

# UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0603595N / SSBN New Design							
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	1,744.587	681.164	776.158	514.846	-	514.846	433.296	313.445	196.082	173.611	Continuing	Continuing
3220: COLUMBIA Class Submarine Development	1,744.587	681.164	776.158	514.846	-	514.846	433.296	313.445	196.082	173.611	Continuing	Continuing
Program MDAP/MAIS Code: Project MDAP/MAIS Code(s): P444												
A. Mission Description and Budget Item Justification												
The FY 2019 funding request was reduced by \$0.046 million to reflect the Department of the Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.												
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. 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.												
Project Unit 3220:												
The objective of the SSBN New Design project is to design and prepare for construction of the replacement of the OHIO Class SSBN.												
B. Program Change Summary (\$ in Millions)					FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total			
Previous President's Budget					700.811	776.158	514.520	-	514.520			
Current President's Budget					681.164	776.158	514.846	-	514.846			
Total Adjustments					-19.647	0.000	0.326	-	0.326			
• Congressional General Reductions					-	-						
• Congressional Directed Reductions					-	-						
• Congressional Rescissions					-	-						
• Congressional Adds					-	-						
• Congressional Directed Transfers					-	-						
• Reprogrammings					-	-						
• SBIR/STTR Transfer					-19.647	0.000						
• Program Adjustments					0.000	0.000	7.831	-	7.831			
• Rate/Misc Adjustments					0.000	0.000	-7.505	-	-7.505			

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COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3220: COLUMBIA Class Submarine Development	1,744.587	681.164	776.158	514.846	-	514.846	433.296	313.445	196.082	173.611	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: P444												
A. Mission Description and Budget Item Justification												
<p>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&amp;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.</p> <p>The COLUMBIA program strategy is to leverage the re-use of existing Submarine systems (as applicable), focus on Life Cycle 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 start in FY 2021.</p> <p>The following key activities support a ship acquisition program to replace the OHIO Class SSBNs:</p> <ol style="list-style-type: none"><li>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).</li><li>2. Concept Definition, System Definition, and Detailed Design for remaining portions of the ship will be accomplished through a Design/Build/Sustain approach modeled after the approach used by the VIRGINIA Class program.</li><li>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.</li></ol> <p>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.</p> <p>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</p>												

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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 examined to include Multi-Program Material Procurement (MPMP) and Economic Order Quantity (EOQ).						
FY17 activities were executed to ensure the first article quad pack (FAQP) prototype of the CMC remains on schedule to support the UK DREADNOUGHT Program and to continue validation of the Integrated Tube and Hull (ITH) build strategy. These activities included the start of construction for the FAQP in August 2016 with a planned completion in 2019. 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 pre-construction 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 will address 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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Common Missile Compartment Design and Prototyping		231.057	256.968	183.413	0.000	183.413
Articles:		-	-	-	-	-
FY 2018 Plans:						
The combination of CMC Design and Prototyping and Ship Study and Design represents the required LDY Shipbuilder effort for the COLUMBIA Program.						
CMC Design and Prototyping: This funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for CMC design and component / technology development for the COLUMBIA submarine. Included in this effort is continued development of CMC design and logistics products. Specific planned efforts in FY 2018 include the completion of all remaining CMC arrangements (1045 products) approximately 20% of logistics products, approximately 85 percent of CMC Design Disclosures (850 design disclosures) in support of the MTM build. Specific planned efforts for 2018 also include: continued fabrication, delivery, and outfitting of MTs; continued manufacturing of the FAQP and continued support of development of SWSS for the land based test facility, SWS Ashore (SWSA).						
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, component / technology development for the COLUMBIA submarine. Specific efforts in FY 2018 include the completion of 90 percent of						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
total Arrangements (approximately 3800 arrangement disclosures including CMC arrangements), 35 percent of total Design Disclosures (approximately 1597 design disclosures including CMC design disclosures), and 7 percent of logistics technical documentation, and supportability assessments. Efforts will also continue towards maintaining configuration control for all CMC interfaces with RoS and progressing ship integration of the Propulsor design.						
FY 2019 Base Plans: The combination of CMC Design and Prototyping with Whole Ship Study and Design represents the required LDY Shipbuilder effort for the COLUMBIA Program.						
CMC Design and Prototyping: This funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for CMC design and component / technology development for the COLUMBIA submarine. Included in this effort is continued development of CMC design products. Specific planned efforts in FY 2019 include the completion of approximately 40 percent of logistic products and 97 percent of CMC Design Disclosures (964 design disclosures) in support of the MTM build. Specific planned efforts for 2019 also include: continued fabrication of MTs; completion of manufacturing of the FAQP and manufacturing in support of the Missile Tube Module, and continued development of SWSS for the land based test facility, SWSA.						
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. Specific efforts in FY 2019 include the completion of 97 percent of total Arrangements (approximately 4104 arrangement disclosures including CMC arrangement), 60 percent of total Design Disclosures (approximately 2735 design disclosures including CMC design disclosures) , 12 percent of logistics technical documentation, and supportability assessments. Efforts will also continue towards maintaining configuration control for all CMC interfaces with Rest of Ship and progressing ship integration of the Propulsor design.						
FY 2019 OCO Plans: N/A						
FY 2018 to FY 2019 Increase/Decrease Statement: Overall efforts transitioning to SCN Detailed Design and construction efforts						
Title: NAVSEA R&D and Prototyping		189.618	276.681	155.860	0.000	155.860

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Articles:		-	-	-	-	-
FY 2018 Plans: This funding applies to the Government combat systems, component and technology development for the COLUMBIA submarine essential to achieving required signatures, maneuverability, combat and communications capabilities. Efforts in FY 2018 will include: completing hardware manufacturing for VLTA and Large Scale Vehicle (LSV) testing, and testing of Generation 2 propulsor designs on the VLTA in water tunnels and on the LSV at the Acoustic Research Detachment. The COLUMBIA Program will complete installation and begin testing and calibration of an array upgrade to support Generation 2 propulsor large scale vehicle testing, and will continue testing on the full scale bearing test facility (FSBTF). Preliminary hydrodynamic characterization and submerged operating envelope development will begin as well as completion of bow dome attachment qualification tests and continued development of detailed designs for the COLUMBIA sonar bow dome. In addition, continued efforts for: development, refinement, and delivery of GFI for NPES, stowage arrangements to support these systems, support arrangement and design disclosure progress, continued development and assessment of AN/BRR-6 reliability based updates, and continued systems architecture assessment and development in conjunction with existing submarine classes to achieve and deliver common combat system architecture across existing submarine classes. Finally this effort will continue Government support and oversight of development of approximately 98 engineered components, begin diesel generator qualification testing, complete fabrication of qualification ACRU and begin qualification testing. CMC will continue preparations for construction of the missile tube module leveraging lessons from FAQP prototype.						
FY 2019 Base Plans: This funding applies to the Government combat systems, component and technology development for the COLUMBIA submarine essential to achieving required signatures, maneuverability, combat and communications capabilities. Efforts planned in FY 2019 include: Combat Systems: Continue refinement and updates to GFI to support detailed design, production, and manufacturing integration, continued assessment of AN/BRR-6 reliability based updates, including land based system development and test, and early environmental qualification testing of Government Furnished Equipment supporting Columbia technical insertion.  Component Development: Continue Government support and oversight of development of over 98 engineered components, deliver prototype diesel generator to compatibility test facility for integration testing, complete ACRU qualification testing and restoration, submit ACRU OPALT package for approval, award contract for lead						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
ship ACRU procurement, and continue operation of prototype ACRU at NSWC Philadelphia to gather reliability and performance data. Propulsor and Shafting: Complete full scale mechanical propulsor designs, complete generation 2 propulsor LSV testing, complete final rotor hydrodynamic design, down-select design for fixed portion of propulsor, test candidate COLUMBIA Class propulsor bearing liner materials at the FSBTF, and begin reconfiguring the FSBTF for COLUMBIA propulsor bearing testing.  Shock, Structures and Composites: Continue fabrication of combined shock and submergence scale models, complete fabrication of the forward pressure hull confirmation model, continue forward pressure hull need to repair procedures, continue out-of-autoclave bow dome fabrication, and begin navigation sonar system window fabrication.  Signatures: evaluate data from PIKE model testing with stern section.  Maneuvering, Ship Control and Hydrodynamic: Deliver steering and diving, assisted ballast and trim, and anomaly detector algorithms to shipbuilder for incorporation into ship control software.  Modular Construction Prototyping: continue construction of the prototype FAQP and validation of the ITH manufacturing technique as well as applying modular construction techniques to be further applied to the entire MTM. Additionally, this effort includes manufacture of the remaining lead ship COLUMBIA missile tubes that will be incorporated into the prototype MTM.  <b>FY 2019 OCO Plans:</b> N/A  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> Overall efforts transitioning to SCN Detailed Design and construction efforts						
Title: Systems Engineering/Program Management		55.750	57.279	56.383	0.000	56.383
Articles:		-	-	-	-	-
FY 2018 Plans: This funding applies to the Government oversight, including Program Office management and technical support from government laboratories, for review, analysis and approval of lead design yard and various government performers' design deliverables. Specific efforts in FY 2018 will include logistics life cycle development,						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
integration of supportability assessment information, identification and assessment of platform, shore facilities and infrastructure requirements; development of maintenance and repair standards; and higher fidelity functional mapping of CDD requirements to key subordinate design documents such as the NPES Functional Requirements Document (FRD) and Ship Building Specifications in support of both the planned System Engineering Technical Review (SETR) events and platform arrangements reviews and staffing of other design deliverables from the LDY and Participating Acquisition Resource Managers (PARM). Tabletop platform cyber risk assessments, including deep dives into mission essential systems, will continue. Conclude OT-B1 and provide a test report to Director Operational Test and Evaluation regarding risk to successful resolution of the critical operational issues identified in the TEMP. Planned LFT&E activities include procurement of Sonar components in synchronization with the PARM's procurement action to support of planned Commercial Off The Shelf (COTS) equipment fragility testing in FY20 and calibration testing of the test bed; and conduct High Capacity Mount/Damper testing to characterize the shock environment of COLUMBIA Class shock-isolated decks. Complete the first COLUMBIA Class Survivability Assessment Report (SAR) Cyber Developmental and Operational Test (DT/OT) events will be planned and conducted. The maturation of the OT-B1 COLUMBIA Survivability M&S baseline will continue, taking leverage from relevant at sea data collected by other programs and the Fleet so as to reduce the need for COLUMBIA first of class sea testing. Complete IWG efforts with final development and acceptance of integration risks and associated mitigations.						
FY 2019 Base Plans: The Program will conduct a Construction Request for Proposal (RFP) Defense Acquisition Board in the first half of the year and a Critical Design Review (CDR) in the second half of FY 2019. The TEMP will be updated as will the LFT&E Management Plan. The final increment of NPES COTS (Imaging and Combat System components) will be procured in support of FY 2020 COTS fragility testing at Naval Surface Warfare Center Philadelphia. Survivability M&S maturation will continue at NUWC with the objective of assuring that the suite will support accreditation by COMOPTEVFOR before Initial Operational Test and Evaluation in FY2028. The COLUMBIA Class Program Office will continue to report on results of developmental testing conducted to DASD(DT&E) in accordance with the TEMP. Additional significant 2019 milestones will include: Cyber Risk assessments to support continual cyber security development, early Strategic Program System Integration into NPES Systems, and Development of Columbia Electronics Integration Plan to support shore side Command and Control integration and test, and execution of integration risk mitigations as identified by the IWG.						
FY 2019 OCO Plans:						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A						
FY 2018 to FY 2019 Increase/Decrease Statement: Minimal decrease from FY18 to FY19 due to rate changes.						
Title: Strategic Weapons Systems Integration		204.739	185.230	119.190	0.000	119.190
Articles:		-	-	-	-	-
FY 2018 Plans: Continuing system engineering efforts required for the re-hosting and integration of the TRIDENT II (D5) SWS on the COLUMBIA submarine including review and modification of SWS Coordination, Interface and Arrangement Drawings for SWS equipment within the CMC and performing associated Logistic Support activities. The COLUMBIA program will also complete launcher evaluation testing at the LTF. The COLUMBIA program will continue: SWS Test Systems material procurement and builds and complete remaining land-based test berth / facility modifications. Continue development of special test vehicles; SWS Ashore test capability development; SWS training capability/requirements development. Continue systems engineering design related to the COLUMBIA guidance handling cart and procurement of a prototype guidance handling cart. The COLUMBIA CLASS program will also continue detailed design efforts required to conduct SWS Launcher, Fire Control, Navigation and Reentry System-level Critical Design Reviews. Commence Reentry Body Simulator material procurement and build.						
FY 2019 Base Plans: Continuing system engineering efforts required for the re-hosting and integration of the TRIDENT II (D5) SWS on the COLUMBIA submarine including review and modification of SWS Coordination, Interface and Arrangement Drawings for SWS equipment within the CMC and performing associated Logistic Support activities. The COLUMBIA program will also commence qualification launches at the LTF. The COLUMBIA program will continue SWS Test Systems material procurement and builds, development of special test vehicles, and SWS Ashore test capability development. Continue SWS training capability/requirements development and conduct a SWS Training System Critical Design Review involving both the SWS Fire Control and Navigation subsystems. Continue systems engineering design related to the COLUMBIA guidance handling cart and commence a Safety Assessment Review. The COLUMBIA program will commence utilization of the SWS Fire Control Engineering Test System within the land-based test berth and deliver a Guidance Handling Cart prototype. The COLUMBIA program also will conduct Production Readiness Reviews for SWS Fire Control and Navigation subsystems.						



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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Continue Reentry Body Simulator production. Additional plans include continuing efforts of the Integration Working Group to execute early integration of NPES with strategic weapon systems.													
FY 2019 OCO Plans: N/A													
FY 2018 to FY 2019 Increase/Decrease Statement: Overall efforts transitioning to Detailed Design and construction efforts													
Accomplishments/Planned Programs Subtotals									681.164	776.158	514.846	0.000	514.846
C. Other Program Funding Summary (\$ in Millions)													
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost		
• RDTEN/0603570N/3219: SBSD Nuclear Technology Development	390.326	265.462	190.100	-	190.100	114.006	80.085	60.142	56.841	Continuing	Continuing		
• RDTEN/0101221N/0951: Joint Warhead Fuze Sustainment Program	111.857	109.730	62.203	-	62.203	28.820	21.777	0.000	0.000	0.000	726.644		
• OPN/5358: Strategic Missile Systems Equip	215.138	246.221	271.817	-	271.817	274.440	241.396	254.053	259.020	Continuing	Continuing		
• WPN/1250: TRIDENT II Mods	1,099.086	1,143.595	1,078.750	-	1,078.750	1,178.210	1,217.078	1,205.587	1,308.930	3,215.106	24,862.561		
• OMN/1D2D: Fleet Ballistic Missile	1,241.095	1,278.456	1,361.947	-	1,361.947	1,379.668	1,397.882	1,432.037	1,460.413	Continuing	Continuing		
• SCN/1045: COLUMBIA Class Submarine	773.138	842.853	3,005.330	-	3,005.330	1,453.159	4,214.573	4,198.025	3,875.888	90,686.558	109,049.524		
• MCN/32414106: Submarine Propulsor Manufacturing Support Facility	0.000	0.000	71.050	-	71.050	0.000	0.000	0.000	0.000	0.000	71.050		
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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R&D efforts will incentivize cost reduction initiatives in the design, construction and operations & support portions of the program. R&D efforts will be performed by Navy laboratories, shipyards, private industry, and University Affiliated Research Centers.

### E. Performance Metrics

Updated Integrated Master Schedule and CMC build strategy down-select. Development of signature management efforts to address knowledge gap, concepts for propulsor and shafting, and design guidance and interface control requirements.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	942.360	231.057	Oct 2016	256.968	Oct 2017	183.413	Oct 2018	-		183.413	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Carderock, MD	298.547	89.804	Oct 2016	105.462	Oct 2017	58.307	Oct 2018	-		58.307	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Philadelphia, PA	0.000	27.142	Oct 2016	31.791	Oct 2017	17.695	Oct 2018	-		17.695	0.000	76.628	-
Product Development	WR	NUWC : Newport, RI	35.853	19.970	Oct 2016	23.270	Oct 2017	12.951	Oct 2018	-		12.951	Continuing	Continuing	Continuing
Product Development	Various	NAVSEA : Various	47.218	52.702	Oct 2016	116.159	Oct 2017	66.907	Oct 2018	-		66.907	Continuing	Continuing	Continuing
Product Development	SS/CPFF	ARL Penn State University : State College, PA	0.984	0.377	Oct 2016	0.900	Oct 2017	0.931	Oct 2018	-		0.931	Continuing	Continuing	Continuing
Product Development	SS/CPFF	NGMS : Sunnyvale, CA	87.324	46.912	Oct 2016	35.183	Oct 2017	17.040	Oct 2018	-		17.040	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL : Laurel, MD	8.396	6.102	Oct 2016	5.542	Jan 2018	6.230	Jan 2019	-		6.230	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Keyport, WA	0.000	0.652	Oct 2016	0.480	Oct 2017	0.372	Oct 2018	-		0.372	Continuing	Continuing	Continuing
Product Development	SS/CPFF	CSDL : Cambridge, MA	6.596	2.485	Oct 2016	0.794	Oct 2017	0.370	Oct 2018	-		0.370	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMRMS : Mitchel Field, NY	27.654	22.153	Oct 2016	21.899	Dec 2017	14.446	Oct 2018	-		14.446	Continuing	Continuing	Continuing
Product Development	C/CPFF	EMCUBE : Alexandria, VA	1.666	0.693	Oct 2016	1.157	Oct 2017	1.158	Oct 2018	-		1.158	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMMSC : Sunnyvale, CA	52.288	22.962	Apr 2017	20.986	Oct 2017	13.462	Feb 2019	-		13.462	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JRC : Washington, DC	1.663	1.333	Oct 2016	3.337	Oct 2017	3.387	Oct 2018	-		3.387	Continuing	Continuing	Continuing
Product Development	C/CPFF	GDMS : Pittsfield, MA	54.852	39.481	Oct 2016	34.057	Nov 2017	12.600	Nov 2018	-		12.600	Continuing	Continuing	Continuing
Product Development	WR	CNSW : China Lake, CA	24.595	25.134	Oct 2016	19.008	Nov 2017	15.972	Nov 2018	-		15.972	Continuing	Continuing	Continuing

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Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	IEC : Anaheim, CA	2.159	0.710	Oct 2016	0.539	Oct 2017	0.505	Oct 2018	-		0.505	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Dahlgren, VA	7.154	5.981	Oct 2016	8.059	Oct 2017	7.244	Oct 2018	-		7.244	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BAE : Rockville, MD	17.724	10.091	Oct 2016	8.397	Oct 2017	6.674	Oct 2018	-		6.674	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BNA : Huntington Beach, CA	1.768	1.449	Oct 2016	0.000	Oct 2017	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	WR	NSWC Crane : Crane, IN	30.357	13.715	Oct 2016	8.960	Nov 2017	8.204	Nov 2018	-		8.204	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDEB : Groton, CT	0.000	0.000		5.830	Oct 2017	4.804	Oct 2018	-		4.804	0.000	10.634	-
Product Development	Various	SSP : Various	9.536	2.032	Oct 2016	8.096	Oct 2017	4.085	Oct 2018	-		4.085	Continuing	Continuing	Continuing
Product Development	SS/CPFF	SPA : Alexandria, VA	5.655	2.477	Oct 2016	2.006	Oct 2017	1.706	Oct 2018	-		1.706	Continuing	Continuing	Continuing
Subtotal			1,664.349	625.414		718.880		458.463		-		458.463	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	41.863	30.304	Oct 2016	30.758	Nov 2017	29.463	Nov 2018	-		29.463	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Carderock, MD	37.509	14.815	Oct 2016	15.725	Oct 2017	15.959	Oct 2018	-		15.959	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Philadelphia, PA	0.000	3.240	Oct 2016	3.289	Oct 2017	3.338	Oct 2018	-		3.338	0.000	9.867	-
Government Management Support	WR	Various: NUWC : Newport, RI	0.000	5.034	Oct 2016	5.109	Oct 2017	5.186	Oct 2018	-		5.186	0.000	15.329	-
Government Management Support	WR	Vairous: SUPSHIP : Groton, CT	0.000	1.744	Oct 2016	1.770	Oct 2017	1.797	Oct 2018	-		1.797	0.000	5.311	-
Travel	WR	NAVSEA HQ : Washington, D.C.	0.866	0.613	Nov 2016	0.627	Nov 2017	0.640	Nov 2018	-		0.640	Continuing	Continuing	Continuing
Subtotal			80.238	55.750		57.278		56.383		-		56.383	Continuing	Continuing	N/A

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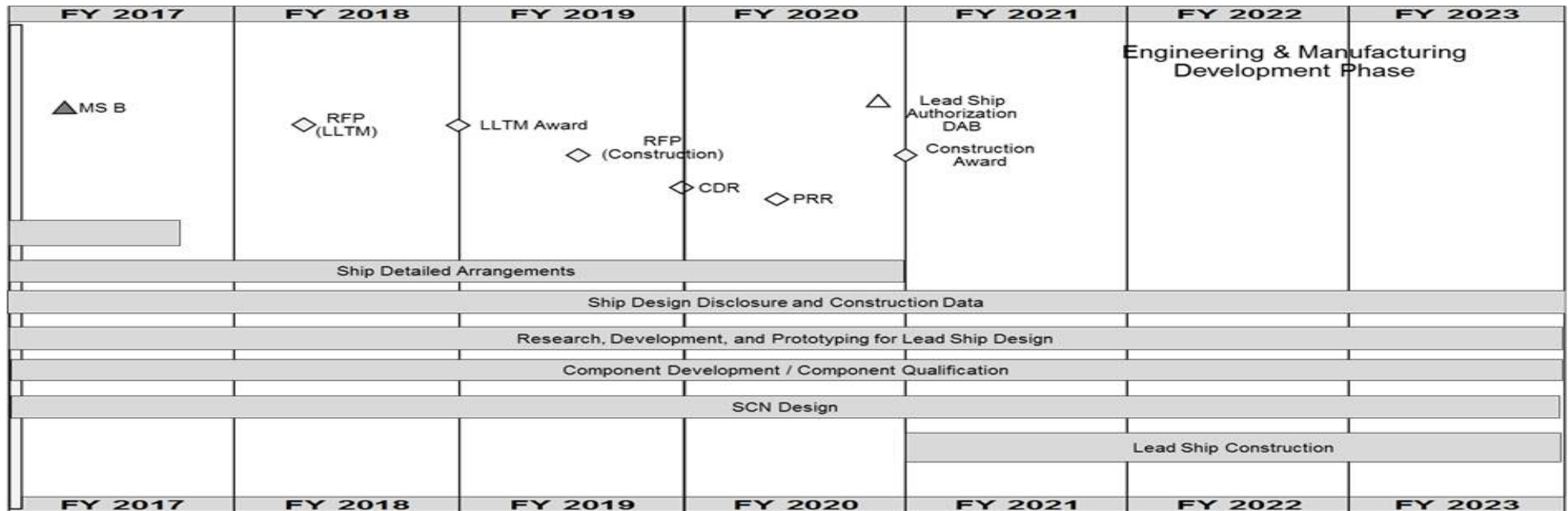
<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Navy												<b>Date:</b> February 2018		
<b>Appropriation/Budget Activity</b> 1319 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0603595N / SSBN New Design				<b>Project (Number/Name)</b> 3220 / COLUMBIA Class Submarine Development				

Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
<b>Remarks</b> The program analyzed the Management Services which were originally planned in SCN beginning in FY17, and determined it was more appropriately funded with R&D through lead ship construction start in FY21. This submission reflects those changes for FY17, FY18 and FY19.																	
			Prior Years														
			FY 2017			FY 2018				FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>			1,744.587	681.164		776.158		514.846		-		514.846	Continuing	Continuing	N/A		
<b>Remarks</b> 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 2019 Navy</b>		<b>Date:</b> February 2018
<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



CDD - Capabilities Development Document  
 CDR - Critical Design Review  
 CPD - Capability Production Document  
 DAB - Defense Acquisition Board  
 IPR - In Progress Review

JROC - Joint Requirements Oversight Council  
 LLTM - Long Lead Time Material  
 MS - Milestone  
 PDR - Preliminary Design Review  
 PRR - Production Readiness Review

RDT&E - Research, Development, Test, & Evaluation  
 RFP - Request for Proposal  
 SCN - Shipbuilding and Conversion, Navy  
 SRR - System Requirements Review

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Navy		<b>Date:</b> February 2018
<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

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Notes: * Effort began prior to 1st Quarter FY 2017. ** Effort continues past 4th Quarter FY 2023</b>				
System Descriptions and Rev A Diagrams*	1	2017	3	2017
Ship Detailed Arrangements*	1	2017	4	2019
Ship Design Disclosure and Construction Data*, **	1	2017	3	2023
Research, Development, and Prototyping for Lead Ship*, **	1	2017	4	2023
Component Development/Component Qualification* , **	1	2017	4	2023
SCN Design**	1	2017	4	2023
Lead Ship Construction**	1	2021	4	2023