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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2023 Navy **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319: <i>Research, Development, Test &amp; Evaluation, Navy / BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	4,082.094	308.433	311.231	335.981	-	335.981	253.754	190.807	228.941	164.244	Continuing	Continuing
3220: <i>COLUMBIA Class Submarine Development</i>	4,082.094	308.433	296.231	268.996	-	268.996	183.095	118.912	155.749	89.808	Continuing	Continuing
3440: <i>SBSD Obsolescence</i>	0.000	0.000	0.000	20.261	-	20.261	21.371	21.745	22.137	22.513	Continuing	Continuing
3441: <i>SBSD Technology Refresh</i>	0.000	0.000	0.000	46.724	-	46.724	49.288	50.150	51.055	51.923	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	0.000	15.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	15.000

**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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
Previous President's Budget	316.396	296.231	0.000	-	0.000
Current President's Budget	308.433	311.231	335.981	-	335.981
Total Adjustments	-7.963	15.000	335.981	-	335.981
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	15.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-7.963	0.000			
• Program Adjustments	0.000	0.000	0.000	-	0.000
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Adjustments to Budget Year	-	-	335.981	-	335.981

**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*

	<b>FY 2021</b>	<b>FY 2022</b>
	0.000	10.000
	0.000	5.000
Congressional Add Subtotals for Project: 9999	0.000	15.000
Congressional Add Totals for all Projects	0.000	15.000

**Change Summary Explanation**

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FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy										<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 1319 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design				<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
3220: COLUMBIA Class Submarine Development	4,082.094	308.433	296.231	268.996	-	268.996	183.095	118.912	155.749	89.808	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
<b>Project MDAP/MAIS Code:</b> 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 will request 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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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy	<b>Date:</b> April 2022
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<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design	<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development
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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 is being 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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<b>Title:</b> Common Missile Compartment Design and Prototyping, and Whole Ship Design	118.715	153.070	161.934	0.000	161.934
<b>Articles:</b>	-	-	-	-	-
<b>FY 2022 Plans:</b>					

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<p>This funding applies to the design, systems engineering, prototyping construction, and vendor qualification activities needed to execute the schedule for 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 2022 include:</p> <ul style="list-style-type: none"> <li>- Continued fabrication of Missile Tubes and Strategic Weapons Support System (SWSS) kits.</li> <li>- The completion of Verification and Validation testing (V&amp;V) at Strategic Weapons Systems Ashore (SWS-A) facility at Cape Canaveral, FL to support risk mitigation for lead ship COLUMBIA construction and testing.</li> <li>- Continued Lead Ship Construction, which includes manufacture of the MTM for lead ship, and integration and test of SWSS systems for the land based test facility.</li> </ul> <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 2022 include:</p> <ul style="list-style-type: none"> <li>- About 97 percent of total Design Disclosures (approximately 4670 design disclosures including CMC design disclosures).</li> <li>- Planned completion is approximately 26 percent of Maintenance Integrated Logistics Products (732 of 2870).</li> <li>- Planned completion is approximately 25 percent of Provisioning Integrated Logistics Products (1155 of 4568).</li> <li>- Planned completion of approximately 31 percent of Logistics Technical Data Products (342 of 752).</li> <li>- Planned construction effort in FY2022 includes construction efforts on all Super Modules (1, 2, 3, 4, 5, and 6).</li> </ul> <p><b>FY 2023 Base Plans:</b></p> <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 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"> <li>- Continued fabrication of Missile Tubes and Strategic Weapons Support System (SWSS) kits.</li> <li>- Continued Lead Ship Construction, which includes manufacture of the MTM for lead ship, and integration and test of SWSS systems for the land based test facility.</li> </ul>					

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<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. Specific planned construction efforts for FY 2023 include:</p> <ul style="list-style-type: none"> <li>- Planned 99 percent of total Design Disclosures (approximately 4767 design disclosures including CMC design disclosures).</li> <li>- Planned completion is approximately 51 percent of Maintenance Integrated Logistics Products (1449 of 2870).</li> <li>- Planned completion is approximately 62 percent of Provisioning Integrated Logistics Products (2811 of 4568).</li> <li>- Planned completion of approximately 63 percent of Logistics Technical Data Products (476 of 752).</li> <li>- Planned construction effort in FY2022 includes construction efforts on all Super Modules (1, 2, 3, 4, 5, and 6).</li> </ul> <p><b>FY 2023 OCO Plans:</b> N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Increase due to shipbuilder design performance, updates made in accordance with 2020/2021 cost estimate.</p>					
<p><b>Title:</b> NAVSEA R&amp;D and Prototyping</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2022 Plans:</b> 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 2022 include:</p> <p>Combat Systems:</p> <ul style="list-style-type: none"> <li>- Complete development of the TI-24 Government Furnished Information changes to the lead ship baseline in support of ship design of the SSBN 827 Command and Control System Module.</li> <li>- Continue AN/BST-1 and AN/BRR-6 reliability based engineering changes, qualification, and testing.</li> <li>- Continue environmental qualification testing of the lead ship Government Furnished Equipment.</li> <li>- Complete delivery of developmental Structurally Integrated Enclosures to combat system vendor sites.</li> <li>- Continue to support technical evaluation and modeling of shock, explodeable volumes, and High Altitude Electromagnetic Pulse test requirements of components.</li> <li>- Continue to perform lab based cyber security testing of the lead ship Non-Propulsion Electronic System (NPES) design</li> </ul>	126.262	93.795	57.730	0.000	57.730
	-	-	-	-	-

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<p>- Continue to perform incremental NPES sub-system integration testing with the Strategic Weapons Systems using simulators and vendor site visits</p> <p>Component Development:</p> <ul style="list-style-type: none"> <li>- Continue Government support and oversight of development of the 101 engineered components.</li> <li>- Deliver diesel generator to compatibility test facility and complete COLUMBIA lead ship production unit build.</li> <li>- Complete prototype AC Unit qualification testing and delivery of lead ship units.</li> <li>- Complete prototype manufacturing and qualification testing of Thin Line Towed Array Handling System</li> <li>- Continue qualification testing of Advanced Carbon Dioxide Removal Unit (ACRU).</li> <li>- Continue production of the ACRU for the first hull.</li> <li>- Continue production of the ACRU for the second hull.</li> <li>- Start reliability/operational testing of the ACRU at Naval Surface Warfare Center.</li> <li>- Continue at-sea operational assessment of ACRU on SSGN.</li> </ul> <p>Propulsor and Shafting:</p> <ul style="list-style-type: none"> <li>- Conduct testing of propulsor bearing engineering demonstration model at Full Scale Bearing Test Facility.</li> <li>- Continue propulsor shock qualification analysis and design certification efforts.</li> <li>- Continue to update performance achievability assessments to reflect as-manufactured parts.</li> </ul> <p>Shock, Structures and Composites:</p> <ul style="list-style-type: none"> <li>- Continue test planning, test simulations and vehicle assessment for Large Vehicle Shock Testing.</li> <li>- Complete instrumentation and conduct test of the forward pressure hull confirmation model.</li> <li>- Complete fabrication of the machining fixture of Out of Autoclave bow dome.</li> <li>- Complete fabrication of Out of Autoclave bow dome.</li> <li>- Complete fabrication of the first US shipset of the Navigation Sonar System Windows.</li> <li>- Complete development of composites inspection and maintenance procedures, criteria and evaluation methods.</li> </ul> <p>Signatures:</p> <ul style="list-style-type: none"> <li>- Update whole-boat signature predictions using updated modeling and predictive tools.</li> <li>- Support GFE design efforts for Stern Area System and demonstration testing</li> <li>- Support Physical Scale Model Testing and ICCP algorithms updates to account for as-built and damage scenarios.</li> </ul>					

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<p>- Supported Shipbuilder qualification testing of machinery components and devices.</p> <p>Maneuvering, Ship Control and Hydrodynamics:</p> <ul style="list-style-type: none"> <li>- Free Running Model hydrodynamic testing with down selected final propulsor configuration</li> <li>- Characterization of CLB Operational Boundaries including new modeling of near-surface behavior for various sea states.</li> <li>- Complete development of the Environmental Maintenance &amp; Operator Guidance System (EMOGS) with planned deployment to King's Bay GA (KBNSB) and Port Canaveral, FL (NOTU).</li> <li>- Complete Ship Control Software FQT (Functional Qualification Testing) TRR (test readiness review) for baseline revision 0.0</li> <li>- Ship Control Software FQT (Functional Qualification Testing) complete for Baseline revision 0.0</li> <li>- Conduct PTR (problem trouble reports) reviews in support of the Columbia CCB (configuration control board) meeting and document.</li> <li>- Delivery of preliminary SFA algorithm (software) to EB for integration testing.</li> <li>- Develop/Review/Support for SFA (steady flight assist) algorithm Interface Requirement Spec/Software Requirement Spec (IRS/SRS).</li> <li>- Update Steering and Diving (Primary and Backup) and Trim and Ballast (ABAT) algorithms (software) to support Ship Control Software (SCS) Revision 0.1.</li> <li>- Provide Final Steering and Diving (primary &amp; backup) and Trim and Ballast (ABAT) algorithms (software) to EB for testing of SCS revision 0.1.</li> <li>- Deliver Integrated Anomaly Detector into the Data Validation Module of the S&amp;D algorithm (software)</li> <li>- Deliver updated interface to the Columbia MCSIM to be used for Algorithm testing.</li> </ul> <p><b>FY 2023 Base Plans:</b>                      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</p> <ul style="list-style-type: none"> <li>- Synthesize TI-24 Government Furnished Information changes to the lead ship baseline into procurement ready documentation of support of SSBN 827 NPES shipset acquisition</li> <li>- Continue AN/BST-1 and AN/BRR-6 reliability based engineering changes, qualification, and testing.</li> <li>- Continue environmental qualification testing of lead ship design Government Furnished Equipment.</li> <li>- Initiate COATS construction test facility Simulation/Stimulation equipment design and qualification testing</li> </ul>					

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<ul style="list-style-type: none"> <li>- Continue to perform lab based cyber security testing of the lead ship NPES design</li> <li>- Complete final year of NPES laboratory-level software development and integration prior to construction delivery</li> <li>- Continue to perform incremental NPES sub-system integration testing with the Strategic Weapons Systems using simulators and vendor site visits</li> </ul> <p>Component Development:</p> <ul style="list-style-type: none"> <li>- Continue Government support and oversight of development of the approximately 13 of 101 remaining engineered components.</li> <li>- Support diesel generator integration testing at compatibility test facility.</li> <li>- Complete assembly of Thin Line Towed Array Handling System on lead ship.</li> <li>- Complete qualification testing of the ACRU</li> <li>- Complete production of the ACRU for the first hull</li> <li>- Complete production of the ACRU for the second hull.</li> <li>- Continue reliability/operational testing of ACRU at Naval Surface Warfare Center.</li> <li>- Continue at-sea operational assessment of ACRU on SSGN.</li> </ul> <p>Propulsor and Shafting:</p> <ul style="list-style-type: none"> <li>- Begin testing of propulsor bearing first production unit at Full Scale Bearing Test Facility.</li> <li>- Continue propulsor shock qualification analysis and design certification efforts.</li> <li>- Continue to update performance achievability assessments to reflect as-manufactured parts.</li> </ul> <p>Shock, Structures and Composites:</p> <ul style="list-style-type: none"> <li>- Continue test planning, test simulations and vehicle assessment for Large Vehicle Shock Testing.</li> <li>- Deliver the Out of Autoclave bow dome to NNS.</li> <li>- Complete fabrication of the second UK shipset of the Navigation Sonar System Windows</li> </ul> <p>Signatures:</p> <ul style="list-style-type: none"> <li>- Update whole-boat signature predictions using updated modeling and predictive tools</li> <li>- Support GFE design efforts for Stern Area System and demonstration testing</li> </ul>					

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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<p>- Support Physical Scale Model Testing and ICCP algorithms updates to account for as-built and damage scenarios.</p> <p><b>FY 2023 OCO Plans:</b> N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Decrease represents the updated program cost estimate from 2020/2021 capturing updates to government component and technology development efforts and an overall shift to SCN and commencement of follow ship R&amp;D obsolescence and technology refresh starting in 2023.</p>					
<p><b>Title:</b> Systems Engineering/Program Management</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2022 Plans:</b> 'Program Office will continue efforts to manage, coordinate, and oversee all efforts of the program including shipbuilder and government activities.</p> <ul style="list-style-type: none"> <li>- Commence preparations at Naval Base Kitsap-Bangor, such as utility system, seismic analysis, and existing conditions.</li> <li>- Trident Training Facility (TTF) Kings Bay MILCON P676 Authority to Advertise (ATA) is planned in FY22 to support Construction Start in FY23.</li> <li>- Trident Refit Facility (TRF) Kings Bay MILCON P684 planned submission for Early Preliminary Design Authority and PRI#2 update in FY22.</li> <li>- Receive stakeholder concurrence on maintenance product development processes, including roles and responsibilities ultimately resulting in an approved Class Maintenance Plan to support Lead Ship Delivery.</li> <li>- Continue development of COLUMBIA Submarine Bridge Trainer (SBT) Engineering Development Model (EDM).</li> <li>- Complete Kings Bay Waterfront Utility study.</li> <li>- Initiate government laboratory and sub-system Participating Area Manager (PARMs) efforts to begin detailed design of the SSBN827 TI-24 NPES configuration.</li> <li>- Continue risk reduction actions necessary to install the TI-24 SSBN 827 COATS configuration as a retrofit on lead ship during PSA.</li> <li>- Execute early Strategic Weapon System Integration into NPES Systems.</li> <li>- Maintain execution of the COLUMBIA Electronics Integration Plan to support shore side Command and Control testing, and mitigation of integration risks.</li> </ul>	38.194	35.594	34.559	0.000	34.559
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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3220 / <i>COLUMBIA Class Submarine Development</i>

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<ul style="list-style-type: none"> <li>- Support the biennial SSBN Security Technology Program (SSTP)-sponsored CLB Vulnerability Assessment.</li> <li>- Draft and coordinate updates to the TEMP and LFT&amp;E Management Plan in support of FY23 approval by stakeholders.</li> <li>- Conduct LFT&amp;E COTS robustness testing of SWS components procured in FY2021at NSWC Philadelphia. Prepare report. Begin assessment of relevant threat weapon shot lines.</li> <li>- Continued development of personal injury scenarios and injury criteria that will enable the projection of casualties resulting from an adversary's simulated successful attack.</li> <li>- Provide technical support for GD EB's completion of LFT&amp;E shock testing of HCMs in the radial direction. Data supports assessment of these components' ability to protect personnel and equipment from higher levels of mechanical shock.</li> <li>- Leverage data from the electronics COTS robustness testing and FVD/HCM testing to establish equipment "kill criteria" or use in assessing CLB mission capabilities after an adversary's simulated successful attack on CLB.</li> <li>- Update CLB threat sonar models and simulated tactics using at-sea data collected in early FY 2022.</li> <li>- Report on results of developmental testing being conducted to Deputy Director, Developmental Testing, Evaluations, and Assessments (DD((DTE&amp;A)) in accordance with the TEMP.</li> <li>- Conduct a cybersecurity test similar to that completed in FY21, this time on TI-20 baseline systems. This will be CLB's first cyber development test of the SWFTS variant that will be installed on the first of class.</li> <li>- Conduct a cybersecurity test similar to that completed in FY21, this time on TI-20 baseline systems. This will be CLB's first cyber development test of the SWFTS variant that will be installed on the first of class.</li> </ul> <p><b>FY 2023 Base Plans:</b></p> <ul style="list-style-type: none"> <li>- Execute TTF Kings Bay MILCON P676 on schedule to support SSP and NAVSEA ready for training dates.</li> <li>- Continue maturing TRF Kings Bay P684.</li> <li>- Continue the advanced planning studies for NBK-Bangor and submit P817 for PRI#0 level of maturity.</li> <li>- Report on results of developmental testing being conducted to Deputy Director, Developmental Test &amp; Evaluations, and Assessments (DD(DTE&amp;A)) in accordance with the TEMP.</li> <li>- Commence Operational Test B2, an Operational Observation of Developmental Testing at SWS Ashore.</li> <li>- Conduct a VA-CLB Cybersecurity Early DT of the SWFTS TI 20/19 hardware that will be installed on CLB Class SSBN 826.</li> <li>- Complete update and approval of the TEMP and LFT&amp;E Management Plan</li> <li>- Update the CLB Class Submarine Construction, Testing and Assumptions letter.</li> </ul>					

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy			<b>Date:</b> April 2022				
<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design	<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development					
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>			<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<p>- Complete the LFT&amp;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.</p> <p><b>FY 2023 OCO Plans:</b> N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Small decrease represents the updated program cost estimate from 2020/2021 capturing updated program estimates.</p>							
<p><b>Title:</b> Strategic Weapons System Integration</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2022 Plans:</b></p> <ul style="list-style-type: none"> <li>- 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 and performing associated Logistic Support activities.</li> <li>- Continue utilization of the SWS Fire Control System (FCS) Engineering Test Systems within the land-based test berths / facilities for SWS FCS hardware and software design, integration, verification, and validation.</li> <li>- Continue SWS Fire Control Subsystem Trainer hardware and software design efforts.</li> <li>- Continue Strategic Weapon Support Systems (SWSS) Verification and Validation (V&amp;V) testing at SWSA.</li> <li>- Continue proofing of Shipyard Installation Test Program (SITP) Test Procedures at SWSA and continue SWS integration and regression testing efforts at SWSA.</li> </ul> <p><b>FY 2023 Base Plans:</b></p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Complete SWS Fire Control Subsystem Trainer hardware and software design efforts.</li> <li>- Complete proofing of Shipyard Installation Test Program (SITP) Test Procedures and continue SWS Ashore (SWSA) integration and regression testing efforts at SWSA.</li> </ul> <p><b>FY 2023 OCO Plans:</b></p>			25.262	13.772	14.773	0.000	14.773
			-	-	-	-	-

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design	<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
N/A					
<b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Increase due to aligning to 2020/2021 program cost estimates and restoration of previous funding reductions.					
<b>Accomplishments/Planned Programs Subtotals</b>	308.433	296.231	268.996	0.000	268.996

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• RDTEN/0603570N/3219: SBSD Nuclear Technology Development	80.085	60.142	56.707	-	56.707	54.230	44.121	38.899	35.511	Continuing	Continuing
• RDTEN/0101221N/0951: Joint Warhead Fuze Sustainment Program	16.332	6.733	3.087	-	3.087	0.000	0.000	0.000	0.000	0.000	720.629
• OPN/5358: Strategic Missile Systems Equip	251.683	276.430	279.430	-	279.430	334.348	318.880	434.297	336.434	0.000	3,813.055
• WPN/1250: TRIDENT II Mods	1,155.600	1,120.241	1,125.164	-	1,125.164	1,230.301	1,613.423	2,429.699	2,884.836	2,176.384	24,512.233
• OMN/1D2D: Fleet Ballistic Missile	1,408.355	1,476.247	1,664.076	-	1,664.076	1,745.037	1,840.905	1,867.972	1,911.348	0.000	11,913.940
• SCN/1045: COLUMBIA Class Submarine	4,122.199	4,776.980	5,857.776	-	5,857.776	5,815.252	7,222.907	8,477.173	8,954.970	60,837.094	112,693.641
• MCN/64482044: MCON Design	199.537	512.729	306.842	-	306.842	258.280	177.262	145.521	136.147	0.000	1,736.318

**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 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 2023 Navy												Date: April 2022			
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 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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	1,747.556	118.715	Oct 2020	153.070	Oct 2021	161.934	Oct 2022	-		161.934	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Carderock, MD	610.165	48.505	Oct 2020	32.801	Oct 2021	20.452	Oct 2022	-		20.452	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Philadelphia, PA	96.760	19.210	Oct 2020	13.614	Oct 2021	9.916	Oct 2022	-		9.916	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Newport, RI	138.096	26.087	Oct 2020	26.988	Oct 2021	15.585	Oct 2022	-		15.585	Continuing	Continuing	Continuing
Product Development	Various	NAVSEA : Various	282.164	32.461	Oct 2020	20.392	Oct 2021	11.777	Oct 2022	-		11.777	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	198.509	2.254	Oct 2020	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL : Laurel, MD	29.088	1.617	Nov 2020	0.967	Nov 2021	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	85.225	0.608	Oct 2020	0.160	Nov 2021	0.232	Nov 2022	-		0.232	Continuing	Continuing	Continuing
Product Development	C/CPFF	EMCUBE : Alexandria, VA	4.033	0.651	Oct 2020	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMS : Sunnyvale, CA	119.268	1.076	Oct 2020	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	159.985	8.395	Oct 2020	5.848	Oct 2021	4.576	Oct 2022	-		4.576	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	3.983	1.316	Oct 2020	1.902	Oct 2021	1.295	Oct 2022	-		1.295	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2023 Navy</b>											<b>Date: April 2022</b>				
<b>Appropriation/Budget Activity</b> 1319 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design					<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development				

<b>Product Development (\$ in Millions)</b>				<b>FY 2021</b>		<b>FY 2022</b>		<b>FY 2023 Base</b>		<b>FY 2023 OCO</b>		<b>FY 2023 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
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	47.435	4.875	Oct 2020	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	70.578	3.670	Nov 2020	3.291	Nov 2021	8.095	Oct 2022	-		8.095	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDEB : Groton, CT	8.737	0.684	Oct 2020	1.007	Oct 2021	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	Various	SSP : Various	19.689	0.115	Oct 2020	0.597	Oct 2021	0.575	Oct 2022	-		0.575	Continuing	Continuing	Continuing
Product Development	SS/CPFF	SPA : Alexandria, VA	12.550	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			3,767.618	270.239		260.637		234.437		-		234.437	Continuing	Continuing	N/A

**Remarks**  
 FY21 amounts for GDMS and BAE do not reflect the application of United Kingdom (UK) Common R&D funding for Common Missile Compartment (CMC) non-recurring engineering (NRE) efforts, which aligns with the approved UK funding profile, noted in the SAR report. UK funding accounts for 23% of SSP SWS CMC NRE efforts in FY21. 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.

<b>Management Services (\$ in Millions)</b>				<b>FY 2021</b>		<b>FY 2022</b>		<b>FY 2023 Base</b>		<b>FY 2023 OCO</b>		<b>FY 2023 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Contractor Management Support	C/CPFF	Various : Multiple Awards	171.884	19.819	Nov 2020	16.298	Nov 2021	14.793	Nov 2022	-		14.793	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Carderock, MD	96.948	10.383	Oct 2020	10.711	Oct 2021	13.455	Oct 2022	-		13.455	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Philadelphia, PA	11.289	1.025	Oct 2020	1.240	Oct 2021	1.000	Oct 2022	-		1.000	0.000	14.554	-
Government Management Support	WR	Various: NUWC : Newport, RI	18.019	2.893	Oct 2020	2.625	Oct 2021	2.684	Oct 2022	-		2.684	0.000	26.221	-

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2023 Navy</b>											<b>Date: April 2022</b>				
<b>Appropriation/Budget Activity</b> 1319 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design					<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development				

<b>Management Services (\$ in Millions)</b>				<b>FY 2021</b>		<b>FY 2022</b>		<b>FY 2023 Base</b>		<b>FY 2023 OCO</b>		<b>FY 2023 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Government Management Support	WR	Various: SUPSHIP : Groton, CT	12.938	4.073	Oct 2020	4.720	Oct 2021	2.627	Oct 2022	-		2.627	0.000	24.358	-
Travel	WR	NAVSEA HQ : Washington, D.C.	3.398	0.001	Nov 2020	0.000	Nov 2021	0.000	Nov 2022	-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			314.476	38.194		35.594		34.559		-		34.559	Continuing	Continuing	N/A

**Remarks**  
The funding properly aligns the execution of funding for FY21 with Management Services and the program transition to SCN Full Funding. These requirements are split funded with SCN beginning in FY21 so values above are ~50% of the required, with remaining balance funded with SCN full funding. Other FY22 & FY23 updates match the approved 2021 cost estimate.

	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>	4,082.094	308.433	296.231	268.996	-	268.996	Continuing	Continuing	N/A

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

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2023 Navy</b>		<b>Date: April 2022</b>
<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3220 / <i>COLUMBIA Class Submarine Development</i>

FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
◇ Construction Award						
		Ship Design Disclosure and Construction Data				
		Research, Development, and Prototyping for Lead Ship Design				
		Component Development / Component Qualification				
	Advanced Propulsor Bearing Prototype					
		Advanced Carbon Dioxide Removal Unit (ACRU)				
			Ship Class SCN Design			
		Lead Ship Construction				
						Trails / DASO
FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027

DASO - Demonstration and Shakedown Operation  
 RDT&E - Research, Development, Test & Evaluation

SCN - Shipbuilding and Conversion, Navy

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2023 Navy		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3220 / <i>COLUMBIA Class Submarine Development</i>

Schedule Details

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

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**Exhibit R-2A, RDT&E Project Justification:** PB 2023 Navy **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>				<b>Project (Number/Name)</b> 3440 / <i>SBSD Obsolescence</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
3440: <i>SBSD Obsolescence</i>	0.000	0.000	0.000	20.261	-	20.261	21.371	21.745	22.137	22.513	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)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<b>Title:</b> Government Furnished/Contractor Furnished NPES Component Technology Refreshment	0.000	0.000	20.261	0.000	20.261
<b>Articles:</b>	-	-	-	-	-
<b>FY 2022 Plans:</b> N/A					
<b>FY 2023 Base Plans:</b> - Catalog lead ship design 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					
<b>FY 2023 OCO Plans:</b> N/A					
<b>FY 2022 to FY 2023 Increase/Decrease Statement:</b>					

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy	<b>Date:</b> April 2022
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<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3440 / <i>SBSD Obsolescence</i>
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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Project Unit commences funding in FY23.					
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	20.261	0.000	20.261

**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 2023 Navy** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design	<b>Project (Number/Name)</b> 3440 / SBSD Obsolescence
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<b>Product Development (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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		0.000		5.947	Nov 2022	-		5.947	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Newport, RI	0.000	0.000		0.000		3.574	Oct 2022	-		3.574	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Philadelphia, PA	0.000	0.000		0.000		1.583	Oct 2022	-		1.583	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Keyport, WA	0.000	0.000		0.000		1.120	Oct 2022	-		1.120	Continuing	Continuing	Continuing
Product Development	WR	NSWC Carderock : Bethesda, MD	0.000	0.000		0.000		0.517	Oct 2022	-		0.517	Continuing	Continuing	Continuing
Product Development	C/BA	GDEB : Groton, CT	0.000	0.000		0.000		3.510	Nov 2022	-		3.510	Continuing	Continuing	Continuing
Product Development	C/BA	Lockheed-Martin : Syracuse, NY	0.000	0.000		0.000		0.650	Nov 2022	-		0.650	Continuing	Continuing	Continuing
Product Development	C/BA	NIWC LANT : Charleston SC	0.000	0.000		0.000		0.887	Oct 2022	-		0.887	Continuing	Continuing	Continuing
Product Development	C/BA	GDMS : Pittsfield, MA	0.000	0.000		0.000		0.750	Nov 2022	-		0.750	Continuing	Continuing	Continuing
Product Development	C/BA	GDMS : Fair Lakes, VA	0.000	0.000		0.000		0.815	Nov 2022	-		0.815	Continuing	Continuing	Continuing
Product Development	C/BA	NSWC : Port Hueneme CA	0.000	0.000		0.000		0.050	Oct 2022	-		0.050	Continuing	Continuing	Continuing
Product Development	C/BA	Progeny Systems : Manassas, VA	0.000	0.000		0.000		0.858	Nov 2022	-		0.858	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	0.000		0.000		20.261		-		20.261	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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	0.000	0.000	0.000	20.261	-	20.261	Continuing	Continuing	N/A

**Remarks**

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**Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3440 / <i>SBSD Obsolescence</i>
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FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
		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 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2023 Navy **Date:** April 2022

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>Proj 3440</i></b>				
* 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	2027
* 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	2027

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**Exhibit R-2A, RDT&E Project Justification:** PB 2023 Navy **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>				<b>Project (Number/Name)</b> 3441 / <i>SBSD Technology Refresh</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3441: <i>SBSD Technology Refresh</i>	0.000	0.000	0.000	46.724	-	46.724	49.288	50.150	51.055	51.923	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 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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<b>Title:</b> Hull, Mechanical, and Electrical Technical Refresh, Obsolescence Design, and Integration Efforts	0.000	0.000	28.034	0.000	28.034
<b>Articles:</b>	-	-	-	-	-
<b>FY 2022 Plans:</b> N/A					
<b>FY 2023 Base Plans:</b> - Redesign components to mitigate obsolescence issues for CFE and GFE 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 GFE systems to mitigate obsolescence issues during construction and initial fielding of the COLUMBIA Submarine Class.					

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy	<b>Date:</b> April 2022
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<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3441 / <i>SBSD Technology Refresh</i>
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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Develop long term Tech Refresh plans CFE and GFE HM&amp;E systems to ensure material availability over the Life-cycle of the COLUMBIA Submarine Class.</p> <p><b>FY 2023 OCO Plans:</b> N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Project Unit commences funding in FY23.</p>					
<p><b>Title:</b> Systems Engineering, Test and Evaluation</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2022 Plans:</b> N/A</p> <p><b>FY 2023 Base Plans:</b> Systems Engineering, Test and Evaluation</p> <p>Ship Control and Hydrodynamics</p> <ul style="list-style-type: none"> <li>- Support incorporation of Steady Flight Assist in Ship Control Algorithm</li> <li>- Support certification of Ship control algorithm with Hardware updates</li> <li>- Support Final Maneuvering Characterization Studies</li> <li>- Support Recoverability Studies and system modeling efforts</li> </ul> <p>Diesel Exhaust</p> <ul style="list-style-type: none"> <li>- Support Phase 3 Material Evaluation efforts</li> </ul> <p>Propulsors</p> <ul style="list-style-type: none"> <li>- Support modal testing of as built propulsor components and assemblies</li> <li>- Support propulsor performance testing and manufacturing demonstrations and processes</li> <li>- Support of Advanced propulsor Bearing follow on testing</li> </ul> <p>Signatures</p> <ul style="list-style-type: none"> <li>- System Software Build 2.0 and updated design efforts based on lessons learned from Future Naval Capability Demonstration effort</li> </ul>	0.000	0.000	18.690	0.000	18.690
	-	-	-	-	-

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy	<b>Date:</b> April 2022
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<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3441 / <i>SBSD Technology Refresh</i>
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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
GFI Design Updates in accordance with ongoing design evolutions, obsolescence evaluation and improvements, and associated engineering efforts  <b><i>FY 2023 OCO Plans:</i></b> N/A  <b><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i></b> Project Unit commences funding in FY23.					
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	46.724	0.000	46.724

**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 2023 Navy** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3441 / <i>SBSD Technology Refresh</i>
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<b>Product Development (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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		0.000		7.071	Oct 2022	-		7.071	Continuing	Continuing	Continuing
Product Development	Various	JHU/APL : Laurel, MD	0.000	0.000		0.000		0.825	Oct 2022	-		0.825	Continuing	Continuing	Continuing
Product Development	Various	NRL : Washington, DC	0.000	0.000		0.000		0.994	Nov 2022	-		0.994	Continuing	Continuing	Continuing
Product Development	TBD	GDEB : Groton, CT	0.000	0.000		0.000		30.272	Nov 2022	-		30.272	Continuing	Continuing	Continuing
Product Development	Various	NSWC : Philadelphia, PA	0.000	0.000		0.000		6.562	Oct 2022	-		6.562	Continuing	Continuing	Continuing
Product Development	Various	NUWC : Newport, RI	0.000	0.000		0.000		1.000	Oct 2022	-		1.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	0.000		0.000		46.724		-		46.724	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 2020/2021 cost estimate and updated inflation/ rates values.

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	0.000	0.000	0.000	46.724	-	46.724	Continuing	Continuing	N/A

**Remarks**

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**Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 1319 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>	<b>Project (Number/Name)</b> 3441 / <i>SBSD Technology Refresh</i>
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FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
																Hydrodynamics											
																Ship Control											
																Signatures											
								Diesel Exhaust Phase III Testing																			
																Propulsor											
																				Shafting and Bearing							
																				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 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			

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**Exhibit R-4A, RDT&E Schedule Details: PB 2023 Navy** **Date:** April 2022

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Proj 3441</b>				
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Hydrodynamics**	1	2023	4	2027
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Ship Control **	1	2023	4	2027
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Signatures**	1	2023	4	2027
* 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**	1	2023	4	2027
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: Shafting and Bearing	1	2024	4	2027
* Effort began prior to 1st quarter FY 2021. ** Effort continues past 4th Quarter FY 2027.: GFI Design Upgrades**	1	2023	4	2027
* 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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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy										<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 1319 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603595N / <i>SSBN New Design</i>				<b>Project (Number/Name)</b> 9999 / <i>Congressional Adds</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
9999: <i>Congressional Adds</i>	0.000	0.000	15.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	15.000
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)**

	<b>FY 2021</b>	<b>FY 2022</b>
<b>Congressional Add:</b> Rapid composites for wet submarine application <i>FY 2021 Accomplishments:</i> N/A <i>FY 2022 Plans:</i> Manufacturing process development and demonstration of submarine propulsor, shafting and bearing components at large scale and full scale.	0.000	10.000
<b>Congressional Add:</b> Columbia digital environment <i>FY 2021 Accomplishments:</i> N/A <i>FY 2022 Plans:</i> Funding is used to convert the digital deliverables provided by the design yard into a 3D interactive digital twin to support efficient logistics, maintenance, and training processes.	0.000	5.000
<b>Congressional Adds Subtotals</b>	0.000	15.000

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A





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**Exhibit R-4A, RDT&E Schedule Details:** PB 2023 Navy **Date:** April 2022

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>Proj 9999</i></b>				
C756: Rapid Composites for Wet Submarine Application: Propulsor Component Manufacturing Demonstration #1	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 #2	4	2022	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