project with selection of industry and government performers to develop, integrate, and test algorithms for dynamic spectrum management. - Initiate Concept of Operation and implementation studies for distributed real-time frequency planning. - Initiate model-based systems engineering design for integrated spectrum operations architecture.					
FY 2025 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1163 / *Information Warfare (IW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY2024 to FY 2025 increase is associate with the new project structure. These funds represent all selected Information Warfare FNCs funded in this PE. These funds were moved from the Information Warfare (IW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	61.467	0.000	61.467

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy			Date: March 2024
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 1164 / *Surface Warfare (SW)*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
1164: *Surface Warfare (SW)*	0.000	0.000	0.000	48.563	-	48.563	46.490	37.035	19.400	0.000	0.000	151.488
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Ongoing FNC investments in this Project were previously funded in this same PE 0603673N under the Surface Warfare (SW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev. This Project was created to promote greater transparency and execution oversight for SW FNC investments in the Department of the Navy's Budget Request. This is not a new start.

A. Mission Description and Budget Item Justification

The Surface Warfare Project focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include technologies that will provide mission visualization, network analysis, and training for operators in denied and degraded environments.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Surface Warfare	0.000	0.000	48.563	0.000	48.563
Articles:	-	-	-	-	-
Description: The Surface Warfare Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include technologies that will provide mission visualization, network analysis, and training for operators in denied and degraded environments.					
FY 2024 Plans: N/A					
FY 2025 Base Plans: Odysseus (formerly C-ISR) - Continue development of prototype and start integration of prototype into the designated host system, this will include confirming interfaces, packaging and testing of the integrated (prototype plus host) system against derived specified requirements. Crossbow					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1164 / *Surface Warfare (SW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Continue development of Decision Aids that enhance the synchronization of Maritime Dynamic Targeting resources with increased OPNAV coordination for implementation within execution of kill-chain timelines for Anti-Surface Warfare Long Range Fires. This coordination is imperative to ensure seamless capability development across tactical and operational levels of war. Radar Advanced Signal Processing (RASP) - Continue the RASP FNC by completing modelling and simulation of candidate radar signal processing algorithms. - Initiate software implementation of candidate algorithms for operation on representative processing hardware. Amon Hen - Continue the Amon Hen FNC by initiating factory testing of the prototype radar illuminator. - Complete design and documentation for interfaces between the illuminator backend scheduler, illuminator hardware, payload assembly, and the test platform. - Complete at-sea testing with multi-INT apertures and other surveillance radars using a modular payload installed on an available surface platform. Amon Hen - Complete the Amon Hen FNC by integrating the prototype radar illuminator on the host platform and characterizing performance against various targets. - Finalize technical documentation for system design and interfaces. Multi-Spectral High Resolution Targeting Sensor (MUST HITS) - Complete the MUST HITS FNC by completing development of a Digital Read Out Integrated Circuit (DROIC) mated with a high-resolution infrared sensor for detection and tracking of difficult targets. - Complete integration of the camera and processing suite for advanced processing of high bandwidth infrared data streams for multi-target tracking. - Complete build of wideband optics for high throughput and wide field of view systems. - Complete shipboard installation of the advanced camera and deliver digital drawings and all model files to the acquisition program of record and conduct shipboard and field testing against representative targets. Rough Patch III - Complete the Rough Patch III FNC by establishing a functional prototype solution that can be evaluated in a simulated relevant environment designed to provide insight into software architectural and transition hardware					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1164 / *Surface Warfare (SW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
solutions targeted at achieving Technology Readiness Level 6 by FY26. The focus in FY25 will be on improving the communications paths and integration with the chosen mission planner. - Finalize prototype packaging efforts and continue getting operator/fleet input for the mission planning effort. Advanced Non-Kinetic Evaluation for Re-engagement (ANKER) - Initiate Concept of Operation and implementation studies with stakeholder organizations to include Resource, Acquisition, and Fleet sponsors that will guide to develop, integrate, test and transition algorithms and capabilities for non-kinetic effectiveness. - Initiate model-based systems engineering design and operator workflows for integration into existing systems to provide naval capabilities for real-time non-kinetic effectiveness feedback with industry and government performers. - Initiate development of software products to enhance non-kinetic effectiveness employment and feedback through algorithm research, data collection, model development, and metrics definition. - Conduct comparative algorithm characterization in modeling and simulation environment to study impacts on non-kinetics feedback functionality in identified naval systems. Joint Highly intelligent Automation to Accelerate Weapon Kills (J-HAAWK) - Initiate the J-HAWWK FNC by defining Interface Control Documents (ICDs) for the algorithm interfaces, architectural foundation, and key system interchanges and timing. - Initiate design and development of the Predictive Engagement (PEA) and Engagement Completion Algorithms (ECA) and the machine learning of fused data, - Define software Input / Output (I/O) timing and begin development on the 500 KW Laser Weapon System Simulator and Hybrid Threat injector. - Analyze the Publish/Subscription Architecture and the Soft Kill Coordinator Associated Track Parameters and, begin compiling Machine Learning Libraries. ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY2024 to FY 2025 increase is associate with the new project structure. These funds represent all selected Surface Warfare FNCs funded in this PE. These funds were moved from the Surface Warfare (SW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev. There is a decrease from the FY 2024 SW Activity of					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1164 / *Surface Warfare (SW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Project 3346 to this new project primarily due to the completion in FY24 of the Empire, Amon Hen and CHAOS FNCs.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	48.563	0.000	48.563

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy											Date: March 2024	
Appropriation/Budget Activity 1319 / 3					R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*				Project (Number/Name) 1165 / *Undersea Warfare (UW)*			
COST ($ in Millions)	**Prior Years**	**FY 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
1165: *Undersea Warfare (UW)*	0.000	0.000	0.000	60.249	-	60.249	36.362	18.345	0.000	0.000	0.000	114.956
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Ongoing FNC investments in this Project were previously funded in this same PE 0603673N under the Undersea Warfare (UW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev. This Project was created to promote greater transparency and execution oversight for UW FNC investments in the Department of the Navy's Budget Request. This is not a new start.

A. Mission Description and Budget Item Justification

The Undersea Warfare Project focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include improvements to a broad range of undersea warfare capabilities, including undersea weapons, submarine acoustic sensing and signal processing systems, communications, electro-optics systems, signature management, training, and decision aids.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Undersea Warfare	0.000	0.000	60.249	0.000	60.249
Articles:	-	-	-	-	-
Description: The Undersea Warfare Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include improvements to a broad range of undersea warfare capabilities, including undersea weapons, submarine acoustic sensing and signal processing systems, communications, electro-optics systems, signature management, training, and decision aids.					
FY 2024 Plans: N/A					
FY 2025 Base Plans: VIRGINIA Improved Propulsion Bearing (VIPB) - Continue the VIPB FNC by completing full scale VIRGINIA Class bearing manufacture, conducting bearing land-based testing, continuing development of component and coupled shaft-line models, completing fabrication					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1165 / *Undersea Warfare (UW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
of the Large-Scale Shaft-Line Test Site (LSTS), and initiating LSTS shake-down testing. (The SLTC is composed of the LSTS and shaft-line component/coupled models). Multi-Material Propeller Prototype (M2P2) - Continue the M2P2 FNC by manufacturing the Navy approved multi-material structural design (full scale 3-blade/hub prototype), including mechanical design of the Design Validation Rotor (DVR). - Conduct initial testing on the full scale 3-blade/hub prototype in accordance with the NAVSEA approved qualification approach for the multi-material structural design. - Initiate manufacture of large (1/3) scale rotors for testing on the Large-Scale Vehicle (LSV) model at the Acoustic Research Detachment (ARD). Conduct test preparations at ARD including modifications to LSV. Own Ship Acoustic Monitoring (OSAM) - Continue the OSAM FNC by conducting a second at-sea demo in FY25 to verify monitoring system hardware achieves performance objectives and to verify software functionality in an at-sea environment - Continue development of a prototype vulnerability decision aid. - Continue software development informed through an FY25 demo data analysis. - Initiate preparations for a final at-sea demo in FY26. - Complete data analysis from the FY24 demo to assess and verify hardware connectivity to ship systems. Gravity-Aided Inertial Navigation system (GAINS) - Continue the GAINS FNC by completing the preliminary design review and testing of updated/new hardware with integrated software for gravity algorithms to correct position fix and deflection of vertical. - Complete the Critical Design Review. - Continue Concept of Operation and implementation studies for new mission profile. - Initiate integration and testing of new gravimeter for navigation subsystem on test ship. Physical and Networking Layer Prototype (PNLP) - Continue hardware and software bench testing, to include integration for an in-water event. - Continue comparative algorithm characterization to support integration for an in-water event. - Conduct in-water characterization for tuning hardware and software for data collection. MK-48 Acoustic Modifications (M&M)					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1165 / *Undersea Warfare (UW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Complete the M&M FNC, previously planned to complete in FY24, by delivering the new component prototype(s) design to NAVSEA PMS404 and providing inputs to NAVSEA's Engineering Change Proposal paperwork. - Completion of this FNC in FY24 was delayed due to contract execution issues, which required it to be extended by one year. Untethered Goat (U-GOAT) - Complete the U-GOAT FNC by demonstrating a multifunction Intelligence, Surveillance, and Reconnaissance (ISR) payload for Unmanned Underwater Vehicles (UUVs) to support distributed maritime operations. - Complete systems engineering, hardware & software development, and fabrication of initial payload prototypes. - Complete integration efforts with the customer vehicle and/or representative surrogate vehicle. - Complete engineering experimentation efforts including field testing in a representative environment. Next Generation Stern Area System (Next Gen SAS) - Initiate development of algorithms to provide new capabilities using Stern Area System hardware. - Initiate laboratory testing to characterize hardware performance with new algorithms. - Initiate preparations to conduct large-scale in-water tests to evaluate algorithm performance. - Initiate assessment of modifications to VIRGINIA SAS software to incorporate new algorithms. UW-FY25-02 Rough Neptune - Initiate development of antenna aperture for single mast solution. - Design/modify existing mast design to accommodate novel aperture infrastructure. - Initiate development of enabling Active Electronically Steered Array (AESA) technology for a multi-constellation non-geostationary satellite orbit communications capability. - Plan network architecture and engage with stakeholders to develop Concept of Employment (CONEMP). ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY2024 to FY 2025 increase is associate with the new project structure. These funds represent all selected Undersea Warfare FNCs funded in this PE. These funds were moved from the Undersea Warfare (UW) Activity of Project 3346 - Future Naval Capabilities Adv Tech Dev. There is a decrease from the FY 2024 UW Activity of Project 3346 to this new project due to the ramp down of the MK-48 Acoustic Modifications (M&M), Untethered					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 1165 / *Undersea Warfare (UW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Goat (U GOAT), and Physical and Networking Layer Prototype (PNLP) FNCs, which complete in FY 2025 (M&M and U-GOAT) and FY26 (PNLP).					
Accomplishments/Planned Programs Subtotals	0.000	0.000	60.249	0.000	60.249

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy											Date: March 2024	
Appropriation/Budget Activity 1319 / 3					R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*				Project (Number/Name) 3346 / *Future Naval Capabilities Adv Tech Dev*			
COST ($ in Millions)	**Prior Years**	**FY 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
3346: *Future Naval Capabilities Adv Tech Dev*	0.000	243.044	264.700	5.170	-	5.170	87.493	171.825	242.382	286.575	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Funds in this Project decreased from FY 2024 to FY 2025 due to a PE restructuring effort. Funds previously in this project have remained in this PE, but were moved as follows.

* Funds for ongoing FNCs in the following Activities of Project 3346 Future Naval Capabilities Adv Tech Dev were moved to new Projects as follows:
- $24.392M from the Expeditionary Maneuver Warfare Activity was moved to new Project 1161 Expeditionary Maneuver Warfare (EMW)
- $52.989M from the Air Warfare Activity was moved to new Project 1162 Air Warfare (AW)
- $48.996M from the Information Warfare Activity was moved to new Project 1163 Information Warfare (IW)
- $40.471M from the Surface Warfare Activity was moved to new Project 1164 Surface Warfare (SW)
- $46.643M from the Undersea Warfare Activity was moved to new Project 1165 Undersea Warfare (UW)

* $53.319M of estimated funds for FNCs not yet selected have remained in Project 3346 Future Naval Capabilities Adv Tech Dev and were moved to new Activity FNC Advanced Technology Development as follows:
- $4.006M from the Expeditionary Maneuver Activity
- $0.299M from the Air Warfare Activity
- $9.628M from the Information Warfare Activity
- $24.901M from the Surface Warfare Activity
- $14.485M from the Undersea Warfare Activity

Note: All $53.319M of these funds will be moved into the new Projects in this PE after the FY25 FNC selections are made, which will occur before PB25 is submitted.

* $5.320M for ongoing FNCs and estimated FY25 start FNC(s) yet to be selected has remained in Project 3346 Future Naval Capabilities Adv Tech Dev in the Capable Manpower Activity.

A. Mission Description and Budget Item Justification

The Future Naval Capabilities (FNC) Program exploits technology advances and responds quickly to Naval needs. As a result, future Budget Activity (BA) 3 investments supporting the FNC Program are made less than one year before commencing execution. Because FNCs start at higher Technology Readiness Levels (TRL), the typical duration of an FNC is 3-years. The FNC Program favors a high level of collaboration. Program Element R-2 Activities align to warfare areas where the FNC technologies will be integrated into acquisition programs of record.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

A complete accounting of FNC technologies and a full disposition of each technology development effort is provided annually to the Congressional oversight committees.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Capable Manpower (CMP)	2.938	5.165	5.170	0.000	5.170
Articles:	-	-	-	-	-
Description: The Capable Manpower R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts focus on all aspects of training, including accelerated learning, training environments, ready relevant training, and Live-Virtual-Constructive (LVC) training.					
FY 2024 Plans: My Navy Foresight (MNF) - Continue the My Navy Foresight (MNF) FNC by continuing development of the platform decision support system with different Manpower, Personnel, Training and Education (MPTE) data sources. The system will include software that supports Government users' activities. - Continue development of the system models and associated documentation. The models will provide realistic quantitative simulation of MPTE behavior. - Continue identifying and documenting requirements for the development of the software for MNF.					
FY 2025 Base Plans: My Navy Foresight (MNF) - Complete advanced technology development of the My Navy Foresight (MNF) modelling capabilities and software. Support transition to system development and demonstration activities. - Complete development of system models and associated documentation that will provide realistic quantitative simulation of Manpower, Personnel, Training, and Education (MPTE) behavior. Deliver a functioning prototype to OPNAV N1 and fleet stakeholders. - Support MyNavyHR information technology solutions in identifying and documenting requirements for software solutions that address MNF capability gaps. Talent Management NEXUS (TM Nexus) - Initiate TM Nexus by Defining the initial software requirements for a Talent Management (TM) Nexus prototype and integration into Navy software infrastructure. - Initiate development of a prototype combining disparate data sources to include leadership assessment data and personnel information.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Initiate testing of TM Nexus prototype with large scale Navy personnel data. ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY 2025 increase associated with this planned program includes the costs of the projects currently being executed plus an estimate of the costs of selected FNCs in FY 2025.					
Title: Expeditionary Maneuver Warfare (EMW)	26.320	25.842	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Expeditionary Maneuver Warfare R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in PE 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. The advanced technologies being developed under this R-2 Activity include innovative naval mine, mine counter measures (MCM), mine delivery methods, low observable mine neutralization technologies, and other technologies supporting expeditionary maneuver warfare overall.					
FY 2024 Plans: Cognitive Router (CR) - Continue the Cognitive Router FNC by continuing development of an Artificial Intelligence / Machine Learning (AI/ML based cognitive engine for autonomous in-situ decision making for network discovery, link parameters optimization, and link path optimization. Demonstrate an increment of autonomous behaviors for cooperative Unmanned Undersea Vehicle (UUV) autonomy with focus on objective arbitration and threat avoidance. - Continue development of data exfiltration, path planning, additional obstacle and threat avoidance, and networking. - Continue development of the Cognitive Router, which is a clandestine AI-enabled, autonomous, undersea, low-latency cross-domain network. Demonstrate Gen1 Cognitive Router AI control and link management in a water data collection event. Magnetic & Acoustic Generation Next Unmanned Superconducting Sweep (MAGNUSS) - Continue the MAGNUSS FNC by continuing the advanced development model with adjustments to the integrated magnetic/acoustic payload and any hardware/software mitigations necessary to operate craft in a magnetic field.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Long-Range Over the Horizon (OTH) Communications at High Frequency (HF) Using a Nested, Electronically-Steered System (LOCH NESS) - Initiate HF multifunction architecture development for greater resiliency. Commence waveform design and beam forming/nulling with advanced algorithms and M&S validation. - Conduct design review with stakeholders and begin prototype development with pacing demonstration of capabilities. Next Generation High Frequency (NGHF) - Initiate award to industry to develop new signal processing algorithms for advanced long range radar waveforms for improved performance in complex, high-clutter environments. - Implement initial versions of radar signal processing algorithms in a modeling and simulation environment to characterize search, track, and identification capabilities against representative targets. ***FY 2025 Base Plans:*** N/A ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The decrease from FY24 to FY25 is due to the elimination of this planned program as part of an FY 2025 PE 0603673N restructuring effort. The funding and requirements are now shown in Project 1161 - Expeditionary Maneuver Warfare (EMW).					
Title: Air Warfare (AW)	42.621	47.440	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Air Warfare R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include human machine interfaces for unmanned platforms and payloads that will assist with delegation of resources from one operator to another, airframe corrosion protection, and a Carrier Air Wing performance assessment tool that uses live, virtual, and constructive data to improve pilot and aircrew performance in near real-time. Different software efforts address unique and specific requirements.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
FY 2024 Plans: Digital Expanded Ultra-High Frequency (UHF) Multiple Input, Multiple Output (MIMO) Optimized Radar (DEUMOR) - Continue the DEUMOR FNC by continuing development of high-value signal processing, MIMO, Cognitive and Advanced Space-Time-Adaptive Processing (STAP) algorithms, and advanced antenna technologies for airborne surveillance platforms. Perform initial flight testing of prototype hardware and software. Prediction of Regional Operational Propagation of HF for EMSO Tactics (PROPHET) - Continue the PROPHET FNC by continuing development based on the initial prototype and validation and verification studies completed in FY23. Refine the model logic and optimize the processing of ionospheric and high frequency propagation models to provide timely and accurate answers to the warfighter. TEDSat - Continue the TEDSat FNC by continuing development and beginning integration of a low size, weight, power and cost electronic warfare payload with required on-board processing to provide a persistent capability not currently available to DoD users. Incapacitation Prediction in Readiness Domains: an Integrated Computational Tool (I-PREDICT) - Complete the I-PREDICT FNC by transitioning integration of the I-PREDICT human digital twin into digital engineering efforts for design of platforms (e.g., future vertical lift helicopter, F-18 and F-35) and equipment (e.g., ejection and crew seats, casualty litter support systems, helmets and body armor). - Use the most up to date human digital models (male/female, large/small) to develop analyses accounting for variability between people for relevant long (e.g., exposure to high accelerations during vehicle motion) and short duration (e.g., high impacts resulting from blast effects) loading scenarios. - Develop end-user graphical interface tool. - Identify improvements that could be made on future I-PREDICT human body modeling versions. Advanced Autonomous Air-to-Air Refueling System (A4RS) - Initiate design activities, based on an Autonomous Aerial Refueling Modular Open System Architecture study, in support of a tanking MQ-25 with a podded aerial refueling store subsystem and a receiving MQ-25 with a computer vision-based navigation subsystem.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Coordinated Advanced Distributed Radio Frequency (RF) Effects (CADRE) - Initiate development of novel technology capabilities to enable advanced distributed and coordinated airborne electronic attack techniques to defeat advanced threats. Modified Aircraft Gamma Inceptor Control Platform Recovery Optimization Program (MAGIC PROP) - Initiate development of baseline system architecture for a preliminary design of the prototype system for E-2D CVN recovery improvements. - Develop new model-based engineering and analytics capabilities required for flight control software simulation. ***FY 2025 Base Plans:*** N/A ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The decrease from FY24 to FY25 is due to the elimination of this planned program as part of an FY 2025 PE 0603673N restructuring effort. The funding and requirements that would have been in this planned program in FY25 are now shown in Project 1162 - Air Warfare (AW).					
Title: Information Warfare (IW)	56.482	61.912	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Information Warfare R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts provide Information Warfare capabilities across several disparate uses and environments. ***FY 2024 Plans:*** Data Framework for Maritime Operations Center of the Future (DF-MOTF) - Continue the DF-MOTF FNC by developing and testing a multi-level security architecture that hosts different artificial intelligence and machine learning big data analytic applications. - Continue to develop and test SELinux policies to demonstrate the ability to run data analytics in multi-level security SELinux enforcing mode.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Continue to test and modify middleware containerization software novel solutions to use central processing unit and memory resources more efficiently than typical virtual machine or bare metal deployments that unnecessarily add operating system overhead. Multi-Beam Array for Cooperative Engagement (MACE) - Continue the MACE FNC by continuing integration and testing of completed critical subassemblies, leading up to a final integrated prototype planar-array system. - Initiate final TRL 6 test planning and demonstration of the MACE prototype planar-array system. Data on the Move (DotM) - Continue the DotM FNC by developing methods for dynamic container deployment and routing at different security level contexts. - Continue to develop container solutions to integrate SE Linux policies with structured and unstructured objects, messaging, and security authorization. - Continue technology development and testing of different hardware and software design prototypes that will meet key performance parameters. MAGICO - Continue MAGICO FNC development through modeling and simulation, which are subject to identified technical performance parameters and system requirements. Begin interfacing with the Program of Record (POR) to initiate the transition process and optimize outputs to shorten decision cycles while meeting operational intent. Additional details are classified. DECAF - Complete DECAF FNC development and demonstrate the capability in support of transition to the Program of Record. Additional details are classified. SLQ 32 Signal Identification Improvements (SI^2) - Complete the SI^2 FNC, evaluating the technology against its exit criteria in a representative environment by testing machine learning based electronic warfare classification systems and their improvements in detection and characterization of modern emitters. Deliver final reports and technology for incorporation into Program of Record (POR) systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
4 Leaf Clovers - Initiate data collections and analysis to identify system requirements, conduct stakeholder reviews of the system approach, and initiate development of capabilities. - Initiate simulation model development for distributed signal processing techniques. - Initiate cybersecurity analysis to discover and characterize system vulnerabilities. Federated Learning and Optimization for Wireless networks (FLOW) - Initiate system engineering, Modeling and Simulation (M&S) for wireless network optimization with enhanced mission performance. - Conduct design review with stakeholders and commence software prototype development. Measurement-Based Adaptive Response (M-BAR) - Initiate development of technologies needed to enable real-time adaptive electronic attack techniques to defeat modern anti-ship missile threats. ***FY 2025 Base Plans:*** N/A ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The decrease from FY24 to FY25 is due to the elimination of this planned program as part of an FY 2025 PE 0603673N restructuring effort. The funding and requirements that would have been in this planned program are now shown in Project 1163 - Information Warfare (IW).					
Title: Surface Warfare (SW)	53.515	60.112	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Surface Warfare R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include technologies that will provide mission visualization, network analysis, and training for operators in denied and degraded environments. ***FY 2024 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Amon Hen - Continue the Amon Hen FNC by initiating factory testing of the prototype radar illuminator. - Complete design and documentation for interfaces between the illuminator backend scheduler, illuminator hardware, payload assembly, and the test platform. - Complete at-sea testing with multi-INT apertures and other surveillance radars using a modular payload installed on an available surface platform. Multi-Spectral High Resolution Targeting Sensor (MUST HITS) - Continue the MUST HITS FNC by continue development of a Digital Read Out Integrated Circuit (DROIC) mated with a high-resolution infrared sensor for detection and tracking of difficult targets. Begin integration of the camera and processing suite. Rough Patch III - Continue the Rough Patch III FNC by establishing a functional prototype solution that can be evaluated in a simulated relevant environment designed to provide insight into software architectural and transition hardware solutions targeted at achieving Technology Readiness Level 6 by FY26. - Initiate prototype packaging efforts and continue getting operator/fleet input for the mission planning effort. Empire - Complete the Empire FNC by completing development of Empire software and algorithms. - Complete demonstration of distributed radar functions with real SPY-6 signal processing hardware in a simulated environment for comparison with over-the-air testing. - Complete integrating the developmental software build of Empire algorithms into surrogate SPY-6 hardware and conduct over-the-air testing. Resolve potential software defects from developmental builds and summarize performance improvements delivered by the Empire algorithms. Agnostic Signal Processing for Increased Radar Efficiency (ASPIRE) - Complete the ASPIRE FNC by completing testing of the first iteration of a next generation SPY-6 digital receiver exciter (DREX). - Complete fabrication and testing of the second iteration DREX design for SPY-6. - Complete testing of a new Heterogeneous Computing (HC) Digital BeamFormer (DBF) and signal processing backend for the SPY-6.					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Characterize the improved waveform generation flexibility provided by the new DREX design and demonstrate representative radar functions provided by the new HC and DBF architectures. Conventional Ammunition High Density Reactive Material Augmented Ordnance Systems (CHAOS) - Complete the CHAOS FNC by completing the integration of off-design, Damaged State, flight performance for representative target models engaged by Navy Conventional Ammunition. The ability of the Damaged State models to discriminate between classes of damage will be evaluated in comparative encounters using baseline (kinetic energy only) and High Density Reactive Material (HDRM) (kinetic and reactive energy) ammunition. Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) - Initiate the integration of the components developed during the tech candidate effort, which will include the design, development, packaging and test for an initial prototype that meets the specified requirements that can be integrated into a designated host system. Crossbow - Initiate development of Decision Aids that enhance the synchronization of Maritime Dynamic Targeting resources for Course of Action options and the monitoring/re-planning and execution of kill-chain timelines for Anti-Surface Warfare Long Range Fires. Radar Advanced Signal Processing (RASP) - Initiate modeling and simulation to characterize long range performance of waveforms transmitted from and received by surface platforms. - Initiate efforts to characterize HF antennas through simulation and field testing. - Implement initial algorithms for improving HF signal reception in a simulated environment. ***FY 2025 Base Plans:*** N/A ***FY 2025 OCO Plans:*** N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
The decrease from FY24 to FY25 is due to the elimination of this planned program as part of an FY 2025 PE 0603673N restructuring effort. The funding and requirements that would have been in this planned program are now shown in Project 1164 - Surface Warfare (SW).					
Title: Undersea Warfare (UW)	61.168	64.229	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Undersea Warfare R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record. Efforts include improvements to a broad range of undersea warfare capabilities, including undersea weapons, submarine acoustic sensing and signal processing systems, communications, electro-optics systems, signature management, training, and decision aids.					
FY 2024 Plans: VIRGINIA Improved Propulsion Bearing (VIPB) - Continue the VIPB FNC by continuing full scale VIRGINIA Class bearing development, completing preparation of manufacturing drawings and the purchase of bearing long lead materials, conducting a bearing manufacturing readiness review, initiating bearing fabrication, continuing land-based test planning, conducting a land-based test readiness review, conducting a Shaft Line Test Capability (SLTC) critical design review, and initiating SLTC development. Multi-Material Propeller Prototype (M2P2) - Continue the M2P2 FNC by establishing the qualification approach for multi-material structural design (full scale 3-blade/hub prototype), including mechanical requirements for the Design Validation Rotor (DVR). - Conduct Resistance & Powering (R&P) testing in the NSWC tow tank. - Complete the designs for large (1/3) scale rotors to test on the Large-Scale Vehicle (LSV) model at the Acoustic Research Detachment (ARD). Own Ship Acoustic Monitoring (OSAM) - Continue the OSAM FNC by conducting an FY24 at-sea demo to collect data for software development and the confirmation of hardware connectivity to ship systems (the FY23 demo was deferred due to ship availability), continuing development of a prototype vulnerability decision aid and monitoring system, continuing software development and the assessment of software performance using FY24 at-sea demo data, and initiating efforts					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
to execute a FY25 at-sea demo to test an initial vulnerability decision aid and a monitoring system prototype hardware/software suite. Untethered Goat (U-GOAT) - Continue the U-GOAT FNC by continuing development of a multifunction Intelligence, Surveillance, and Reconnaissance (ISR) payload for Unmanned Underwater Vehicles (UUVs) to support distributed maritime operations. - Continue hardware/software development, fabrication, integration, and demonstration efforts. CRAW Upgrade - Complete this FNC by finishing the final demonstration. This demonstration was originally scheduled for FY23, but a delay in submarine availability required it to be rescheduled into FY24. MK-48 Acoustic Modifications (M&M) - Complete the M&M FNC by delivering the new component prototype(s) design to NAVSEA PMS404 and providing inputs to NAVSEA's Engineering Change Proposal paperwork. Gravity-Aided Inertial Navigation system (GAINS) - Initiate system software and software in the loop simulation for gravity algorithms integrated in the navigation subsystem. - Initiate field testing of existing gravimeter system on test ship. - Initiate Concept of Operation and implementation studies for new mission profiles. Physical and Networking Layer Prototype (PNLP) - Initiate PNLP FNC with award selection for a multidisciplinary team of industry and government performers to integrate algorithms, hardware, and system test frames for in-water data collection - Initiate hardware and software bench testing in tank environments - Conduct comparative algorithm characterization in a virtual live reconstruction environment, leveraged from the ASTRAnet 6.2 program ***FY 2025 Base Plans:*** N/A ***FY 2025 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy		Date: March 2024
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
N/A ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The decrease from FY24 to FY25 is due to the elimination of this planned program as part of an FY 2025 PE 0603673N restructuring effort. The funding and requirements that would have been in this planned program are now shown in Project 1165 - Undersea Warfare (UW).					
Accomplishments/Planned Programs Subtotals	243.044	264.700	5.170	0.000	5.170

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy			Date: March 2024
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	17.376	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.376
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other projects

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024
Congressional Add: Advanced Energetics Research ***FY 2023 Accomplishments:*** Conduct advanced energetics technology development ***FY 2024 Plans:*** N/A	4.827	0.000
Congressional Add: Development of Submersible Air Revitalization ***FY 2023 Accomplishments:*** Conduct Development of Submersible Air Revitalization research ***FY 2024 Plans:*** N/A	7.723	0.000
Congressional Add: Advanced carbon nanotube conductors for naval power systems ***FY 2023 Accomplishments:*** Conduct research supporting Advanced carbon nanotube conductors for naval power systems ***FY 2024 Plans:*** N/A	4.826	0.000
Congressional Adds Subtotals	17.376	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A