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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	4,390.527	302.004	344.981	257.076	-	257.076	193.861	195.724	182.954	209.402	Continuing	Continuing
3220: <i>COLUMBIA Class Submarine Development</i>	4,390.527	287.533	268.996	185.739	-	185.739	121.400	121.994	107.882	134.707	Continuing	Continuing
3440: <i>SBSD Obsolescence</i>	0.000	0.000	20.261	21.655	-	21.655	21.964	22.365	22.751	22.639	Continuing	Continuing
3441: <i>SBSD Technology Refresh</i>	0.000	0.000	46.724	49.682	-	49.682	50.497	51.365	52.321	52.056	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	14.471	9.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	23.471

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 444

A. Mission Description and Budget Item Justification

This program element supports innovative research and development in submarine Hull, Mechanical and Electrical (HM&E) and combat systems technologies and the subsequent evaluation, demonstration, and validation for submarine platforms over the life cycle of the COLUMBIA Class. It will increase the submarine technology base and provide subsystem design options not currently feasible. The program element also supports programs transitioning from Science and Technology (S&T), Defense Advanced Research Projects Agency (DARPA), Independent Research and Development, and Small Business Innovation Research (SBIR) projects.

The funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for Common Missile Compartment (CMC) design, whole ship design, and component technologies development for the next generation U.S. ballistic missile submarine (SSBN), the COLUMBIA Class.

Project Unit 3220: The objective of the COLUMBIA Class Submarine Development is to design, prepare for, and support construction and delivery of the class that is the replacement of the OHIO Class SSBN.

Project Unit 3440: This project provides the engineering development and program management required to outfit, upgrade, and support each ship of the COLUMBIA Class Submarine with a Non- Propulsion Electronics System (combat, sonar, etc.) that satisfies requirements to meet its sole mission of Strategic Deterrence over the class life cycle.

Project Unit 3441: This project encompasses ship system development, coordination, and management efforts for the COLUMBIA Class Submarine Technology Insertion Program and Technology Refresh Program over the class life cycle.

Project Unit 9999: This Congressional Add project funds efforts for the Advanced Materials Propeller Program, Materials for Submarine Propulsor Applications and Naval Propulsion Foundry Center Facility Power Upgrades.

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B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	311.231	335.981	253.754	-	253.754
Current President's Budget	302.004	344.981	257.076	-	257.076
Total Adjustments	-9.227	9.000	3.322	-	3.322
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	9.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.212	0.000			
• SBIR/STTR Transfer	-9.015	0.000			
• Program Adjustments	0.000	0.000	-0.655	-	-0.655
• Rate/Misc Adjustments	0.000	0.000	3.977	-	3.977

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

Project: 9999: *Congressional Adds*

Congressional Add: *Rapid composites for wet submarine application*

Congressional Add: *Columbia digital environment*

Congressional Add Subtotals for Project: 9999

Congressional Add Totals for all Projects

	FY 2022	FY 2023
	9.647	9.000
	4.824	0.000
Congressional Add Subtotals for Project: 9999	14.471	9.000
Congressional Add Totals for all Projects	14.471	9.000

Change Summary Explanation

FY2023 increase from PB23 due to Congressional Add. FY2022 decrease from PB23 due to SBIR reduction and SSP cancelled accounts. FY24 - FY27 increases due to restoration of total force management and alignment with the NRE RDT&E Requirements from the 2021 05C Cost Checkpoint, including SSP DASO items.

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy										Date: March 2023		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design				Project (Number/Name) 3220 / COLUMBIA Class Submarine Development			
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
3220: COLUMBIA Class Submarine Development	4,390.527	287.533	268.996	185.739	-	185.739	121.400	121.994	107.882	134.707	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 444												

A. Mission Description and Budget Item Justification

The COLUMBIA Submarine Class Program (previously the OHIO Replacement Class) is developing the next generation sea-based strategic deterrent. The funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for Common Missile Compartment (CMC) design, whole ship design, and component technologies development for the next generation U.S. ballistic missile submarine (SSBN). This RDT&E program supports cooperation with the United Kingdom (UK) to maintain strategic deterrence, based on a single effort to develop a CMC as agreed by the UK Secretary of State for Defense and the U.S. Secretary of Defense in 2009. At the COLUMBIA Program Semi-Annual Interim Progress Review (IPR) held on August 30, 2021, the USD(A&S) Milestone Decision Authority (MDA) directed COLUMBIA to be funded to the program baseline, including Integrated Enterprise Plan (IEP) funding as reflected in this budget submission. The total RDTE FY2023 increase of \$24.75M from FY2022 RDTE controls (+\$95.829M in the FYDP) is due to adjusting funding for the COLUMBIA Class Program to the baseline, and the start of funding in the 3440/3441 lines, which commence in FY23 per the program plan.

The COLUMBIA program strategy is to leverage the re-use of existing Submarine system designs (as applicable), focus on lifecycle Total Ownership Cost (TOC) affordability, and meet the military requirements established for this SSBN to achieve mission success in a challenging environment. The requested funding levels provide for the Technology Development, Design, Engineering, and Integration efforts necessary to support the COLUMBIA Class SSBN lead ship construction along with continued development and design support for construction of the class. A Contract Modification for ongoing design/advance construction efforts was awarded on 22 Jun 2020, which also included the Build I Option for the First Two Ships. This was a Pre-Priced Option for the two ships, SSBN 826 and SSBN 827, and associated design/support efforts. This was a modification of the current IPPD contract (N00024-17-C-2117) and is in line with the program's approved Acquisition Strategy. The program requested authorization of SSBN 826 in FY21, funded with three years of incremental funding in FY21-23, and is requesting authorization of SSBN 827 in FY24, funded with two years of incremental funding in FY24-25. The RDT&E efforts support this plan.

The following key activities support the COLUMBIA Class SSBN Program:

1. Design and development of a missile compartment, launch system, and Strategic Weapons Support Systems (SWSS) to meet U.S. strategic requirements while cooperating with the UK on modernizing its strategic deterrent in accordance with Presidential direction (December 2006).
2. Concept Definition, System Definition, and Detailed Design for remaining portions of the ship accomplished through a Design/Build/Sustain approach modeled after the approach used by the VIRGINIA Class program.

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- 3. Engineering and integration of existing technologies and development of new technologies required to provide the capabilities necessary to ensure platform operational effectiveness and minimize life cycle cost.
- 4. Ongoing design support for construction of the submarine class.

COLUMBIA Class SSBN concept study, system definition prototyping, and technology development efforts support design, systems engineering, component development and vendor qualification activities needed to develop the CMC design and the COLUMBIA whole ship design. The COLUMBIA design timelines are based on a design approach proven on the VIRGINIA Class Program, adjusted for the additional complexity of a missile compartment and Strategic Weapons Systems (SWS). Planned technical studies and prototyping are necessary to reduce risks associated with updating SSBN system designs for current technical standards and demonstrating design feasibility of developmental technology to meet the ship design and construction schedule.

The Navy continues to invest in program funded affordability initiatives similar to those employed successfully for VIRGINIA Class, but tailored to the unique SSBN mission and operational tempo of COLUMBIA Class to drive down overall program costs. Efforts focus on reducing ship construction costs through implementing more effective design features and fabrication and assembly methods for a more affordable submarine. As part of this effort, alternative procurement and contracting strategies are also being utilized to include Multi-Program Material Procurement (MPMP) and Economic Order Quantity (EOQ).

Activities were executed for the first article quad pack (FAQP) prototype of the CMC to support the UK DREADNOUGHT Program and COLUMBIA Program, and to continue validation of the Integrated Tube and Hull (ITH) build strategy. These activities included the continuation of the construction of the FAQP, which began August 2016, and completed in October 2019. This FAQP was determined to not be useable based on defective missile tubes and was cut apart to recover the missile tubes to use later in the program. The CMC program will mature required technologies and re-host the TRIDENT II D5 SWS (Launcher, Fire Control and Navigation) while ensuring no degradation to D5 security, safety, and performance. In addition, whole ship design efforts are focused on technologies requiring significant engineering, integration, and development time as well as those technologies that are required to support ship design and construction schedules such as the propulsor and maneuvering/ship control. These technologies are critical for stealth capability for a ship class that will be in service until the 2080s. Ship detailed design efforts include important activities such as finalizing ship arrangements, development of design disclosures to support build products, risk characterization, and mitigation, improvement and validation of performance prediction tools and improvement of design tools. Technology development addresses engineering and integration of existing technologies as well as maturation of developmental technologies.

On 14 December 2016, the Secretary of the Navy announced the lead ship of the OHIO Replacement Program will be USS COLUMBIA (SSBN 826) which officially designates this program the COLUMBIA Class Submarine Program.

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Common Missile Compartment Design and Prototyping, and Whole Ship Design	153.040	158.930	97.839	0.000	97.839
Articles:	-	-	-	-	-
FY 2023 Plans:					

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>CMC Design and Prototyping: This funding applies to the design, systems engineering, prototyping construction, and vendor qualification activities required to execute the schedule for Common Missile Compartment (CMC) construction schedule, design and component and/ technology development for the COLUMBIA submarine. Included in this effort is continued development of CMC design products and associated engineering/ management efforts.</p> <p>Specific planned construction efforts for FY 2023 include:</p> <ul style="list-style-type: none"> - Continued fabrication of Missile Tubes and Strategic Weapons Support System (SWSS) kits. - Continued Lead Ship Construction, which includes manufacture of the Missile Tube Module (MTM) for lead ship, and integration and test of SWSS systems for the land based test facility. <p>Whole Ship Study and Design: This funding applies to the shipbuilder design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for whole ship design and component / technology development for the COLUMBIA submarine, and associated engineering/management efforts.</p> <p>Specific planned construction efforts for FY 2023 include:</p> <ul style="list-style-type: none"> - Planned 99 percent of total Design Disclosures (approximately 4767 design disclosures including CMC design disclosures). - Planned completion is approximately 51 percent of Maintenance Integrated Logistics Products (1464 of 2870). - Planned completion is approximately 60 percent of Provisioning Integrated Logistics Products (2615 of 4371). - Planned completion of approximately 63 percent of Logistics Technical Data Products (474 of 752). - Planned construction effort in FY2023 includes construction execution on all Super Modules (1, 2, 3, 4, 5, and 6). <p>FY 2024 Base Plans:</p> <p>Specific planned construction efforts for FY 2024 include:</p> <ul style="list-style-type: none"> - Continued fabrication of Missile Tubes and Strategic Weapons Support System (SWSS) kits. - Continued Lead Ship Construction, which includes manufacture of the MTM for lead ship, and integration and test of SWSS systems and Final Operating Capability (FOC) for the land based test facility. <p>Whole Ship Study and Design: This funding applies to the shipbuilder design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for whole ship design and component / technology development for the COLUMBIA submarine, and associated engineering/management efforts.</p> <ul style="list-style-type: none"> - Planned completion is approximately 57 percent of Maintenance Integrated Logistics Products (1226 of 2143). - Planned completion is approximately 79 percent of Provisioning Integrated Logistics Products (3465 of 4371). 					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Planned completion of approximately 81 percent of Logistics Technical Documentation products (635 of 787)</p> <p>- Specific planned construction efforts for FY 2024 including construction execution on all Super Modules (1, 2, 3, 4, 5, and 6).</p> <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Decrease due to shipbuilder design performance, updates made in accordance with 2021 cost estimate and an overall shift to SCN.</p>					
<p>Title: NAVSEA R&D and Prototyping</p> <p align="right">Articles:</p> <p>FY 2023 Plans: This funding applies to the Government combat systems, component and technology development for the COLUMBIA submarine essential to achieving required survivability, combat and communications capabilities. Efforts planned in FY 2023 include: Combat systems - Continue to convert TI-24 Government Furnished Information changes into procurement ready documentation to support SSBN 827 Nuclear Propulsion Electronic System (NPES) shipset acquisition. - Continue AN/BST-1 and AN/BRR-6 reliability based engineering changes, qualification, and testing. - Continue environmental qualification testing of lead ship design Government Furnished Equipment. - Initiate COATS construction test facility Simulation/Stimulation equipment design and qualification testing - Continue to perform lab based cyber security testing of the lead ship NPES design - Complete final year of NPES laboratory-level software development and integration prior to construction delivery - Continue to perform incremental NPES sub-system integration testing with the Strategic Weapons Systems (SWS) using simulators and vendor site visits</p> Component Development: - Continue Government support and oversight of development of the approximately 37 remaining of the initial 101 engineered components. - Support diesel generator integration testing at compatibility test facility. - Complete assembly of Thin Line Towed Array Handling System on lead ship.	87.560	62.548	53.090	0.000	53.090
	-	-	-	-	-

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<ul style="list-style-type: none"> - Continue qualification testing of the Advanced Carbon Dioxide Removal Unit (ACRU) based on incorporation of lessons learned from qualification testing. - Continue production of the ACRUs for Build I (826 and 827). - Continue reliability/operational testing of ACRU. - Continue at-sea operational assessment of ACRU on SSGN. <p>Propulsor and Shafting:</p> <ul style="list-style-type: none"> - Continue propulsor shock qualification analysis and design certification efforts. - Continue to update performance achievability assessments to reflect as-manufactured parts. <p>Shock, Structures and Composites:</p> <ul style="list-style-type: none"> - Continue test planning, test simulations and vehicle assessment for Large Vehicle Shock Testing. - Deliver the Out of Autoclave bow dome to Newport News Shipbuilding (NNS). - Complete fabrication of the first US shipset and the second and third UK shipset of the Navigation Sonar System Windows. <p>Signatures:</p> <ul style="list-style-type: none"> - Update whole-boat signature predictions using updated modeling and predictive tools. - Support GFE design efforts for a system and demonstration testing. - Support Physical Scale Model Testing and ICCP algorithms updates to account for as-built and damage scenarios. <p>FY 2024 Base Plans: This funding applies to the Government combat systems, component and technology development for the COLUMBIA submarine essential to achieving required survivability, combat and communications capabilities. Efforts planned in FY 2024 include:</p> <p>Combat systems:</p> <ul style="list-style-type: none"> - Conduct electronic and platform integration risk mitigation testing of the TI-24 NPES configuration across vendor and navy development sites. - Conduct TI-20 design review and factory acceptance testing for applicable SSBN 826 NPES shipset deliveries. <p>Component Development:</p>					

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<ul style="list-style-type: none"> - Continue Government support and oversight of development of approximately 7 remaining of the initial 101 engineered components. - Continue support of diesel generator integration testing at compatibility test facility. - Complete shock testing of diesel generator set. - Deliver Advanced Propulsor Bearing to Shipbuilder for first hull. - Delivery ACRU production unitsx for Build I (826 and 827). - Deliver Main Shaft Seal to Shipbuilder for first hull. - Deliver Main Shaft Brake Lock & Turning Gear to Shipbuilder for first hull. - Continue reliability/operational testing of ACRU. - Continue at-sea operational assessment of ACRU on SSGN. <p>Propulsor and Shafting:</p> <ul style="list-style-type: none"> - Continue propulsor shock qualification analysis and design certification efforts. - Continue to update performance achievability assessments to reflect as-manufactured parts. <p>Shock and Structures:</p> <ul style="list-style-type: none"> - Conduct Large Vehicle Shock Test at Aberdeen Proving Ground. - Start Preparations for initial deep dive testing. <p>Signatures:</p> <ul style="list-style-type: none"> - Update whole-boat signature predictions using updated modeling and predictive tools. - Support GFE design efforts for a system. - Support Physical Scale Model Testing and Iterative Closest Contour Point (ICCP) algorithms updates to account for as-built and damage scenarios. - Begin preparations for a VA full scale test to demonstrate new measurement and modeling approach for verifying full scale performance planned for CLB Class as a potential life cycle savings. <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement:</p>					

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design	Project (Number/Name) 3220 / COLUMBIA Class Submarine Development			
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Decrease represents the updated program cost estimate from 2021 capturing updates to government component and technology development efforts and an overall shift to SCN and commencement of follow ship R&D obsolescence and technology refresh starting in 2023.					
Title: Systems Engineering/Program Management	33.778	32.745	34.810	0.000	34.810
Articles:	-	-	-	-	-
FY 2023 Plans: <ul style="list-style-type: none"> - Execute Trident Training Facility (TTF) Kings Bay MILCON P676 on schedule to support Strategic System Programs (SSP) and NAVSEA ready for training dates. - Continue maturing Trident Refit Facility (TRF) Kings Bay P684. - Continue the advanced planning studies for NBK-Bangor and submit P817 for PRI#0 level of maturity. Test and Evaluation <ul style="list-style-type: none"> - Complete update and approval of the Test and Evaluation Master Plan (TEMP) and LFT&E Management Plan. - Update CLB Class Submarine Post-Delivery Testing Certifications Schedule Information. - Continue survivability modeling and simulation maturation. Updated CLB threat sonar models and simulated tactics using at-sea data. - Complete the third operator-in-the-loop hardware event, CLB-E3. CLB-E3 will assess CLB and threat submarines in a deep-water scenario. - Complete LFT&E shot line assessment and documentation in support of simulating underwater explosions at selected locations ("Shot Lines") outside CLB's hull and the propagation of energy through the decks and other structures to personnel and equipment to predict personal injuries and post event operational capability. - Report DT results to Deputy Director, Developmental Testing, Evaluations, and Assessments (D.D((DTE&A)) and DOT&E in accordance with the TEMP. - Complete Cybersecurity EDT 23 of CLB baseline Submarine Warfare Federated Tactical Systems (SWFTS), Common Submarine Radio Room (CSRR), and Consolidated Afloat Network Enterprise System (CANES)enclaves in summer 2023. This will be CLB's first cyber DT of the SWFTS variant installed on the first of class. - Continue planning Operational Test (OT-B2), an Operational Observation of DT (OODT), at Strategic Weapons System Ashore facility to assess the CLB TEMP Strike Critical Operational Issues (COIs). - Commence detailed planning for lead ship (SSBN 826) Acoustic trials, Electromagnetic Trials, Hydrodynamic Trials, and Conventional Weapon's Launcher Trials. FY 2024 Base Plans:					

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>Test and Evaluation</p> <ul style="list-style-type: none"> - Commence detailed planning for OT-B3, including verification and validation of Simulation II Digital Weapons Analysis Framework (SIMII/DWAF), the Ship Control Operational Trainer, and Control System Module Off-Hull Assembly and Test Site (COATS) for the survivability and strike COI assessment. - Continue survivability modeling and simulation maturation. Updated CLB threat sonar models and simulated tactics using at-sea data. - Report DT results to Deputy Director, Developmental Testing, Evaluations, and Assessments (D.D((DTE&A)) and DOT&E in accordance with the TEMP. - Complete Operational Test (OT-B2), an Operational Observation of DT (OODT), at Strategic Weapons System Ashore facility to assess the CLB TEMP Strike Critical Operational Issues (COIs). - Continue detailed planning for lead ship (SSBN 826) Acoustic trials, Electromagnetic Trials, Hydrodynamic Trials, and Conventional Weapon's Launcher Trials. <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Increase for restoration of total force management and represents the updated program cost estimate from 2021 capturing updated program estimates.</p>					
<p>Title: Strategic Weapons System Integration</p> <p align="right">Articles:</p> <p>FY 2023 Plans:</p> <ul style="list-style-type: none"> - Continue system engineering efforts required for the re-hosting and integration of the TRIDENT II (D5) SWS on the COLUMBIA submarine including review, modification, and update of SWS Coordination, Interface and Arrangement Drawings for SWS equipment within the CMC. - Complete SWS Fire Control Subsystem Trainer hardware and software design efforts. - Complete proofing of Shipyard Installation Test Program (SITP) Test Procedures and continue SWS Ashore (SWSA) integration and regression testing efforts at SWSA. <p>FY 2024 Base Plans:</p>	13.155	14.773	0.000	0.000	0.000
	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Continue system engineering efforts required for the re-hosting and integration of the TRIDENT II (D5) SWS on the COLUMBIA submarine including review, modification, and update of SWS Coordination, Interface and Arrangement Drawings for SWS equipment within the CMC.					
FY 2024 OCO Plans: Not applicable; R&D design efforts completed. R&D funding for first of class Test and Evaluation events required beginning in FY26.					
FY 2023 to FY 2024 Increase/Decrease Statement: R&D design efforts conclude in FY23.					
Accomplishments/Planned Programs Subtotals	287.533	268.996	185.739	0.000	185.739

C. Other Program Funding Summary (\$ in Millions)											
Line Item	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
• RDTEN/0603570N/3219: SBSD <i>Nuclear Technology Development</i>	60.142	56.707	54.400	-	54.400	44.385	39.173	35.834	36.222	Continuing	Continuing
• RDTEN/0101221N/0951: <i>Joint Warhead Fuze Sustainment Program</i>	6.570	3.087	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	720.466
• OPN/5358: Strategic <i>Missile Systems Equip</i>	276.430	279.430	325.318	-	325.318	321.406	435.968	325.448	447.515	Continuing	Continuing
• WPN/1250: TRIDENT II Mods	1,120.241	1,125.164	1,284.705	-	1,284.705	1,705.878	2,468.925	2,897.274	3,186.112	4,352.768	30,073.252
• OMN/1D2D: Fleet Ballistic Missile	1,474.005	1,664.933	1,763.238	-	1,763.238	1,861.325	1,890.125	1,934.921	1,983.564	0.000	12,572.111
• SCN/1045: COLUMBIA <i>Class Submarine</i>	4,776.980	5,857.776	5,834.332	-	5,834.332	7,275.820	8,467.564	8,788.208	8,728.802	52,170.081	112,651.052
• MCN/64482044: MCON Design	512.729	520.442	502.827	-	502.827	214.687	168.206	144.893	155.359	0.000	2,219.143

Remarks

D. Acquisition Strategy
The Common Missile Compartment (CMC) will be designed and developed to support the U.S. and UK in development of the COLUMBIA and DREADNOUGHT SSBN programs enabling a common U.S.-UK CMC and maximizing the benefit of the ongoing U.S.-UK partnership in strategic deterrence. The COLUMBIA Class Program

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3220 / <i>COLUMBIA Class Submarine Development</i>

RDT&E efforts will support the design, construction and operations & support portions of the program. RDT&E efforts will be performed by Navy laboratories, shipyards, private industry, and University Affiliated Research Centers.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy												Date: March 2023			
Appropriation/Budget Activity 1319 / 4						R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design				Project (Number/Name) 3220 / COLUMBIA Class Submarine Development					
Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/CPFF	Ship Design Contractor-EB : Groton, CT	1,866.271	153.040	Oct 2021	158.930	Oct 2022	97.839	Oct 2023	-		97.839	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Carderock, MD	658.670	28.146	Oct 2021	20.106	Oct 2022	17.888	Oct 2023	-		17.888	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Philadelphia, PA	115.970	13.415	Oct 2021	9.583	Oct 2022	8.021	Oct 2023	-		8.021	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Newport, RI	164.183	20.540	Oct 2021	14.673	Oct 2022	11.960	Oct 2023	-		11.960	Continuing	Continuing	Continuing
Product Development	Various	NAVSEA : Various	314.625	25.458	Oct 2021	18.186	Oct 2022	15.221	Oct 2023	-		15.221	Continuing	Continuing	Continuing
Product Development	SS/CPFF	ARL Penn State University : State College, PA	3.811	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	NGMS : Sunnyvale, CA	200.763	0.500	Nov 2021	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL : Laurel, MD	30.705	0.767	Nov 2021	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Keyport, WA	0.652	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	DRAPER : Cambridge, MA	10.166	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMRMS : Mitchel Field, NY	85.833	0.160	Nov 2021	0.232	Nov 2022	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	C/CPFF	EMCUBE : Alexandria, VA	4.684	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMS : Sunnyvale, CA	120.344	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JRC : Washington, DC	5.832	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	C/CPFF	GDMS : Pittsfield, MA	168.380	5.232	Oct 2021	4.576	Oct 2022	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	WR	CNSW : China Lake, CA	82.243	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	IEC : Anaheim, CA	5.299	1.902	Feb 2022	1.295	Oct 2022	0.000		-		0.000	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy											Date: March 2023				
Appropriation/Budget Activity 1319 / 4						R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design					Project (Number/Name) 3220 / COLUMBIA Class Submarine Development				

Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WR	NSWC : Dahlgren, VA	27.876	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BAE : Rockville, MD	52.310	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BNA : Huntington Beach, CA	3.217	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	WR	NSWC Crane : Crane, IN	74.248	2.925	Nov 2021	8.095	Oct 2022	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDEB : Groton, CT	9.421	1.095	Oct 2021	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	Various	SSP : Various	19.804	0.575	Oct 2021	0.575	Oct 2022	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	SPA : Alexandria, VA	12.550	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			4,037.857	253.755		236.251		150.929		-		150.929	Continuing	Continuing	N/A

Remarks
 There are no FY22 or FY23 UK common funds. Other FY23 updates reflect the approved 2021 cost estimate.
 Note: Various is used for multiple activities with different award dates.

Management Services (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Management Support	C/CPFF	Various : Multiple Awards	191.703	14.140	Nov 2021	14.049	Nov 2022	14.933	Nov 2023	-		14.933	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Carderock, MD	107.331	12.325	Oct 2021	10.111	Oct 2022	12.763	Oct 2023	-		12.763	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Philadelphia, PA	12.314	0.885	Oct 2021	1.240	Oct 2022	1.127	Oct 2023	-		1.127	0.000	15.566	-
Government Management Support	WR	Various: NUWC : Newport, RI	20.912	2.996	Oct 2021	2.625	Oct 2022	3.025	Oct 2023	-		3.025	0.000	29.558	-
Government Management Support	WR	Various: SUPSHIP : Groton, CT	17.011	3.431	Oct 2021	4.720	Oct 2022	2.962	Oct 2023	-		2.962	0.000	28.124	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design	Project (Number/Name) 3220 / COLUMBIA Class Submarine Development
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Management Services (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Travel	WR	NAVSEA HQ : Washington, D.C.	3.399	0.001	Nov 2021	0.000	Nov 2022	0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			352.670	33.778		32.745		34.810		-		34.810	Continuing	Continuing	N/A

Remarks
 Since Lead ship authorization in 2021, Management Services requirements have been split funded 50/50% RDTE and SCN, with remaining balance funded with SCN full funding. FY22 & FY23 match the approved 2021 cost estimate.

	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	4,390.527	287.533	268.996	185.739	-	185.739	Continuing	Continuing	N/A

Remarks
 The listed Award Dates represent the date on which initial obligations occur for the effort.

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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Navy		Date: March 2023
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3220 / <i>COLUMBIA Class Submarine Development</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Notes: * Effort began prior to 1st Quarter FY 2021. ** Effort continues past 4th Quarter FY 2027				
Ship Design Disclosure and Construction Data*	1	2022	2	2027
Research, Development, and Prototyping for Lead Ship Design*	1	2022	3	2027
Component Development / Component Qualification*	1	2022	3	2027
Advanced Propulsor Bearing Prototype *	1	2022	2	2024
Advanced Carbon Dioxide Removal Unit (ACRU)*	1	2022	3	2027
Ship Class SCN Design*, **	1	2022	4	2028
Lead Ship Construction**	1	2022	3	2027
Trials/DASO**	3	2027	4	2028

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3440 / <i>SBSD Obsolescence</i>
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
3440: <i>SBSD Obsolescence</i>	0.000	0.000	20.261	21.655	-	21.655	21.964	22.365	22.751	22.639	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 444

Note

Project 3440 (SBSD Obsolescence) is a new project in FY23. This project is not a new start but represents continuation of efforts previously executed under project 3220 in FY22 and earlier.

A. Mission Description and Budget Item Justification

This project provides the engineering development and program management effort required to sustain NPES outfitting of each ship of the COLUMBIA Class throughout the duration of the 12-ship construction program. Non-recurring engineering activity is required to ensure specification compliant components are available for procurement as fleet common sub-systems, which evolve over the life of the program due to either competitive selection of new suppliers, component obsolescence replacement, increased technical performance, or improvements in reliability. Non-recurring engineering activity is needed to perform platform integration of the components, and software modification to accommodate electronic data exchange, COLUMBIA unique submarine environment qualification, and update of all logistics products.

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Government Furnished/Contractor Furnished NPES Component Technology Refreshment	0.000	20.261	21.655	0.000	21.655
Articles:	-	-	-	-	-
FY 2023 Plans:					
<ul style="list-style-type: none"> - Evaluate NPES component obsolescence issues, and initiate construction risk mitigation actions. - Initiate re-design activity for components impacting ship safety/self-protect functions. - Program contract changes to procurement documentation affecting follow-on shipset acquisition. - Complete AN/BST-1 and AN/BRR-6 environmental qualification testing of redesigned components. - Continue environmental qualification testing of lead ship design Government Furnished Equipment. 					
FY 2024 Base Plans:					
<ul style="list-style-type: none"> - Conduct simulation/stimulation equipment validation at the COATS construction test site for all GFE supplied sensors and simulators. - Conduct first of class NPES validation/verification of NPES Ship Systems manual and casualty procedures. - Continue to perform lab based cyber security testing of the lead ship NPES design at COATS. - Conduct find-fix-repair of NPES software defects discovered during COATS testing. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy	Date: March 2023
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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3440 / <i>SBSD Obsolescence</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Continue to perform incremental NPES sub-system integration testing with the Strategic Weapons Systems using simulators at vendor site visits.</p> <p><i>FY 2024 OCO Plans:</i> N/A</p> <p><i>FY 2023 to FY 2024 Increase/Decrease Statement:</i> Small increase represents restoration of total force management and the updated program cost estimate from 2021 capturing updated program estimates.</p>					
Accomplishments/Planned Programs Subtotals	0.000	20.261	21.655	0.000	21.655

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

N/A

Remarks

D. Acquisition Strategy

The COLUMBIA Class Program RDT&E efforts will support the design, construction and operations & support portions of the program. RDT&E efforts will be performed by Navy laboratories, shipyards, private industry, and University Affiliated Research Centers.

Project 3440 funding has been realigned from Project 3220 funding in FY23 and later to mimic the Virginia class submarine follow ship cost tracking model.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design	Project (Number/Name) 3440 / SBSD Obsolescence
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Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Development	SS/CPFF	Lockheed-Martin : Manassas, VA	0.000	0.000		5.947	Nov 2022	6.771	Nov 2023	-		6.771	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Newport, RI	0.000	0.000		3.574	Oct 2022	3.529	Oct 2023	-		3.529	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Philadelphia, PA	0.000	0.000		1.583	Oct 2022	1.800	Oct 2023	-		1.800	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Keyport, WA	0.000	0.000		1.120	Oct 2022	1.955	Oct 2023	-		1.955	Continuing	Continuing	Continuing
Product Development	WR	NSWC Carderock : Bethesda, MD	0.000	0.000		0.517	Oct 2022	1.100	Oct 2023	-		1.100	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDEB : Groton, CT	0.000	0.000		3.510	Nov 2022	1.300	Nov 2023	-		1.300	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Lockheed-Martin : Syracuse, NY	0.000	0.000		0.650	Nov 2022	0.750	Nov 2023	-		0.750	Continuing	Continuing	Continuing
Product Development	WR	NIWC LANT : Charleston SC	0.000	0.000		0.887	Oct 2022	1.400	Oct 2023	-		1.400	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDMS : Pittsfield, MA	0.000	0.000		0.750	Nov 2022	0.250	Nov 2023	-		0.250	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDMS : Fair Lakes, VA	0.000	0.000		0.815	Nov 2022	0.150	Nov 2023	-		0.150	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Port Hueneme CA	0.000	0.000		0.050	Oct 2022	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Progeny Systems : Manassas, VA	0.000	0.000		0.858	Nov 2022	0.950	Nov 2023	-		0.950	Continuing	Continuing	Continuing
Product Development	WR	NIWC PAC : San Diego, CA	0.000	0.000		0.000		1.700	Oct 2023	-		1.700	0.000	1.700	-
Subtotal			0.000	0.000		20.261		21.655		-		21.655	Continuing	Continuing	N/A

Remarks
All non-recurring engineering development activity is performed using engineering services Contract Line Item Numbers (CLINs) from existing Original Equipment Manufacturer (OEM) contracts, or field activity direct tasking. Funding levels reflect the approved 2020/2021 cost estimate.

	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000	20.261	21.655	-	21.655	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy	Date: March 2023
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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3440 / <i>SBSD Obsolescence</i>
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	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
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Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3440 / <i>SBSD Obsolescence</i>
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FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Monitor all 15 major Non-Propulsion Electronic Systems (NPES) for technology obsolescence issues and formulate mitigation action plans						
Execute component re-design, component qualification, sub-system integration, and platform integration						
FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028

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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3440 / <i>SBSD Obsolescence</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Proj 3440</i>				
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Monitor all 15 major NPES for technology obsolescence issues and formulate mitigation action plans**	1	2023	4	2028
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Execute component re-design, component qualification, sub-system integration, and platform integration**	1	2023	4	2028

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>				Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>			
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
3441: <i>SBSD Technology Refresh</i>	0.000	0.000	46.724	49.682	-	49.682	50.497	51.365	52.321	52.056	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 444

Note

Project 3441 (SBSD Technology Refresh) is a new project in FY23. This project is not a new start but represents continuation of efforts previously executed under project 3220 in FY22 and earlier.

A. Mission Description and Budget Item Justification

This project encompasses ship system development, coordination, and management efforts for the COLUMBIA Class Submarine Technology Insertion Program and Technology Refresh Program over the life cycle. The purpose of the Technology Insertion Program is to efficiently upgrade performance of all hulls by virtue of improvements in HM&E ship systems. The purpose of the Technology Refresh Program is to develop, coordinate, and manage technical refresh plans for ship systems reliant on Commercial off the Shelf (COTS) technology that have short product life cycles to ensure materiel solutions for obsolescence issues. Additionally, this project will support mitigation of obsolescence issues for HM&E components that are not included in systems that have not historically had a formal Tech Refresh plan. Technology development implementation and logistics for developmental items, and COLUMBIA Class test & evaluation for these items are also included. Testing of components and systems will be used to inform performance predictions for later ships in the class and determine if design changes are needed. Technologies developed in this program will be considered for applicability to the VIRGINIA Program for commonality opportunities. The thrust of these efforts will be to maintain required technical performance and materiel readiness of COLUMBIA SSBNs in order to support the Sea Based Strategic Deterrence (SBSD) mission.

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: Hull, Mechanical, and Electrical Technical Refresh, Obsolescence Design, and Integration Efforts	0.000	28.034	29.875	0.000	29.875
Articles:	-	-	-	-	-
FY 2023 Plans:					
- Redesign components to mitigate obsolescence issues for HM&E to mitigate obsolescence issues during construction and initial fielding of the COLUMBIA Submarine Class.					
- Commence Tech Refresh for CFE Commercial Off the Shelf based systems and HM&E systems to mitigate obsolescence issues during construction and initial fielding of the COLUMBIA Submarine Class.					
- Develop long term Tech Refresh plans CFE and GFE HM&E systems to ensure material availability over the Life-cycle of the COLUMBIA Submarine Class.					
FY 2024 Base Plans:					
- Redesign components to mitigate obsolescence issues for CFE and GFE to mitigate obsolescence issues during construction and initial fielding of the COLUMBIA Submarine Class.					

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<ul style="list-style-type: none"> - Commence Tech Refresh for CFE Commercial Off the Shelf based systems and GFE systems to mitigate obsolescence issues during construction and initial fielding of the COLUMBIA Submarine Class. - Develop long-term Tech Refresh plans CFE and GFE HM&E systems to ensure material availability over the Life-cycle of the COLUMBIA Submarine Class. <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Small increase represents restoration of total force management and the updated program cost estimate from 2021 capturing updated program estimates.</p>					
<p>Title: Systems Engineering, Test and Evaluation</p> <p align="right">Articles:</p> <p>FY 2023 Plans: Systems Engineering, Test and Evaluation</p> <p>Ship Control and Hydrodynamics</p> <ul style="list-style-type: none"> - Support incorporation of the Steady Flight Assist Algorithm in Ship Control Algorithm. - Support incorporation of Ship control algorithm with Hardware updates. - Support Ship Control Software FQT (Functional Qualification Testing) for Baseline revision 0.0. - A free running model test to support Characterization of CLB Operational Boundaries will be performed. - Characterization of CLB Operational Boundaries will continue including the validation of new modeling of near-surface behavior for various sea states (first and second order near surface forces). - Support substantial GFI deliveries to the shipbuilder for Ship's Systems Manual (SSM). <p>Diesel Exhaust</p> <ul style="list-style-type: none"> - Complete 5000 hours of Phase III Hot Corrosion Testing of the down selected material to verify its materialistic strength properties as the build material for the Diesel Exhaust. - Complete multiple iterations of the Phase III Fracture Toughness Testing of the down selected material to verify its materialistic fatigue properties as the build material for the Diesel Exhaust. <p>Propulsors and Shafting</p> <ul style="list-style-type: none"> - Conduct and support modal testing of as built propulsor components and assemblies. - Analyze modal testing data to inform and improve computational models and update performance predictions. 	0.000	18.690	19.807	0.000	19.807
	-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy		Date: March 2023
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Begin testing of propulsor bearing first production unit at Full Scale Bearing Test Facility to evaluate performance and generate design feedback.</p> <p>Signatures</p> <p>- System Software Build 2.0 and updated design efforts based on lessons learned from Future Naval Capability Demonstration effort.</p> <p>GFI Design Updates in accordance with ongoing design evolutions, obsolescence evaluation and improvements, and associated engineering efforts.</p> <p><i>FY 2024 Base Plans:</i> Systems Engineering, Test and Evaluation</p> <p>Ship Control, Hydrodynamics and Shock</p> <ul style="list-style-type: none"> - Continue support incorporation of Steady Flight Assist in Ship Control Algorithm. - Support certification of Ship control algorithm with Hardware updates. - Tasking will begin to pivot to support for SSM development requiring hundreds of simulation runs supporting SSM procedures. - Final free-running model test prior to FY28 Hydrodynamic Performance Trial (HPT) characterization cycle will be performed. The test will continue to support Characterization of CLB Operational Boundaries. - Characterization of CLB Operational Boundaries will continue. - Support the Large Vehicle Shock Test. <p>Diesel Exhaust</p> <ul style="list-style-type: none"> - Complete 5000 hours of Phase III Hot Corrosion Testing of the down selected material to verify its materialistic strength properties as the build material for the Diesel Exhaust. - Complete multiple iterations of the Phase III Fracture Toughness Testing of the down selected material to verify its materialistic fatigue properties as the build material for the Diesel Exhaust. <p>Propulsor and Shafting</p> <ul style="list-style-type: none"> - Continue modal testing of as built propulsor components and assemblies. - Continue analyzing modal testing data to inform and improve computational models, and update performance predictions. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy	Date: March 2023
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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Continue testing of propulsor bearing first production unit at Full Scale Bearing Test Facility to evaluate performance and generate design feedback.</p> <p>Signatures</p> <ul style="list-style-type: none"> - Continue System Software Build 2.0 and updated design efforts based on lessons learned from Future Naval Capability Demonstration effort and ongoing design evolution. - Support Modeling efforts to improve prediction capabilities and support reviews/assessments of Shipbuilder products by Subject Matter Experts. <p>Support GFI Design Updates in accordance with ongoing design evolutions, obsolescence evaluation and improvements, and associated engineering efforts.</p> <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Increase primarily due to planned shock test in FY24. Funding aligns with the updated program cost estimate from 2021 capturing updated program estimates.</p>					
Accomplishments/Planned Programs Subtotals	0.000	46.724	49.682	0.000	49.682

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

N/A

Remarks

D. Acquisition Strategy

The COLUMBIA Class Program RDT&E efforts will support the design, construction and operations & support portions of the program. RDT&E efforts will be performed by Navy laboratories, shipyards, private industry, and University Affiliated Research Centers.

Project 3441 funding has been realigned from Project 3220 funding in FY23 and later to mimic the Virginia class submarine follow ship cost tracking model.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>
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Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Development	Various	NSWC Carderock : Bethesda, MD	0.000	0.000		7.681	Oct 2022	14.348	Oct 2023	-		14.348	Continuing	Continuing	Continuing
Product Development	Various	JHU/APL : Laurel, MD	0.000	0.000		0.645	Oct 2022	0.250	Oct 2023	-		0.250	Continuing	Continuing	Continuing
Product Development	Various	NRL : Washington, DC	0.000	0.000		3.494	Nov 2022	3.534	Nov 2023	-		3.534	Continuing	Continuing	Continuing
Product Development	TBD	GDEB : Groton, CT	0.000	0.000		31.101	Nov 2022	27.009	Nov 2023	-		27.009	Continuing	Continuing	Continuing
Product Development	Various	NSWC : Philadelphia, PA	0.000	0.000		1.588	Oct 2022	1.736	Oct 2023	-		1.736	Continuing	Continuing	Continuing
Product Development	Various	ARL PSU : State College, PA	0.000	0.000		2.215	Nov 2022	2.805	Nov 2023	-		2.805	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		46.724		49.682		-		49.682	Continuing	Continuing	N/A

Remarks
The listed Award Dates represent the date on which initial obligations occur for the effort. Funding levels reflect the approved 2021 cost estimate and updated inflation/rates values.

	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000	46.724	49.682	-	49.682	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>
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FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
				Hydrodynamics		
				Ship Control		
				Signatures		
				Diesel Exhaust Phase III Testing		
				Propulsor and Shaffing		
				Shock Testing		
				GFI Design Upgrades		
				Monitor, redesign, and qualify CFE and GFE for HM&E components to mitigate obsolescence issues		
				Develop and implement tech refresh plans for 20 CFE and GFE HM&E systems		
FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028

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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 3441 / <i>SBSD Technology Refresh</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3441				
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Hydrodynamics**	1	2023	4	2028
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Ship Control **	1	2023	4	2028
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Signatures**	1	2023	4	2028
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Diesel Exhaust	1	2023	4	2025
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Propulsor and Shafting**	1	2023	4	2028
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Shock Testing	1	2024	4	2024
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: GFI Design Upgrades**	1	2023	4	2028
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Monitor, redesign, and qualify CFE and GFE for HM&E components to mitigate obsolescence issues	1	2023	4	2027
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Develop and implement tech refresh plans for 20 CFE and GFE HM&E systems	1	2023	4	2027

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design				Project (Number/Name) 9999 / Congressional Adds			
COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
9999: Congressional Adds	0.000	14.471	9.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	23.471
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

FY22 Congressional Adds support the continued development of composite materials and also provides funding for COLUMBIA Digital Environment development.

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

	FY 2022	FY 2023
<p>Congressional Add: Rapid composites for wet submarine application</p> <p>FY 2022 Accomplishments: Manufacturing process development and demonstration of composite materials for submarine propulsor, and shafting components at large scale and full scale.</p> <p>FY 2023 Plans: Continue manufacturing process development and demonstration of composite materials for submarine propulsor and shafting components at large scale and full scale.</p>	9.647	9.000
<p>Congressional Add: Columbia digital environment</p> <p>FY 2022 Accomplishments: Funding is used to convert the digital deliverables provided by the design yard into a government hosted 3D interactive digital twin to support efficient logistics, maintenance, and training processes.</p> <p>FY 2023 Plans: '- Develop and configure cloud-based capabilities for hosting CLB 3D digital twin models.</p> <ul style="list-style-type: none"> - Develop Digital Threads from Design/Planning Yards to enable automated export and model build process. - Master Job File development pilot leveraging gov-hosted CLB design data/digital twin to develop CLB work packages for planned maintenance requirements. - Integrate CLB model in containerized rendering software compatible with accredited Naval Nuclear Propulsion Information (NNPI) cloud, local, and disconnected deployments (environment agnostic). 	4.824	0.000
Congressional Adds Subtotals	14.471	9.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Development	SS/CPFF	Seeman Composites : Gulfport, MS	0.000	4.148	May 2022	0.000		0.000		-		0.000	0.000	4.148	-
Product Development	SS/CPFF	Seeman Comp. : Gulfport, MS	0.000	1.640	Aug 2022	0.000		0.000		-		0.000	0.000	1.640	-
Product Development	WR	NSWC/Carderock : Carderock, MD	0.000	3.859	Apr 2022	9.000	Sep 2023	0.000		-		0.000	0.000	12.859	-
Product Development	C/FFP	Beast Code : Fort Walton Beach, FL	0.000	4.824	Jul 2022	0.000		0.000		-		0.000	0.000	4.824	-
Subtotal			0.000	14.471		9.000		0.000		-		0.000	0.000	23.471	N/A

Remarks
The listed Award Dates represent the date on which initial obligations occur for the effort.

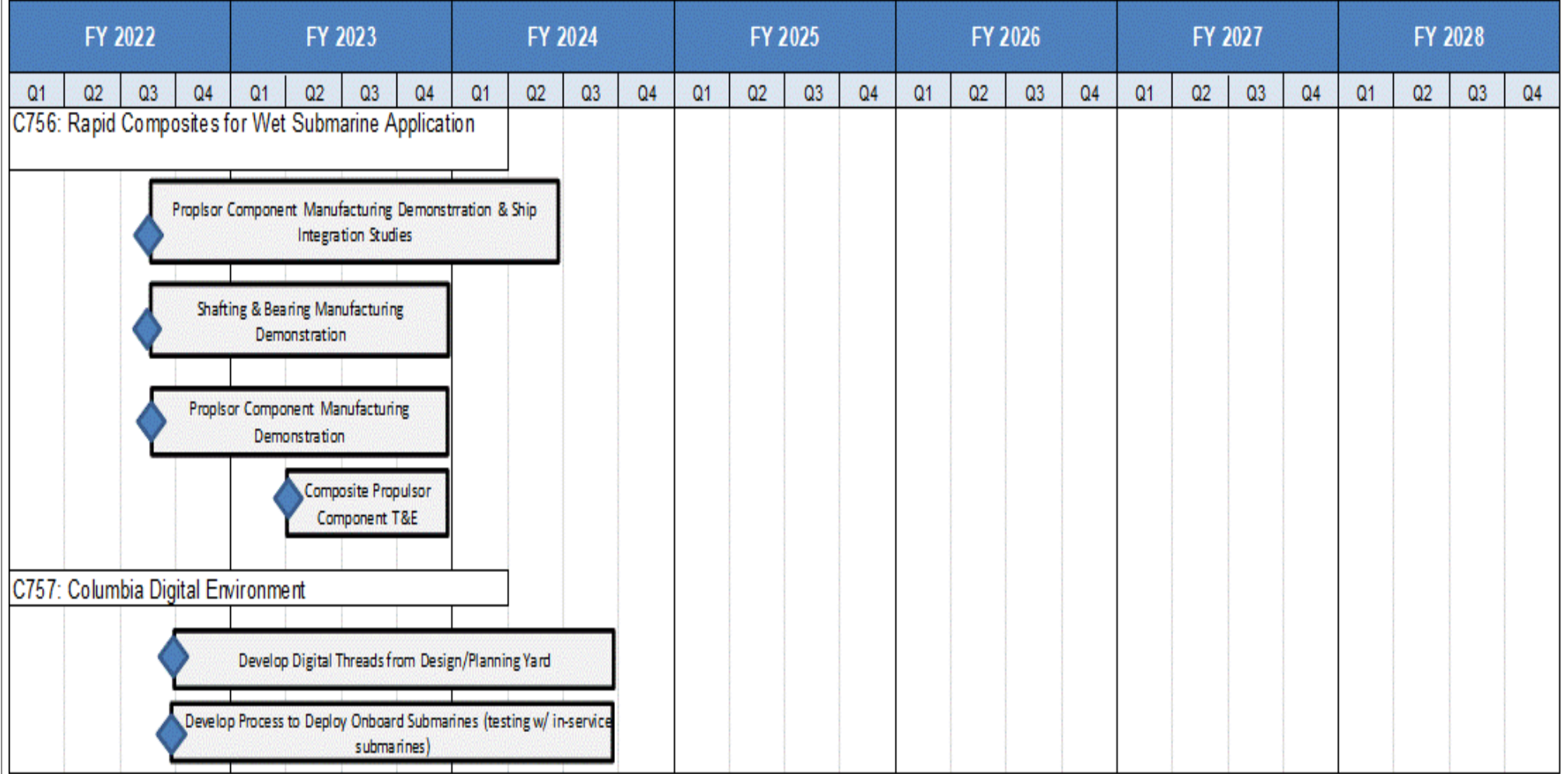
	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	14.471	9.000	0.000	-	0.000	0.000	23.471	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / <i>SSBN New Design</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Proj 9999</i>				
C756: Rapid Composites for Wet Submarine Application: Propulsor Component Manufacturing Demonstration and Ship Integration Studies	3	2022	4	2023
C756: Rapid Composites for Wet Submarine Application: Shafting and Bearing Manufacturing Demonstration	3	2022	3	2023
C756: Rapid Composites for Wet Submarine Application: Propulsor Component Manufacturing Demonstration	4	2022	4	2023
C756: Rapid Composites for Wet Submarine Application: Composite Propulsor Component Test and Evaluation	2	2023	4	2023
C757: Columbia Digital Environment: Develop Digital Threads from Design/Planning Yards	4	2022	3	2024
C757: Columbia Digital Environment: Develop Process to Deploy Onboard Submarines (testing w/ in-service submarines)	4	2022	3	2024