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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1,600.649	142.167	126.932	84.663	-	84.663	82.685	93.103	95.811	96.653	Continuing	Continuing
0219: Sub Sonar Improvement (ENG)	1,026.925	84.074	67.030	57.390	-	57.390	62.783	62.871	62.545	63.800	Continuing	Continuing
0742: Sub Integrated Ant System	310.884	15.267	15.426	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	341.577
0775: Submarine Supt Equip Prog	27.733	9.082	28.408	27.273	-	27.273	19.902	30.232	33.266	32.853	Continuing	Continuing
1411: Sub Tact Comm System	228.337	14.443	16.068	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	258.848
9999: Congressional Adds	6.770	19.301	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	26.071
Note Funding for the following projects has been realigned out of PE 0604503N into PE 0604280N as part of Program Element Consolidation starting in FY20: Project 0742 - Sub Integrated Antenna System, Project 1411 - Sub Tactical Communication System.												
A. Mission Description and Budget Item Justification The FY 2020 funding request was reduced by \$4.000 million to account for the availability of prior year execution balances. SSN-688 & Trident Modernization delivers block updates to Submarine Sonar systems, provides improved secure voice and data communications capabilities, develops improved Submarine Electronic Warfare (EW) systems, and provides a fully integrated and tested Common Submarine Radio Room (CSRR). These development activities ensure all Submarine Classes maintain clear acoustical, tactical, and operational superiority over Submarines and Surface Combatants in Joint Littoral Warfare, Joint Intelligence Surveillance Reconnaissance (ISR), Indications and Warnings, Information Operations including Cyber, and Special Operations Force (SOF) support. Current developments are focused on supporting Joint Littoral Warfare, Regional Sea Denial, Strike Group Support, Diesel Submarine Detection, Joint Surveillance and Peacetime Engagement, Space and Electronic Warfare, Intelligence Collection, Maritime Protection, and Joint Strike.												

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Appropriation/Budget Activity		R-1 Program Element (Number/Name)			
1319: Research, Development, Test & Evaluation, Navy / BA 5: System Development & Demonstration (SDD)		PE 0604503N / SSN-688 & Trident Modernization			
B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	130.981	126.932	110.805	-	110.805
Current President's Budget	142.167	126.932	84.663	-	84.663
Total Adjustments	11.186	0.000	-26.142	-	-26.142
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.813	0.000			
• Program Adjustments	0.000	0.000	-25.846	-	-25.846
• Rate/Misc Adjustments	-0.001	0.000	-0.296	-	-0.296
• Congressional Directed Reductions	-5.000	-	-	-	-
Adjustments					
• Congressional Add Adjustments	20.000	-	-	-	-
Congressional Add Details (\$ in Millions, and Includes General Reductions)					
Project: 9999: Congressional Adds				FY 2018	FY 2019
Congressional Add: <i>Program Increase</i>				19.301	0.000
Congressional Add Subtotals for Project: 9999				19.301	0.000
Congressional Add Totals for all Projects				19.301	0.000
Change Summary Explanation					
FY 2020 funding request reflects a net decrease of \$26.142 million.					
FY 2020 funding request was reduced by \$33.100 million in order to support PEO C4I RD TEN Budget Line Item Consolidation to allow the Navy to more quickly react to changes in C4I technology and changes in Cyber requirements, \$5.217 million to adjust the funding profile for Common Submarine Radio Room Cyber Security Workforce, and \$0.296 million to account for other rate / miscellaneous adjustments. The FY 2020 funding request was further reduced by \$4.000 million to account for the availability of prior year execution balances.					
FY 2020 funding decrease was offset by \$12.075 million for development of Future Electronic Warfare (EW) systems and EW Tactical TEMPALT (EWTT) for SSNs. Additional \$4.600 million was realigned to address AN/BRR-6 Item Unique Identification (IUID) implementation to collect and manage systems data to					

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Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	
improve Fleet reliability and sustainability and addresses reduced diameter High-Lift Auxiliary Wire (HLAW) development requirement to improve system reliability and reduce detectability.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0219 / Sub Sonar Improvement (ENG)			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0219: Sub Sonar Improvement (ENG)	1,026.925	84.074	67.030	57.390	-	57.390	62.783	62.871	62.545	63.800	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program delivers block updates to Sonar Systems installed on SSN 688, 688I, SSN 21, VIRGINIA, SSBN, and SSGN Class Submarines to maintain clear acoustical, tactical, and operational superiority over Submarines and Surface Combatants in all scenarios through detection, classification, localization, and contact following.

Acoustics Rapid COTS Insertion (A-RCI) provides multi-phased evolutionary development geared toward addressing acoustic superiority issues through the rapid introduction of interim development products applicable to all Classes of Submarines.

- A-RCI Phase I and II introduced Towed Array processing improvements
- Phase III introduced Spherical Array processing improvements
- Phase IV provided High Frequency (HF) Array processing improvements for SSN 688I, SSGN, VIRGINIA, and SSN 21 Class Submarines.

As part of the Navy's plan to maintain acoustic superiority for in-service submarines, a joint cooperative effort was established to deliver annual Advanced Processing Builds (APBs) to prevent obsolescence and deliver ongoing capability improvements.

- Capabilities in the APBs will be integrated as part of A-RCI certified systems.
- Development of the Large Vertical Array (LVA) will improve detection and enhanced tactical situational awareness capability for tracking targets of interest, and supports acoustic superiority objectives for the VIRGINIA and OHIO Class Submarines.

Sensor Efforts provide increased operational capabilities for littoral operations, situational awareness, and reliability improvements.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: APB Productionization	12.724	12.519	14.461	0.000	14.461
Articles:	-	-	-	-	-
Description: APB Productionization provides for the transition of APB capability improvements to the Fleet for integration, testing and formal certification.					
FY 2019 Plans:					
-Continue Advanced Processing Build (APB) Sea Testing, Integration, and Certification.					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>-Transition APB software from development to A-RCI for integration, testing, and formal certification.</p> <p>-Ensure continued transition of the SSBN legacy sonar system to the TI/APB model and the incorporation of in-board signal processing associated with the Large Vertical Array (LVA).</p> <p>FY 2020 Base Plans:</p> <p>-Continue Advanced Processing Build (APB) Sea Testing, Integration, and Certification.</p> <p>-Continue transition of APB software from development to A-RCI for integration, testing, and formal certification.</p> <p>-Ensure continued transition of the SSBN legacy sonar system to the TI/APB model</p> <p>-Continue in-board signal processing associated with the Large Vertical Array (LVA).</p> <p>FY 2020 OCO Plans:</p> <p>N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>FY 2020 emphasizes APB signal processing requirements for TI-20 to include the Large Vertical Array (LVA) on VA Class submarines resulting in an increase in funding. Efforts also include additional system architecture redesign to address increased requirements associated with Information Assurance (IA) and Cybersecurity.</p>						
<p>Title: Integration and Testing</p> <p align="right">Articles:</p> <p>Description: Integration and Testing provides support to integrate and test APB's into all Submarine Classes containing multiple sensor systems.</p> <p>FY 2019 Plans:</p> <p>-Support Advanced Processing Builds installed on SSN 688I, SSN 688, SSN 21, SSGN 726, SSBN, and VA Class Submarines.</p> <p>-Continue the incorporation of integration and testing associated with the conversion of the SSBN legacy sonar system to the TI/APB model; as well as, signal processing in support of the Large Vertical Array (LVA).</p> <p>FY 2020 Base Plans:</p> <p>-Continue support of Advanced Processing Builds installed on SSN 688I, SSN 688, SSN 21, SSGN 726, SSBN, and VA Class Submarines.</p> <p>-Continue the incorporation of integration and testing associated with the conversion of the SSBN legacy sonar system to the TI/APB model.</p>		34.484 -	34.056 -	39.201 -	0.000 -	39.201 -

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)				FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Continue integration and testing associated with signal processing in support of Large Vertical Array (LVA) on SSBN and VA Class submarines. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 incorporates APB signal processing requirements for TI-20 to include the Large Vertical Array (LVA) on VA Class submarines resulting in an increase in integration and testing requirements. Efforts also include integration and testing associated with system architecture redesign to address increased requirements associated with Information Assurance (IA) and Cybersecurity.								
Title: Large Vertical Array (LVA) Articles: Description: Provides funding for the development of Large Vertical Array (LVA) capability in the areas of detection and tracking for back-fit installation on VIRGINIA Class and OHIO Class Submarines. FY 2019 Plans: -Finalize development of Large Vertical Array (LVA) acoustic modules; to include acoustic sensors, array material, outboard electronics, fairings, and associated cabling -Finalize development of mechanical fixtures (required to manufacture, transport, and install an LVA ship-set on a submarine), to effectively incorporate the required capabilities into the TI/APB model for back-fit modernization. FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 concludes LVA acoustic module and mechanical fixture development and fabrication.				33.283 -	16.800 -	0.000 -	0.000 -	0.000 -
Title: A-RCI Acoustic Superiority Integration Articles:				3.583 -	3.655 -	3.728 -	0.000 -	3.728 -

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Description: Maintain Acoustic Superiority for In-service Submarines to deliver bi-annual Advance Processing Builds (APBs) to prevent obsolescence and deliver emerging capability improvements for current and future threats.</p> <p>FY 2019 Plans: -Continue development of emerging capability improvements for current and future threats by supporting development, integration, and testing of emerging capability improvements in passive long range detection/wide area search for current and future threats in support of Navy SSN/SSBN Acoustic Superiority initiatives.</p> <p>FY 2020 Base Plans: -Continue development of emerging capability improvements for current and future threats by supporting development, integration, and testing of emerging capability improvements in passive long range detection/wide area search for current and future threats in support of Navy SSN/SSBN Acoustic Superiority initiatives.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 integrates additional software enabled capability enhancements across various Submarine Classes resulting in a funding increase.</p>					
Accomplishments/Planned Programs Subtotals	84.074	67.030	57.390	0.000	57.390

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2150: SSN Acoustic Equipment	354.253	328.658	366.968	-	366.968	381.207	430.868	518.736	534.697	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
Acoustic Systems:											
-A-RCI utilizes an open architecture and Commercial Off-the-Shelf (COTS) products in support of new and upgraded sonar systems.											
-Program Reviews with the Milestone Decision Authority (MDA) are conducted granting approval for the contract											

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Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0219 / Sub Sonar Improvement (ENG)
<p>production options.</p> <p>Large Vertical Array (LVA):</p> <ul style="list-style-type: none">-Performance specification-based contract in support of LVA to enhance SSN/SSBN platform capability and situational awareness. <p>E. Performance Metrics</p> <ul style="list-style-type: none">-The A-RCI program will modernize approximately 8-12 SSNs per year through executing bi-annual software Advanced Processor Builds (APBs) and bi-annual Technical Insertions (TIs).-Beginning with FY 2017 installations, the A-RCI program will modernize approximately 2-3 SSBNs per year through bi-annual APBs/TIs.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0219 / Sub Sonar Improvement (ENG)					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Primary Hardware Development	SS/CPIF	LMC : Manassas, VA	360.688	15.647	Dec 2017	15.386	Dec 2018	21.526	Dec 2019	-		21.526	Continuing	Continuing	Continuing
Ancillary Hardware Development	SS/CPFF	ARL University of Texas : Austin, TX	40.635	3.425	Mar 2018	3.371	Mar 2019	2.903	Mar 2020	-		2.903	Continuing	Continuing	Continuing
Systems Engineering	SS/CPFF	Johns Hopkins APL : Baltimore, MD	42.776	3.433	Dec 2017	3.391	Dec 2018	2.919	Dec 2019	-		2.919	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	LMC : VA - Keyport	39.699	3.690	Jan 2018	3.591	Jan 2019	3.089	Jan 2020	-		3.089	Continuing	Continuing	Continuing
Primary Hardware Development	C/CPIF	Progeny Systems : Manassas, VA	70.639	6.669	Jan 2018	6.984	Jan 2019	5.959	Jan 2020	-		5.959	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Newport, RI	178.551	5.561	Dec 2017	5.453	Dec 2018	9.142	Dec 2019	-		9.142	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Carderock, MD	31.222	2.163	Dec 2017	2.060	Dec 2018	2.613	Dec 2019	-		2.613	Continuing	Continuing	Continuing
TB-29X Development	C/CPIF	L-3 CSC : Millersville, MD	15.675	0.000		0.000		0.000		-		0.000	0.000	15.675	-
LVA Development	C/CPIF	Electric Boat : Groton, CT	13.265	33.283	Nov 2017	16.800	Nov 2018	0.000		-		0.000	0.000	63.348	-
Subtotal			793.150	73.871		57.036		48.151		-		48.151	Continuing	Continuing	N/A
Remarks															
Performer specific cost growth in FY 2020 provides for the development necessary to support APB signal processing requirements for TI-20 to include the Large Vertical Array (LVA) on VA Class submarines, additional system architecture redesign to address increased requirements associated with Information Assurance (IA) and Cybersecurity; as well as, additional software enabled capability enhancements across various Submarine Classes addressing Acoustic Superiority.															
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Primary Software Development	C/CPIF	General Dynamics, AIS : Fairfax, VA	165.289	5.047	Dec 2017	5.028	Dec 2018	4.619	Dec 2019	-		4.619	Continuing	Continuing	Continuing
Primary Software Development	C/CPFF	Sedna Digital, : Manassas, VA	40.640	3.920	Dec 2017	3.802	Dec 2018	3.493	Dec 2019	-		3.493	Continuing	Continuing	Continuing
Subtotal			205.929	8.967		8.830		8.112		-		8.112	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0219 / Sub Sonar Improvement (ENG)					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Operational Test and Evaluation	WR	OPTEVFOR : Norfolk, VA	10.781	0.485	Dec 2017	0.470	Dec 2018	0.432	Dec 2019	-		0.432	Continuing	Continuing	Continuing
Subtotal			10.781	0.485		0.470		0.432		-		0.432	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Management Support Services	C/FFP	Alion, BAH, AECOM : Washington, DC	14.628	0.657	Dec 2017	0.600	Dec 2018	0.601	Dec 2019	-		0.601	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : Washington, DC	2.437	0.094	Dec 2017	0.094	Dec 2018	0.094	Dec 2019	-		0.094	Continuing	Continuing	Continuing
Subtotal			17.065	0.751		0.694		0.695		-		0.695	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			1,026.925	84.074		67.030		57.390		-		57.390	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																			Date: March 2019																		
Appropriation/Budget Activity 1319 / 5										R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization										Project (Number/Name) 0219 / Sub Sonar Improvement (ENG)																	
										FY18				FY19				FY20				FY21				FY22				FY23				FY24			
KEY EVENTS										1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
ACQUISITION MILESTONES MDA Reviews												▲				△			△			△			△			△			△						
										Annual Program Reviews																											
CONTRACT AWARDS A-RCI TI 18/20 Development and Production (CPIF) A-RCI TI 22/24 Development and Production (CPIF)																																					
CAC TI 18 Development and Production (CPIF) CAC TI 22 Development and Production (CPIF)																																					
OMS TI 20 Development and Production (CPIF) OMS TI 24 Development and Production (CPIF)										▲																											
PROCUREMENTS											▲				△					△																	
DT/OT/FOT&E										APB 15																											
													▲																								
APBs												▲	APB 17																								
TECH INSERTIONS														▲	TI 18																						
INSTALLATION PERIODS																																					
										688i Ph III/IV Upgrade and 688 Ph III																											
										SSGN																											
										SEAWOLF																											
										VIRGINIA																											
										SSBN																											
										FY18				FY19				FY20				FY21				FY22				FY23				FY24			
▲ Completed Milestone										APB: Advanced Processing Builds																											
△ Upcoming Milestone										A-RCI: Acoustic – Rapid Commercial Off the Shelf (COTS) Insertion																											
										CAC: Common Acoustic Cabinet																											
										OMS: Ownship Monitoring System																											
SSN Installation Period																																					
SSGN/SSBN Installation Period																																					

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PE 0604503N: SSN-688 & Trident Modernization
Navy

R-1 Line #126

1319 / 5

PE 0604503N / SSN-688 & Trident
Modernization

0219 / Sub Sonar Improvement (ENG)



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0219 / Sub Sonar Improvement (ENG)	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0219				
ACOUSTICS	1	2018	3	2024
---Acquisition Milestones - Acoustics	3	2018	3	2024
---Annual Program Reviews - Acoustics	1	2018	4	2024
---Contract Awards - Acoustics	1	2018	1	2022
---Procurements - Acoustics	2	2018	2	2024
---DT/OT/FOT&E Tests	1	2018	1	2024
---APB Deliveries	3	2018	3	2024
---Tech Insertions	1	2019	1	2023
---Installation Periods - Acoustics	1	2018	4	2024
LARGE VERTICAL ARRAY	1	2018	4	2024
---Annual Program Reviews - Large Vertical Array	1	2018	4	2024
---Contract Awards - Large Vertical Array	2	2019	2	2024
---Procurements - Large Vertical Array	2	2019	2	2024
---First Article Fabrication	1	2018	2	2019
---First Article Testing	3	2018	4	2019
---Material & Installation Fixture Fabrication	1	2018	4	2019
---Installation Periods - Large Vertical Array	3	2021	4	2024

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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0742: Sub Integrated Ant System	310.884	15.267	15.426	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	341.577
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Funding has been realigned out of PE 0604503N Project 0742, into PE 0604280N Project 0742 as part of RDTEN PE Consolidation starting in FY20.

A. Mission Description and Budget Item Justification

The programs funded under the Submarine Integrated Antenna System project (0742) provide Submarines with improved communications capabilities to support future Joint, Allied, and Naval operations. These efforts provide for the development and testing of submarine antennas and apertures designed to meet emerging submarine requirements (a) Increased antenna and aperture performance while operating at speed and depth, (b) Increased stealth capability of existing and future antennas and apertures, (c) Antenna and aperture compatibility with new waveforms and transceiver equipment, (d) Increased capabilities of antennas, apertures and their interface to the External Communications System, and (e) Improved antenna and aperture design to reduce Total Ownership Cost. Specifically, this project funds research and development for submarine antennas and apertures including (1) Transition Engineering, (2) Outboard Electronics (OE)-538/BRC Multi-Function Antenna, (3) OE-562 Submarine High Data Rate (SubHDR), (4) Advanced High Data Rate (AdvHDR) apertures, (5) Towed Buoy Antenna (TBA)(AN/BRR- 6/6B), and (6) Antenna Improvements.

The Transition Engineering program focuses on technology development and assessments to support Fourth Generation Undersea Warfare objectives and Undersea Communications with Optical Laser Frequencies (Under C-WOLF). Under C-WOLF is a Joint Capability Technology Demonstration (JCTD) program which provides lower latency communications between undersea platforms and will be managed as well.

The OE-538/BRC Multi-Function Antenna Program supports radio frequency communications from Very Low Frequency (VLF) to Ultra High Frequency (UHF) and provides Identification Friend and Foe (IFF), Global Positioning System (GPS), Mobile Users Objective System (MUOS), Tactical Data Link (TDL) via Link 16, and Iridium capabilities for all submarine classes across all submarine mission areas.

The SubHDR program provides the submarine fleet with EHF low data rate (LDR), EHF Medium Data Rate (MDR), EHF Extended data Rate (XDR), military Super High Frequency (SHF), and enables reception of the Global Broadcast Service (GBS).

The AdvHDR program develops communications methods that will improve undersea communications utilizing products developed by the Optical Communications Project Arrangement with the United Kingdom.

The Towed Buoy Antenna (TBA) AN/BRR-6/6B is installed on OHIO class submarines and a variant of AN/BRR-6 will be the TBA for COLUMBIA class.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy				Date: March 2019				
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 0742 / Sub Integrated Ant System				
The Antenna Improvements project provides for Reliability, Maintainability and Availability (RMA) improvements and continued Preplanned Product Improvement (P3I) developments in support of current and future submarine antenna applications which includes OE-315, AN/BRA-24, ANBRA-6, AN/BRT-1 and AN/BRM -2								
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)				FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Transition Engineering				2.513	2.627	0.000	0.000	0.000
				Articles: -				
FY 2019 Plans: - Continue management of the Undersea Communications with Optical Laser Frequencies (Under C-WOLF) Joint Capabilty Technology Demonstration (JCTD) program which provides lower latency communications between undersea platforms. - Continue concept engineering, new technology evaluations, and assessments in support of current and future Undersea Warfare. - Continue development of future undersea communication capabilities in support of Fourth Generation Undersea Warfare. - Continue development and integration of the Links of the Chain (LOTC) as a plug in for Virtual Worlds in support of simulation of the Undersea Architecture. - Complete development of the Undersea Constellation Security Classification Guide (SCD). - Complete development of Subsea and Seabed Warfare (SSW) Initial Capabilities Document (ICD). - Complete Maritime Information System (MIS) Analysis of Alternatives (AoA).								
FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 0742 as part of PE Consolidation								
FY 2020 OCO Plans: N/A								
FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 0742								
Title: Outboard Electronics (OE)-538				0.200	0.100	0.000	0.000	0.000
				Articles: -				
FY 2019 Plans: - Complete development/update of required Full Rate Production (FRP) acquisition documents. - Complete operational test (OT) on operational submarine in support of Full Rate Production (FRP).								

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy				Date: March 2019		
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 0742 / Sub Integrated Ant System		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Note: Due to submarine availability for OE-538A installation operational test (OT) was rescheduled from 3QFY17 to 1QFY19. FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: - The \$100K decrease from FY19 to FY20 is due to the completion of operational test (OT) and acquisition documentation for required Full Rate Production (FRP) Decision.						
Title: Submarine High Data Rate (SubHDR) Pre-Planned Product Improvement (P3I) Articles: FY 2019 Plans: - Continue oversight of Reliability Maintainability, and Availability (RMA) components identified by research and analysis to maintain Ao throughout the life of the system. FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 0742 as part of PE Consolidation FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 0742		2.231 -	0.253 -	0.000 -	0.000 -	0.000 -
Title: Advanced High Data Rate (AdvHDR) Articles: FY 2019 Plans: - Continue Optical Communications (OCOMMS) Project Arrangement (PA) with United Kingdom. - Continue development and integration of OCOMMS. FY 2020 Base Plans:		3.323 -	3.483 -	0.000 -	0.000 -	0.000 -

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019			
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 0742 / Sub Integrated Ant System		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 funding has been realigned to PE 0604280N Project 0742 as part of PE Consolidation						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 0742						
Title: Towed Buoy Antenna (AN/BRR-6/6B)		3.589	6.320	0.000	0.000	0.000
Articles:		-	-	-	-	-
FY 2019 Plans: - Continue development for cybersecurity vulnerability detection and hardening. - Continue design specification, component development, system integration, and testing for reliability improvements of radio frequency and depth canisters and buoy shape. - Commence and complete at-sea integration testing for the buoy shape. - Continue the development for BRR-6 Program on OHIO and COLUMBIA Class program, contract, logistics and system engineering management.						
FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 0742 as part of PE Consolidation						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 0742						
Title: Antenna Improvements		3.411	2.643	0.000	0.000	0.000
Articles:		-	-	-	-	-
FY 2019 Plans: - Continue Pre-Planned Product Improvement (P3I) investigation and Reliability, Maintainability and Availability (RMA) development efforts for legacy antennas. - Continue P3I investigation and RMA development efforts for AN/BRA-24.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy								Date: March 2019			
Appropriation/Budget Activity 1319 / 5				R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0742 / Sub Integrated Ant System			

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>- Continue development of the Transmit Receive Automatic Identification System (AIS) Amplifier Module (TRAAM) improvement to the OE-315 Buoyant Cable Assembly (BCA).</p> <p>FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 0742 as part of PE Consolidation</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 0742</p>					
Accomplishments/Planned Programs Subtotals	15.267	15.426	0.000	0.000	0.000

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/3130: Submarine Communication Equipment	76.327	78.580	69.643	-	69.643	62.380	65.201	65.927	67.081	Continuing	Continuing
• 0604280N/0742: Submarine Integrated Antenna System	0.000	0.000	18.925	-	18.925	16.152	15.680	13.943	14.219	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
Continue antenna reliability improvements and fielding for SubHDR, Towed Buoy Antenna (TBA) (AN/BRR-6/6B), OE-315, OE-538 and other legacy antenna systems.											
Program Milestones (MS): Outboard Electronics (OE)-538: 2nd QTR FY19 Full Rate Production (FRP) Decision Review.											
Buoy Antenna (TBA) (AN/BRR-6/6B): Details available at higher classification.											
Test and Evaluation (T&E) Milestones: OE-538: 1st QTR FY19 Operational Test (OT) for FRP.											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0742 / Sub Integrated Ant System

E. Performance Metrics

FY20 funding has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0742 / Sub Integrated Ant System					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Future Capabilites (Trans Eng)	WR	SSC Pacific : San Diego, CA	6.202	0.736	Nov 2017	1.170	Nov 2018	0.000		-		0.000	0.000	8.108	-
Systems Engineering (Trans Eng)	Various	Available at higher classification : Available at higher classification	2.521	0.545	Nov 2017	0.251	Nov 2018	0.000		-		0.000	0.000	3.317	-
Systems Engineering (Trans Eng)	WR	NUWC : Newport, RI	40.783	0.582	Nov 2017	0.551	Nov 2018	0.000		-		0.000	0.000	41.916	-
Security Engineering (Trans Eng)	Various	Available at higher classification : Available at higher classification	0.550	0.258	Nov 2017	0.255	Nov 2018	0.000		-		0.000	0.000	1.063	-
JCTD Development (Trans Eng)	WR	Various : Various	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Research and Analysis Reliability Dev (SubHDR)	WR	NUWC : Newport, RI	7.341	0.806	Nov 2017	0.253	Nov 2018	0.000		-		0.000	0.000	8.400	-
Research and Analysis Reliability Dev (SubHDR)	Various	Available at higher classification : Available at higher classification	4.162	0.838	Feb 2018	0.000		0.000		-		0.000	0.000	5.000	-
OCOMMS PA Demonstration System Development (AdvHDR)	C/CPFF	TBD : TBD	0.000	1.924	Jul 2018	1.551	Jan 2019	0.000		-		0.000	0.000	3.475	-
Technology Development (AdvHDR)	C/CPFF	TBD : TBD	0.000	0.250	Jul 2018	0.312	Jan 2019	0.000		-		0.000	0.000	0.562	-
Systems Engineering (AdvHDR)	WR	SSC Pacific : San Diego, CA	11.498	1.000	Nov 2017	1.210	Nov 2018	0.000		-		0.000	0.000	13.708	-
Security Engineering/ Cybersecurity (BRR-6)	Various	Available at higher classification : Available at higher classification	0.264	0.252	Oct 2017	0.250	Oct 2018	0.000		-		0.000	0.000	0.766	-
Systems Engineering/ Hardware Dev (BRR-6)	WR	NSWC : Philadelphia, PA	6.424	0.734	Oct 2017	1.750	Oct 2018	0.000		-		0.000	0.000	8.908	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy **Date:** March 2019

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0742 / Sub Integrated Ant System
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Systems Engineering/ Hardware Dev (BRR-6)	WR	NUWC : Newport, RI	3.797	0.641	Oct 2017	0.499	Oct 2018	0.000		-		0.000	0.000	4.937	-
Systems Engineering/ Hardware Dev (BRR-6)	WR	NSWC : Carderock	0.938	0.288	Oct 2017	0.099	Oct 2018	0.000		-		0.000	0.000	1.325	-
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NSWC : Philadelphia, PA	2.270	1.500	Nov 2017	0.959	Nov 2018	0.000		-		0.000	0.000	4.729	-
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NSWC : Carderock	0.125	0.130	Nov 2017	0.135	Nov 2018	0.000		-		0.000	0.000	0.390	-
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NUWC : Newport, RI	0.000	1.556	Nov 2017	1.424	Nov 2018	0.000		-		0.000	0.000	2.980	-
Product Development Prior Years	Various	Various : Various	168.310	0.000		0.000		0.000		-		0.000	0.000	168.310	-
Research and Analysis Reliability Dev (SubHDR)	Various	Available at higher classification- : Available at higher classification-	5.149	0.167	Feb 2018	0.000		0.000		-		0.000	0.000	5.316	-
Subtotal			260.334	12.207		10.669		0.000		-		0.000	0.000	283.210	N/A

Remarks
FY20 Cost data is provided under PE 0604280N Project 0742

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Integrated Logistics Support (SubHDR)	Various	Available at higher classification : Available at higher classification	0.432	0.090	Nov 2018	0.000		0.000		-		0.000	0.000	0.522	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0742 / Sub Integrated Ant System					
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Cost Estimating (AdvHDR)	Various	Available at higher classification : Available at higher classification	0.150	0.075	Feb 2018	0.075	Feb 2019	0.000		-		0.000	0.000	0.300	-
Integrated Logistics Support (AdvHDR)	Various	Available at higher classification : Available at higher classification	0.150	0.075	Feb 2018	0.080	Feb 2019	0.000		-		0.000	0.000	0.305	-
Cost Estimating (BRR-6)	Various	Available at higher classification : Available at higher classification	0.109	0.000		0.053	Oct 2018	0.000		-		0.000	0.000	0.162	-
Integrated logistics Support (BRR-6)	WR	NUWC : Newport, RI	0.211	0.116	Oct 2017	0.134	Oct 2018	0.000		-		0.000	0.000	0.461	-
Configuration Management (BRR-6)	WR	NSWC : Philadelphia, PA	0.644	0.303	Oct 2017	0.054	Oct 2018	0.000		-		0.000	0.000	1.001	-
Systems Engineering Support (BRR-6)	Various	Available at higher classification : Available at higher classification	0.000	0.000		0.060	Oct 2018	0.000		-		0.000	0.000	0.060	-
Integrated Logistics Support (Antenna Improvements)	Various	Available at higher classification : Available at higher classification	0.050	0.050	Nov 2017	0.050	Nov 2018	0.000		-		0.000	0.000	0.150	-
Support Prior Years	Various	Various : Various	8.609	0.000		0.000		0.000		-		0.000	0.000	8.609	-
Subtotal			10.355	0.709		0.506		0.000		-		0.000	0.000	11.570	N/A
Remarks FY20 Cost data is provided under PE 0604280N Project 0742															

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy **Date:** March 2019

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0742 / Sub Integrated Ant System
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Developmental/ Operational T&E (OE-538)	WR	NUWC : Newport, RI	8.239	0.050	Nov 2017	0.050	Nov 2018	0.000		-		0.000	0.000	8.339	-
Test & Evaluation (OE-538)	WR	COTF : Norfolk, VA	1.374	0.150	Nov 2017	0.050	Nov 2018	0.000		-		0.000	0.000	1.574	-
Test & Evaluation (SubHDR)	WR	NUWC : Newport, RI	3.058	0.164	Nov 2017	0.000		0.000		-		0.000	0.000	3.222	-
Integration, Assembly & Test (BRR-6)	WR	NSWC : Philadelphia, PA	0.130	0.283	Oct 2017	0.919	Oct 2018	0.000		-		0.000	0.000	1.332	-
Integration, Assembly & Test (BRR-6)	WR	NSWC : Carderock	0.099	0.481	Oct 2017	1.384	Oct 2018	0.000		-		0.000	0.000	1.964	-
Integration, Assembly & Test (BRR-6)	WR	NUWC : Newport, RI	0.219	0.241	Oct 2017	0.180	Oct 2018	0.000		-		0.000	0.000	0.640	-
Integration, Assembly & Test (BRR-6)	WR	SSC Pacific : San Diego, CA	0.000	0.000		0.300	Oct 2018	0.000		-		0.000	0.000	0.300	-
Test and Evaluation Prior Years	Various	Various : Various	5.247	0.000		0.000		0.000		-		0.000	0.000	5.247	-
Subtotal			18.366	1.369		2.883		0.000		-		0.000	0.000	22.618	N/A

Remarks

FY20 Cost data is provided under PE 0604280N Project 0742

Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management Support (Trans Eng)	Various	Available at higher classification : Available at higher classification	4.561	0.392	Feb 2018	0.400	Feb 2019	0.000		-		0.000	0.000	5.353	-
Program Management Support (SubHDR)	Various	Available at higher classification : Available at higher classification	4.262	0.166	Feb 2018	0.000		0.000		-		0.000	0.000	4.428	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0742 / Sub Integrated Ant System					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management Support (AdvHDR)	Various	Available at higher classification : Available at higher classification	8.031	0.249	Feb 2018	0.255	Feb 2019	0.000		-		0.000	0.000	8.535	-
Program Management Support (BRR-6)	Various	Available at higher classification : Available at higher classification	0.292	0.000		0.638	Feb 2019	0.000		-		0.000	0.000	0.930	-
Program Management Support (Antenna Improvements)	Various	Available at higher classification : Available at higher classification	0.075	0.175	Feb 2018	0.075	Feb 2019	0.000		-		0.000	0.000	0.325	-
Management Services Prior Years	Various	Various : Various	4.608	0.000		0.000		0.000		-		0.000	0.000	4.608	-
Subtotal			21.829	0.982		1.368		0.000		-		0.000	0.000	24.179	N/A
Remarks															
FY20 Cost data is provided under PE 0604280N Project 0742															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			310.884	15.267		15.426		0.000		-		0.000	0.000	341.577	N/A
Remarks															
FY20 Cost data is provided under PE 0604280N Project 0742															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																							Date: March 2019					
Appropriation/Budget Activity 1319 / 5												R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization								Project (Number/Name) 0742 / Sub Integrated Ant System								
Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Transition Engineering																												
Concept Engineering, Future Fourth Generation Undersea Warfare Communications, and Links of the Chain Development																												
Under C-WOLF Requirements, Development, and Demonstration																												
Maritime Information System (MIS) Analysis of Alternatives (AoA).																												
Note: - Efforts in FY20 and out are funded under PE 0604280N Project 0742																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

Appropriation/Budget Activity
1319 / 5

R-1 Program Element (Number/Name)
PE 0604503N / SSN-688 & Trident
Modernization

Project (Number/Name)
0742 / Sub Integrated Ant System

Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition (OE-538 Inc 2) Milestones						FRP DR																						
Testing				DT	OT																							
Contract/Deliveries																												
OE-538A Antenna Contract Options			24				19																					
OE-538A Antenna Deliveries	5				7		24																					
OE-538A RFDACS Contract Options			5				12																					
OE-538A RFDACS Deliveries				3			5																					

ACRONYMS:
DT - Developmental Test
OT - Operational Test

DR - Decision Review

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																		Date: March 2019										
Appropriation/Budget Activity 1319 / 5									R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization								Project (Number/Name) 0742 / Sub Integrated Ant System											
Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition (SubHDR) Milestones																												
Performance Reliability Development																												
Component Development MMS																												
Radome Procurement Deliveries																												
Efforts in FY20 and out are funded under PE 0604280N Project 0742																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																Date: March 2019												
Appropriation/Budget Activity 1319 / 5								R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization								Project (Number/Name) 0742 / Sub Integrated Ant System												
Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition ADVHDR																												
Milestones																												
Contract Award (OCOMMS)				▲																								
Development and Integration																												
TOTIM Research and Analysis																												
Note: - Optical Communications (OCOMMS) Project Arrangement (PA) is an international agreement with the United Kingdom. - Efforts in FY20 and out are funded under PE 0604280N Project 0742																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																							Date: March 2019					
Appropriation/Budget Activity 1319 / 5												R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization								Project (Number/Name) 0742 / Sub Integrated Ant System								
Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Towed Buoy Antenna (BRR-6/6B) OHIO and COLUMBIA Reliability Improvement Development																												

Efforts in FY20 and out are funded under PE 0604280N Project 0742

Additional details available at higher classification

IMU = Inertial Measurement Unit Implementation

Ant & Amp = Antenna and Amplifier Improvements

Efforts in FY20 and out are funded under PE 0604280N Project 0742

Additional details available at higher classification

IMU = Inertial Measurement Unit Implementation

Ant & Amp = Antenna and Amplifier Improvements

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																				Date: March 2019								
Appropriation/Budget Activity 1319 / 5										R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization										Project (Number/Name) 0742 / Sub Integrated Ant System								
Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Antenna Improvements	Reliability, Maintainability & Availability (RMA) Improvements																											
Component development (TRAAM)																												
Efforts in FY20 and out are funded under PE 0604280N Project 0742 Transmit Receive Automatic Identification System (AIS) Amplifier Module (TRAAM)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0742 / Sub Integrated Ant System	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0742				
Transition Engineering Concept Engineering, Future Fourth Generation Undersea Warfare Communications, and Links of the Chain (LOC) Development	1	2018	4	2019
Transition Engineering Under C-WOLF Requirements, Development, and Demonstration	2	2018	4	2019
Transition Engineering Maritime Information System (MIS) Analysis of Alternatives (AoA)	1	2018	1	2018
OE-538A Full Rate Production Decision Review (FRP DR)	2	2019	2	2019
OE-538A Development Test (DT) for FRP	4	2018	4	2018
OE-538A Operational Test (OT)	1	2019	1	2019
OE-538A Antenna Deliveries Year 2	1	2018	2	2018
OE-538A Antenna Deliveries Year 3	3	2018	2	2019
OE-538A Antenna Contract Option Year 4	3	2018	3	2018
OE-538A Antenna Deliveries Year 4	3	2019	4	2019
OE-538A Antenna Contract Option Year 5	3	2019	3	2019
OE-538A RFDACS Deliveries Year 1	3	2018	4	2018
OE-538A RFDACS Contract Option Year 2	3	2018	3	2018
OE-538A RFDACS Deliveries Year 2	3	2019	4	2019
OE-538A RFDACS Contract Option Year 3	3	2019	3	2019
OE-538A RFDACS Contract Option Year 4	3	2020	3	2020
SubHDR Performance Reliability Component Development/Test	1	2018	4	2019
SubHDR Mast Motion Sensor	4	2018	4	2019
SubHDR Radome Production Deliveries	3	2018	3	2018

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019		
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 0742 / Sub Integrated Ant System	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
AdvHDR Contract Award Optical Communications (OCOMMS)		3	2018	3	2018
AdvHDR Development and Integration (OCOMMS)		4	2018	4	2019
AdvHDR TOTIM Reseach and Analysis		1	2018	1	2018
TBA (AN/BRR-6/6B) reliability improvement development: Cybersecurity Hardening		1	2018	4	2019
TBA (AN/BRR-6/6B) reliability improvement development: Inertial Measurement Unit (IMU) Implementation		1	2018	4	2018
TBA (AN/BRR-6/6B) reliability improvement development: Antenna and Amplifier Improvements		1	2018	4	2018
TBA (AN/BRR-6/6B) reliability improvement development: Radio Frequency and Depth Canisters		1	2018	4	2019
TBA (AN/BRR-6/6B) Buoy Shape Improvements		1	2018	4	2019
Antenna Improvements Reliability, Maintainability & Availability (RMA) Development		1	2018	4	2019
Antenna Improvemnts Component development (TRAAM)		1	2018	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0775 / Submarine Supt Equip Prog			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0775: Submarine Supt Equip Prog	27.733	9.082	28.408	27.273	-	27.273	19.902	30.232	33.266	32.853	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Submarine Support Equipment Program (SSEP) is responsible for the development and improvement of submarine Electronic Warfare (EW) systems in support of effective operations in the following mission areas: Joint Littoral Warfare; Joint Intelligence Surveillance Reconnaissance (ISR), Indications and Warnings; Electronic Warfare; Information Operations including Cyber; and Special Operations Force (SOF) support. The rapid proliferation of complex radar, communications and navigation equipment available to potential adversaries creates an increasingly dense and sophisticated electromagnetic environment. Sustained and significant improvements to submarine EW systems are required to maintain tactical ship safety and operational effectiveness. As such, EW was raised to a submarine primary mission area in FY2012 by Commander Submarine Forces, and EW is listed as the number one modernization requirement by the Submarine Tactical Requirements Group (STRG).

The FY 20 budget has increased from PB 19 submission to include funding for acceleration of digital technology into future EW Technical Insertions (TIs). This includes a \$7.1M realignment from OPN (BLI 0840) to RDT&E. The FY 20 budget continues to develop Gen 2 of the Multifunction Modular Mast (MMM) payload, completes Advanced Processor Build 19 (APB-19) development and commences APB-21, supports developmental and operational test events, and completes development of the AN/BLQ-IOB Technical Insertion (TI-20) system, as well as transitions technologies from the Advanced Submarine Support Equipment Program (ASSEP) and Future Naval Capability (FNC) efforts.

- TI-22 provides the same critical update to 688i and SEAWOLF class ships as TI-20 provided to the VA Class. Additionally, TI-22 looks to improve the high-speed network and signal distribution systems developed in TI-20 as well as integrate new generations of EW Payloads. Funding is critical to developing enabling technologies that will provide maximized electronic spectrum digitization and processing, allowing Submarine EW system to continue to pace the threat. The EW environment is increasingly complex and crowded. The paradigms, algorithms, and analogue systems the Navy has relied on for decades are no longer able to maintain tactical relevance in the digital era of low power radars with digital waveforms. Tactical decision makers are unable to maintain awareness of the EW spectrum with current systems. Without significant investment in TI-22, the Submarine Navy will not be able to maintain littoral presence, conduct Anti-Access Area Denial operations, coordinated strike operations, joint ISR, and SOF support.

- The MMM Payload will be developed in three successive generations adding capability to pace the threat. The first generation provides Unmanned Aerial Systems (UAS) capability. The second generation is planned to add Tactical Data Link (TDL) Communications to the UAS mission. The third generation will add Coherent Electronic Attack (CEAS) and improve the ranges and reliability of previous Gen 1 and Gen 2 mission sets. With concurrence of the warfighting stakeholders, funding for MMM Payload development has been reduced from FY 19 to FY 20 to provide more funding to TI development and integration efforts.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019				
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0775 / Submarine Supt Equip Prog				
<p>- APB-19 brings three capabilities to the AN/BLQ-10 system: improved RADAR Direction Finding (DF) capability (688i/SSGN), improved Low Probability of intercept performance (LPI), and RADAR Vulnerability and Assessment Tools (RVAT). APB-21 brings improved RADAR Direction Finding (DF) capability for VA Class submarines, further refinements to RVAT and LPI processing and capabilities, Passive Ranging and Targeting, and Organic/Non-Organic fusion.</p> <p>- Transitioning technologies include (Scalable Integrated RF System for Undersea Platforms) SIRFSUP, Submarine Simultaneous Transmit and Receive (SUBSTAR) and Electronic Warfare Micro-Adaptive Trainer (EW MAT).</p>							
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)			FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Submarine Support Equipment Program			9.082	28.408	27.273	0.000	27.273
Articles:			-	-	-	-	-
FY 2019 Plans:							
<p>-- The \$19M increase in funding is to initiate TI-20 development, design, integration of previously developed TI-20 technologies and other Non-Recurring Engineering efforts with industry and procure initial development hardware including racks, cabling, RF simulators, downconverters, signal distribution modules, controls and display units, and initial integration hardware. This funding will support further digitization of the AN/BLQ-10 system with a completely new design removing stove-piped analogue subsystems and replacing them with digital components that allows for "spectrum as a service" usage. TI-20 funding is critical to developing enabling technologies that will provide maximized electronic spectrum digitization and processing, allowing Submarine EW system to continue to pace the threat. The EW environment is increasingly complex and crowded. The paradigms, algorithms, and analogue systems the Navy has relied on for decades are no longer able to maintain tactical relevance in the digital era of low power radars with digital waveforms. Tactical decision makers are unable to maintain awareness of the EW spectrum with current systems. Without significant investment in TI-20, the Submarine Navy will not be able to maintain littoral presence, conduct Anti-Access Area Denial operations, coordinated strike operations, joint ISR, and SOF support.</p> <p>-- Commence integration of EW Payloads into the AN/BLQ-10 system to interface with the TI-20 system.</p> <p>-- Commence development of a digital Early Warning Receiver as part of the TI-20 system.</p> <p>-- Complete TI-16 developmental testing on the Server-Based Radar Narrow Band (SB-RNB) and EW portions of the Low-Profile Photonics Mast.</p>							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019			
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 0775 / Submarine Supt Equip Prog		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>-- Update AN/BLQ-10 software baseline changes for SWFTS and NPES, SPR Resolution and Software Enhancement via the Advanced Processor Build (APB) process to fully utilize the new technology being fielded in TI-20 with broader spectrum digitization.</p> <p>-- Continue development of TI-20 capabilities for MMM payload EW System, EW Server, DF improvements, and Communications Digital Aperture Correlation and Emitter improvements.</p> <p>-- Develop advanced technology demonstrations for feasibility of systems capable of meeting later increments of AN/BLQ-10 for performance and digital data delivery.</p> <p>-- Conduct testing for MMM Payload, SLD buoy, improvements to emitter algorithms and improvements to correlation algorithms, improvements to vulnerability assessment algorithms. Tests include side by side laboratory testing, at sea testing (inclusive of TEMPALT development and crew training), fleet experimentation coordination and support, and technology demonstrations.</p> <p>-- Update the MMM Payload to meet emerging Fleet needs and integrate into the AN/BLQ-10 system and combine Gen 1 MMM Payload capabilities with TDL communications capabilities.</p> <p>FY 2020 Base Plans:</p> <p>-- Continue TI-20 development, design, integration, configuration, architecture documentation and software design.</p> <p>-- Complete MMM Payload Gen 2 development efforts including Tactical Data Link Comms.</p> <p>-- Complete APB-19 development.</p> <p>-- Finalize plans for APB-21 and commence development.</p> <p>-- Update AN/BLQ-10 software baseline changes for SWFTS and NPES, SPR Resolution and Software Enhancement via the APB process to fully utilize the new technology being fielded in TI-20 with broader spectrum digitization.</p>						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 5				R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0775 / Submarine Supt Equip Prog				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)												
				FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total				
-- Coordinate with ONR and NUWC Newport to develop FNC capabilities to a high technology readiness level and transition to EW systems as appropriate. -- Develop advanced technology demonstrations for feasibility of systems capable of meeting later increments of AN/ BLQ-10 for performance and digital data delivery. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: The SSEP budget decreases by \$1.135M from FY 2019 to FY 2020 due to lower amounts of funding required for development and testing of MMM payloads in FY20 compared to FY19.												
Accomplishments/Planned Programs Subtotals				9.082	28.408	27.273	0.000	27.273				
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• SCN/2013: VIRGINIA Class Submarine	5,450.911	7,137.077	9,925.498	-	9,925.498	6,123.064	5,968.338	6,080.771	7,052.398	28,976.120	148,078.924	
• RDT&E/0604558N: New Design SSN	117.887	180.233	121.010	-	121.010	201.638	248.406	277.648	283.190	Continuing	Continuing	
• RDT&E/0603562N/0770: Adv Sub Supp Equip Prog	4.120	4.307	4.557	-	4.557	4.718	4.822	4.908	5.004	Continuing	Continuing	
• OPN/0840: Sub Periscope, Imaging and Supt Equip Prog	172.740	176.621	160.803	-	160.803	210.461	280.369	289.212	290.378	Continuing	Continuing	
• RDT&E/0603595N: SSBN New Design	775.624	542.846	419.051	-	419.051	313.582	196.261	171.766	187.173	Continuing	Continuing	
Remarks												
D. Acquisition Strategy AN/BLQ-10 EW System - Procurements are executed/managed in accordance with Acquisition Plan (Rev 10) for AN/BLQ-10 EW System dtd 02/01/17, Single Acquisition Management Plan dtd 06/12/14, Individual Streamlined Acquisition Plan (Rev 0) for AN/BLQ-10 dtd 04/09/18, and the AN/BLQ-10 Acquisition Strategy dtd 01/28/13.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0775 / Submarine Supt Equip Prog

E. Performance Metrics

The Research, Development and Demonstration (RDD) program goal is to respond to urgent operational needs within 30 days and provide for rapid development and fielding of prototype solutions within 270 days.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 0775 / Submarine Supt Equip Prog					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Hardware and Software Development	Various	Various : Various	2.500	1.323	Oct 2017	1.349	Oct 2018	0.679	Oct 2019	-		0.679	Continuing	Continuing	Continuing
Hardware and Software Development	WR	NUWC : Newport, RI	16.630	1.423	Oct 2017	1.451	Oct 2018	0.782	Oct 2019	-		0.782	Continuing	Continuing	Continuing
Hardware and S/W Development MMM Payload	C/FFP	SEACORP : Newport, RI	0.000	3.000	Oct 2017	3.570	Oct 2018	1.123	Oct 2019	-		1.123	Continuing	Continuing	Continuing
Hardware and S/W Development TI-20/TI-22	C/CPIF	Competitive: : TBD	0.000	0.000		18.561	Oct 2018	22.799	Oct 2019	-		22.799	Continuing	Continuing	Continuing
Subtotal			19.130	5.746		24.931		25.383		-		25.383	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Test Support	WR	COTF : Norfolk, VA	0.789	0.275	Oct 2017	0.320	Oct 2018	0.330	Oct 2019	-		0.330	Continuing	Continuing	Continuing
Systems Engineering & Test Support	WR	NUWC : Newport, RI	7.814	3.061	Oct 2017	3.157	Oct 2018	1.560	Oct 2019	-		1.560	Continuing	Continuing	Continuing
Subtotal			8.603	3.336		3.477		1.890		-		1.890	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			27.733	9.082		28.408		27.273		-		27.273	Continuing	Continuing	N/A
Remarks The SSEP budget decreases by \$1.135M from FY 2019 to FY 2020 due to lower amounts of funding required for development and testing of MMM payloads in FY20 compared to FY19.															

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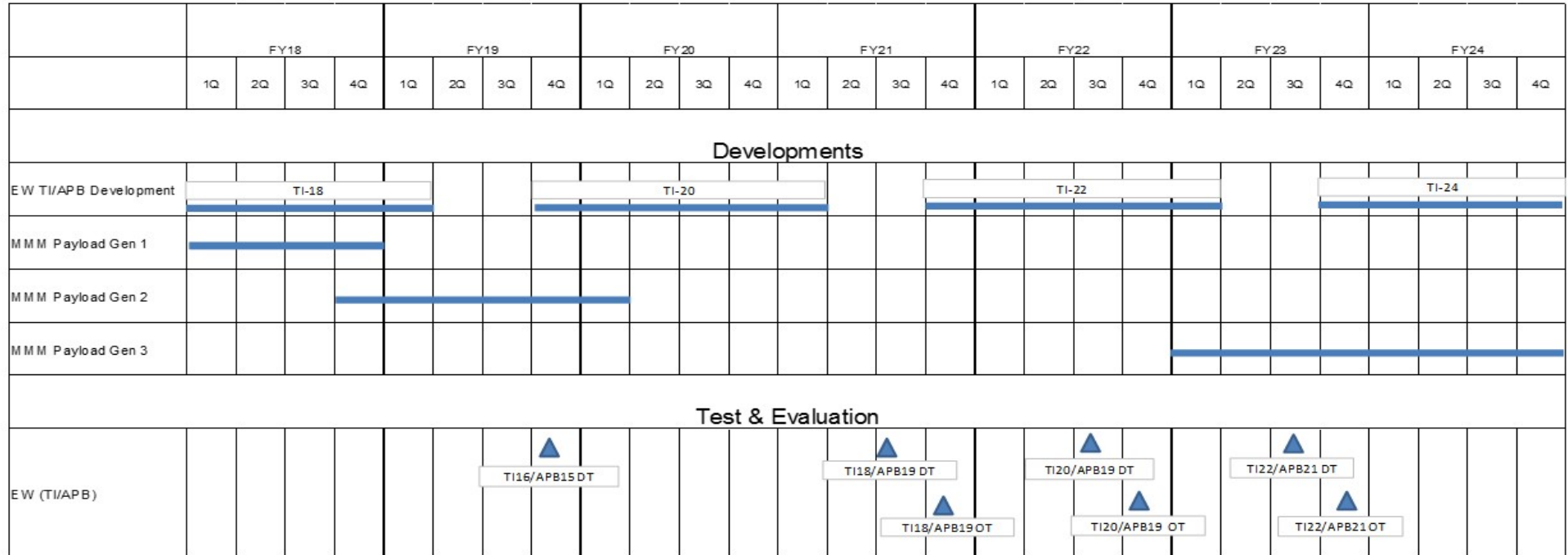
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

Appropriation/Budget Activity
1319 / 5

R-1 Program Element (Number/Name)
PE 0604503N / SSN-688 & Trident
Modernization

Project (Number/Name)
0775 / Submarine Supt Equip Prog



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 0775 / Submarine Supt Equip Prog	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0775				
Developments: EW TI/APB Development: TI-18	1	2018	1	2019
Developments: EW TI/APB Development: TI-20	4	2019	1	2021
Developments: EW TI/APB Development: TI-22	4	2021	1	2023
Developments: EW TI/APB Development: TI-24	4	2023	4	2024
Developments: MMM Payload Gen 1:	1	2018	4	2018
Developments: MMM Payload Gen 2:	4	2018	1	2020
Developments: MMM Payload Gen 3:	1	2023	4	2024
Test and Evaluation: TI-16/APB-15: Developmental Testing	4	2019	4	2019
Test and Evaluation: TI-18/APB-19: Developmental Testing	2	2020	2	2020
Test and Evaluation: TI-18/APB-19: Operational Testing	4	2021	4	2021
Test and Evaluation: TI-20/APB-19: Developmental Testing	3	2022	3	2022
Test and Evaluation: TI-20/APB-19: Operational Testing	4	2022	4	2022
Test and Evaluation: TI-22/APB-21: Developmental Testing	3	2023	3	2023
Test and Evaluation: TI-22/APB-21: Operational Testing	4	2023	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 1411 / Sub Tact Comm System			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1411: Sub Tact Comm System	228.337	14.443	16.068	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	258.848
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Funding has been realigned out of PE 0604503N Project 1411, into PE 0604280N Project 1411 as part of RDTEN PE Consolidation starting in FY20.

A. Mission Description and Budget Item Justification

The Submarine Tactical Communications System budget item (1411) funds the Common Submarine Radio Room (CSRR) program, which provides a fully integrated and tested communications architecture of Command, Control, Communications, Computers, and Intelligence (C4I) program of record components, providing secure voice and data communications for all submarine classes. The CSRR program, via an end-to-end integrated test environment, ensures that submarine communications systems: (a) enhance assured information transfer via automated and integrated network management; (b) support assured command and control, (c) provide submarine Internet Protocol (IP) connectivity; (d) are interoperable with United States and allied/coalition military networks; (e) provide improved reliability, maintainability, and availability. The CSRR program includes the development of a network-controlled computer based trainer to support training requirements. The CSRR program provides systems engineering efforts associated with implementation of new technology allowing submarines to connect to the global information grid. The new technology will also ensure the submarine's continued ability to participate in network-centric warfare and exploit its inherent stealth capabilities in support of the Navy, Joint, and allied/coalition fight to achieve total battlespace information dominance. The CSRR program is authorized to field Increment 1 as multiple block upgrades (Versions). CSRR modernization activities bring new capabilities, address new requirements, resolve End-of-Life (EOL) and obsolescence issues or correct known system deficiencies. CSRR Increment 1 Version 4 enables critical submarine C4I capabilities (i.e., MUOS, Link-16, Iridium, GPS Anti-Jam, GPS M-Code) and addresses obsolescence and EOL issues of radio room infrastructure supporting critical Navy C4I systems (e.g., NMT, DMR, CANES, ADNS, SLVR).

Additional efforts funded under the Submarine Tactical Communications System budget item include (1) Undersea Platforms Special Communications, which provides fully integrated and tested Undersea Assured Command & Control (UAC2) communications systems; and (2) Link 16, which provides an enhanced submarine communication system by providing a two-way Tactical Data Link (TDL) processing capability on all classes of Submarines. The Link 16 program provides submarine Command & Control systems with Link 16 tactical network communications capabilities for situational awareness in a contested environment and is a key element in naval tactical networking. The new technology ensures the submarine's continued ability to participate in network-centric warfare and exploit its inherent stealth capabilities in support of the Navy, Joint, and allied/coalition fight to achieve total battlespace information dominance.

JUSTIFICATION FOR BUDGET ACTIVITY:

These programs are funded under ENGINEERING and MANUFACTURING DEVELOPMENT because they encompass development and demonstration of new end-items.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy				Date: March 2019		
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 1411 / Sub Tact Comm System		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Common Submarine Radio Room (CSRR)		10.978	10.616	0.000	0.000	0.000
Articles:		-	-	-	-	-
FY 2019 Plans:						
CSRR Increment 1 Version 4 efforts:						
- Complete systems engineering and development activities in support of modernization for the LOS ANGELES, OHIO-SSBN, OHIO-SSGN, VIRGINIA, and SEAWOLF Class submarines.						
- Complete development of platform specific builds of Control and Management software for LOS ANGELES and VIRGINIA Class capabilities.						
- Complete development of the Test and Evaluation Master Plan (TEMP) and all preparations for Developmental Test (DT) and Operational Test (OT) events.						
- Complete implementation of security upgrades to meet Cybersecurity and multiple certification requirements for General Service (GENSER) and Sensitive Compartmented Information (SCI) for all CSRR platforms.						
- Continue development of Multi-purpose Reconfigurable Training System (MRTS) software upgrade for LOS ANGELES, OHIO-SSBN, and OHIO-SSGN Class operator trainer and VIRGINIA Class maintenance trainer.						
- Continue development of platform specific builds of Control and Management software for OHIO-SSBN, OHIO-SSGN, and SEAWOLF Class capabilities.						
- Commence/Complete Critical Design Review.						
CSRR Build 22 (previously Increment 1 Version 5) efforts:						
- Commence systems engineering and development activities in support of modernization for the LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class submarines.						
- Commence development of platform specific builds of Control and Management software for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class capabilities.						
- Commence implementation of security upgrades to meet Cybersecurity and multiple certification requirements for GENSER and SCI for all CSRR platforms.						
- Commence Federal Information Security Management Act (FISMA) statutory requirement for Cybersecurity compliance of Cybersecurity deficiencies.						
All CSRR Versions/Builds:						
- Complete Environmental Qualification Testing (EQT) for CSRR Increment 1 Version 1 through Version 4.						
- Complete FISMA statutory requirement for Cybersecurity compliance and correction of Increment 1 Version 1 through Version 4 Cybersecurity deficiencies.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy				Date: March 2019		
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization		Project (Number/Name) 1411 / Sub Tact Comm System		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<div>- Continue Supply Chain Risk Management (SCRM) assessment as part of Program Protection Plan (PPP) revision.</div> <div>- Commence development of CSRR Increment 1 Version 1, 3, and 4 architecture model databases in support of implementing Model Based Systems Engineering (MBSE) for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class submarines.</div> <div>- Commence development of a reconfigurable Platform Integration and Test Laboratory.</div> <div>- Commence updates to CSRR Acquisition documentation to reflect implementation of CSRR Build Process.</div> <div>FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation</div> <div>FY 2020 OCO Plans: N/A</div> <div>FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 1411</div>						
<div>Title: Undersea Assured Command & Control (UAC2)</div> <div>Articles:</div> <div>FY 2019 Plans:<div>- Complete UAC2 Phase 2 Trade Study Development.</div><div>- Continue UAC2 technology development Phase 1 (solutions 1 and 2).</div><div>- Continue shore integration of UAC2 solution 1 to support DoD Teleports.</div><div>- Continue shore integration of UAC2 solution 1 to support DoN Submarine Broadcast Control Authority.</div><div>- Continue afloat integration of UAC2 solution 1 on all classes of submarines.</div><div>- Commence afloat integration of UAC2 solution 2 on all classes of submarines.</div><div>- Commence/complete Environmental Qualification Testing (EQT) on UAC2 Phase 1 solution 2.</div></div> <div>FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation</div> <div>FY 2020 OCO Plans: N/A</div> <div>FY 2019 to FY 2020 Increase/Decrease Statement:</div>		2.496 -	1.973 -	0.000 -	0.000 -	0.000 -

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy									Date: March 2019				
Appropriation/Budget Activity 1319 / 5				R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 1411 / Sub Tact Comm System					
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 1411													
Title: Link 16				Articles:					0.969	3.479	0.000	0.000	0.000
									-	-	-	-	-
FY 2019 Plans: - Commence systems engineering and development activities in support of Link 16 tactical network communications capability. - Commence Lab integration of the Tactical Data Link (TDL) processor with Multifunctional Information Distribution System (MIDS) into the submarine architecture. - Commence Environmental Qualification Testing (EQT). - Commence Submarine radio room to combat system design, development, and integration. - Commence updates to applicable Acquisition Documentation to support Link 16.													
FY 2020 Base Plans: FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation													
FY 2020 OCO Plans: N/A													
FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease is due to realigning funds as part of PE Consolidation. FY20 justification and change explanation is provided under PE 0604280N Project 1411													
Accomplishments/Planned Programs Subtotals									14.443	16.068	0.000	0.000	0.000
C. Other Program Funding Summary (\$ in Millions)													
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost		
• OPN/3130: Submarine Communication Equipment	76.327	78.580	69.643	-	69.643	62.380	65.201	65.927	67.081	Continuing	Continuing		
• 0604280N/1411: Submarine Tactical Communication System	0.000	0.000	14.175	-	14.175	12.977	14.372	14.674	14.963	Continuing	Continuing		
Remarks													

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 1411 / Sub Tact Comm System
D. Acquisition Strategy -CSRR Program Milestones: Increment 1 Version 4 Critical Design Review (CDR) 2Q FY19, Developmental Test (DT) 1Q FY20, Fielding Decision 2Q FY20 and Operational Test (OT) 3Q FY20. CSRR Build 22 PDR 3Q FY21, CDR 3Q FY22, DT 2Q FY23, OT 1Q FY24, and Fielding Decision 3Q FY23. CSRR Acquisition Strategy shifted to CSRR Builds (CB) post fielding of Increment 1 Version 4 to better align with the Navy's Submarine Warfare Federated Tactical Systems (SWFTS). - UAC2 Program Milestones: Detailed information available at a higher classification. -Link 16 Program Milestones: Developmental Test (DT) 1Q FY21, Operational Test (OT) 2Q FY21. Link 16 is a newly funded, existing requirement within CSRR. Tactical Data Links capability documented in the CSRR Capability Production Document (CPD). E. Performance Metrics FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 1411 / Sub Tact Comm System					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Multi-Purpose Reconfigurable Training System (MRTS) Development (CSRR)	WR	SSC LANT : Charleston, SC	5.129	1.332	Dec 2017	1.387	Dec 2018	0.000		-		0.000	0.000	7.848	-
Systems Eng/Design Increment 1 (CSRR)	WR	NUWC : Newport, RI	17.933	4.665	Dec 2017	4.675	Dec 2018	0.000		-		0.000	0.000	27.273	-
Site Platform Integration/ Certification (CSRR)	WR	NUWC : Newport, RI	13.212	0.255	Dec 2017	0.263	Dec 2018	0.000		-		0.000	0.000	13.730	-
Software Development (CSRR)	C/CPFF	TBD : TBD	0.000	0.505	Sep 2018	1.757	Dec 2018	0.000		-		0.000	0.000	2.262	-
Software Development (CSRR)	Various	Available at higher classification : Available at higher classification	11.011	1.660	Nov 2017	0.000		0.000		-		0.000	0.000	12.671	-
Systems Eng/Integration (UAC2)	WR	NUWC : Newport, RI	0.000	1.560	Nov 2017	0.650	Nov 2018	0.000		-		0.000	0.000	2.210	-
Design (UAC2)	WR	SSC PAC : San Diego, CA	0.000	0.200	Nov 2017	0.350	Nov 2018	0.000		-		0.000	0.000	0.550	-
Hardware Development (Link 16)	C/CPFF	TBD : TBD	0.000	0.000		0.500	Nov 2018	0.000		-		0.000	0.000	0.500	-
Systems Engineering (Link 16)	WR	NUWC : Newport, RI	0.000	0.497	Nov 2017	1.300	Nov 2018	0.000		-		0.000	0.000	1.797	-
Site Platform integration/ Certification (Link 16)	WR	NUWC : Newport, RI	0.000	0.353	Nov 2017	0.980	Nov 2018	0.000		-		0.000	0.000	1.333	-
Software Development (Link 16)	C/CPFF	TBD : TBD	0.000	0.000		0.421	Nov 2018	0.000		-		0.000	0.000	0.421	-
Product Development Prior Years	Various	Various : Various	124.155	0.000		0.000		0.000		-		0.000	0.000	124.155	-
Subtotal			171.440	11.027		12.283		0.000		-		0.000	0.000	194.750	N/A
Remarks FY20 cost data is provided under PE 0604280N Project 1411															

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy **Date:** March 2019

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 1411 / Sub Tact Comm System
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Integrated Logistics Support (CSRR)	WR	NUWC : Newport, RI	4.148	0.290	Nov 2017	0.296	Nov 2018	0.000		-		0.000	0.000	4.734	-
Software Engineering (CSRR)	WR	SSC PAC : San Diego, CA	4.043	0.248	Nov 2017	0.155	Nov 2018	0.000		-		0.000	0.000	4.446	-
Information Security/ Cyber Security (INFOSEC) Certification/Supply Chain Risk Management (SCRM) Assessment (CSRR)	Various	SSC PAC/SSC LANT/NUWC : San Diego, CA/ Charleston, SC/ Newport, RI/San Diego	25.453	1.321	Nov 2017	1.346	Nov 2018	0.000		-		0.000	0.000	28.120	-
Integrated Logistics Support (UAC2)	WR	NUWC : Newport, RI	0.000	0.000		0.250	Nov 2018	0.000		-		0.000	0.000	0.250	-
Trade Study (UAC2)	Various	Available at higher classification : Available at higher classification	0.000	0.075	Jul 2018	0.500	Nov 2018	0.000		-		0.000	0.000	0.575	-
Integrated Logistics Support (Link 16)	WR	NUWC : Newport, RI	0.000	0.000		0.050	Nov 2018	0.000		-		0.000	0.000	0.050	-
Software Engineering (Link 16)	WR	SSC PAC : San Diego, CA	0.000	0.000		0.045	Nov 2018	0.000		-		0.000	0.000	0.045	-
Subtotal			33.644	1.934		2.642		0.000		-		0.000	0.000	38.220	N/A

Remarks

FY20 cost data is provided under PE 0604280N Project 1411

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Developmental/ Operational Test and Evaluation (T&E) (CSRR)	WR	COTF, JITC : Various	11.285	0.060	Nov 2017	0.090	Nov 2018	0.000		-		0.000	0.000	11.435	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 1411 / Sub Tact Comm System					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Test and Evaluation (T&E) (UAC2)	WR	COTF, JITC : Various	0.000	0.461	Nov 2017	0.023	Nov 2018	0.000		-		0.000	0.000	0.484	-
Developmental/ Operational Test and Evaluation (T&E) (Link 16)	WR	COTF, JITC : Various	0.000	0.000	Nov 2017	0.030	Nov 2018	0.000		-		0.000	0.000	0.030	-
Subtotal			11.285	0.521		0.143		0.000		-		0.000	0.000	11.949	N/A
Remarks															
FY20 cost data is provided under PE 0604280N Project 1411															
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management Support (CSRR)	Various	Available at higher classification : Available at higher classification	11.968	0.642	Nov 2017	0.647	Nov 2018	0.000		-		0.000	0.000	13.257	-
Program Management Support (UAC2)	Various	Available at higher classification : Available at higher classification	0.000	0.200	Nov 2017	0.200	Nov 2018	0.000		-		0.000	0.000	0.400	-
Program Management Support (Link 16)	Various	Available at higher classification : Available at higher classification	0.000	0.119	Nov 2017	0.153	Nov 2018	0.000		-		0.000	0.000	0.272	-
Subtotal			11.968	0.961		1.000		0.000		-		0.000	0.000	13.929	N/A
Remarks															
FY20 cost data is provided under PE 0604280N Project 1411															

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy											Date: March 2019				
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization					Project (Number/Name) 1411 / Sub Tact Comm System					
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			228.337	14.443		16.068		0.000		-		0.000	0.000	258.848	N/A

Remarks

FY20 cost data is provided under PE 0604280N Project 1411

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

Appropriation/Budget Activity

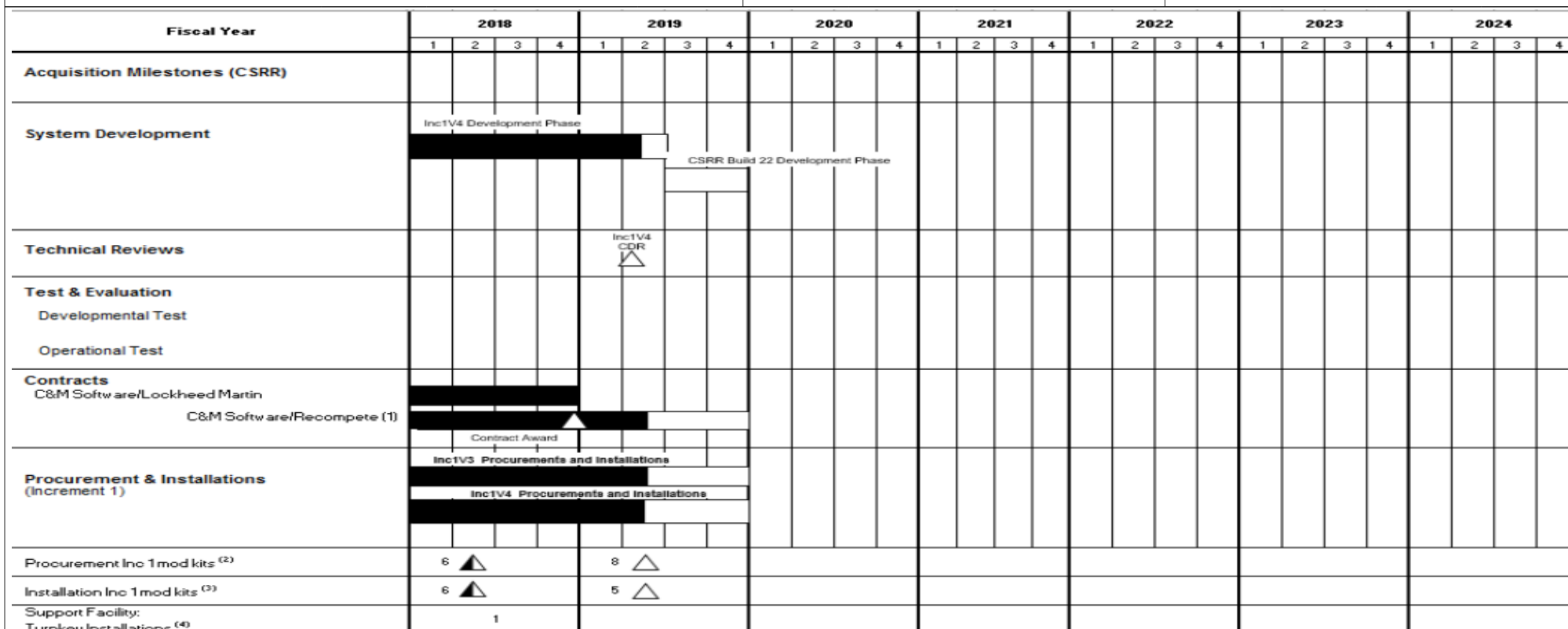
1319 / 5

R-1 Program Element (Number/Name)

PE 0604503N / SSN-688 & Trident
Modernization

Project (Number/Name)

1411 / Sub Tact Comm System



⁽¹⁾ Contract planning for C&M Software/Recompete continued in FY18.

⁽²⁾ Due to Fleet rescheduling of availability periods, some procurements have been rescheduled.

⁽³⁾ Due to Fleet rescheduling of availability periods, some installations have been rescheduled.

⁽⁴⁾ Installation cost included in procurement (Turnkey) for version updates to 3 submarine class modernization reconfigurable lab assets.

Efforts in FY20 and out are under PE 0604280N Project 1411

Legend



Scheduled Event



Completed Event



Ongoing/Future Event



Completed Phase of Ongoing Event

Acronyms

Inc	Increment
V	Version
CDR	Critical Design Review
PDR	Preliminary Design Review
T&E	Test & Evaluation
DT	Developmental Test
OT	Operational Test
JITC	Joint Interoperability Test
Command	Command
C&M	Control & Management

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

Appropriation/Budget Activity

1319 / 5

R-1 Program Element (Number/Name)

PE 0604503N / SSN-688 & Trident
Modernization

Project (Number/Name)

1411 / Sub Tact Comm System

Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
System Development (UAC2)																												
Solution 1																												
Solution 2																												
Contracts																												
Hardware Contract																												
Procurement & Installations																												
Solution 1																												
Solution 2																												
Procurement	33				34																							
Installation	2				26																							
Shore/Lab Installation (1)	5				8																							

Notes:

(1) Installation cost included in procurement (Turnkey) for two (2) submarine class modernization reconfigurable lab assets and seven (7) Shore sites. Shore sites contain five (5) modems.

*Efforts in FY20 and out are funded under PE 0604280N Project 1411

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

Appropriation/Budget Activity

1319 / 5

R-1 Program Element (Number/Name)

PE 0604503N / SSN-688 & Trident
Modernization

Project (Number/Name)

1411 / Sub Tact Comm System

Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
System Development (Link 16)																												
Test & Evaluation																												
Contracts																												
Procurement & Installations																												
Procurements																												
Support Facility (Turnkey Installations) (1)																												

Notes:

(1) Installation cost included in procurement (Turnkey) for three (3) submarine class modernization reconfigurable lab assets.

*Efforts in FY20 and out are funded under PE 0604280N Project 1411

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 1411 / Sub Tact Comm System	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 1411				
Technical Reviews (Increment 1 Version 4 Critical Design Review (CDR))	2	2019	2	2019
System Development (Increment 1 Version 4)	1	2018	2	2019
System Development (CSRR Build 22)	3	2019	4	2019
Contracts (Software)	1	2018	4	2018
Contracts (Software-Follow-on to include planning)	1	2018	4	2019
Procurement/Installation (Increment 1 Version 3 Modernization Kits)	1	2018	4	2019
Procurement/Installation (Increment 1 Version 4 Modernization Kits)	1	2018	4	2019
System Development (Undersea Assured Command & Control (UAC2) Solution 1)	1	2018	3	2018
System Development (UAC2 Solution 2)	4	2018	4	2019
Contract Award (UAC2) Solution 1)	2	2018	2	2018
Contract Award (UAC2) Solution 2)	3	2019	3	2019
Procurement/Installation (UAC2) Solution 1)	2	2018	4	2019
Procurement/Installation (UAC2) Solution 2)	4	2019	4	2019
System Development (Link 16)	4	2018	4	2019
Procurement (Link 16)	3	2019	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 9999 / Congressional Adds			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: Congressional Adds	6.770	19.301	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	26.071
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Submarine Support Equipment Program (SSEP) seeks to develop or transition from the Advanced Submarine Support Equipment Program (ASSEP) and Future Naval Capability (FNC) efforts to all Technical Insertions (TIs).

The SSEP is responsible for the development and improvement of submarine Electronic Warfare (EW) systems in support of effective operations in the following mission areas: Joint Littoral Warfare; Joint Intelligence Surveillance Reconnaissance (ISR), Indications and Warnings; Electronic Warfare; Information Operations including Cyber; and Special

Operations Force (SOF) support. The rapid proliferation of complex radar, communications and navigation equipment available to potential adversaries creates an increasingly dense and sophisticated electromagnetic environment. Sustained and significant improvements to submarine EW systems are required to maintain tactical ship safety and operational effectiveness. As such, EW was raised to a submarine primary mission area in FY2012 by Commander Submarine Forces, and EW is listed as the number one modernization requirement by the Submarine Tactical Requirements Group (STRG).

The RDTE funding line supports the development of capability improvements to submarine electronic surveillance measures that are used to detect, classify, localize, and record radar and communications signals. These enhancements would allow current technology to keep up with the advances in electronic warfare of our adversaries. The funding line also supports the specific development of AN/BLQ-10 EW capabilities to progress PMS435's efforts to provide maximized electronic spectrum digitization, Low Probability of Intercept (LPI)/ Low Probability of Detection (LPD) radars and Critical Event Recorder (CER) capability.

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

	FY 2018	FY 2019
Congressional Add: Program Increase	19.301	0.000
FY 2018 Accomplishments: Electronic Warfare Tactical TEMPALT: Developed the Electronic Warfare Tactical TEMPALT to provide capability improvements to submarine electronic surveillance measures that are used to detect, classify, localize, and record radar and communications signals.		
Enhanced LPI and CER: Commenced development of an enhanced capability for detecting Low Probability of Intercept RADARs. Commenced development of a Critical Event Recorder capability to allow for recording information from the AN/BLQ-10 around a critical event similar to other Submarine Warfare Federated Tactical		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019	
Appropriation/Budget Activity 1319 / 5				R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 9999 / Congressional Adds			

B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Systems. These capabilities will be included in AN/BLQ-10 systems for all TI-18 and on TI-16 SEAWOLF systems when fielded.</p> <p>FY 2019 Plans: Electronic Warfare Tactical TEMPALT: Complete development of the Electronic Warfare Tactical TEMPALT to provide capability improvements to submarine electronic surveillance measures that are used to detect, classify, localize, and record radar and communications signals.</p> <p>Enhanced LPI and CER: Complete development of an enhanced capability for detecting Low Probability of Intercept RADARs. Complete development of a Critical Event Recorder capability to allow for recording information from the AN/BLQ-10 around a critical event similar to other Submarine Warfare Federated Tactical Systems. These capabilities will be included in AN/BLQ-10 systems for all TI-18 and on TI-16 SEAWOLF systems when fielded.</p>			
Congressional Adds Subtotals		19.301	0.000

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTE/0604503N/0775: Submarine Supt Equip Prog	9.082	28.408	27.273	-	27.273	19.902	30.232	33.266	32.853	Continuing	Continuing
• SCN/2013: VIRGINIA Class Submarine	5,450.911	7,137.077	9,925.498	-	9,925.498	6,123.064	5,968.338	6,080.771	7,052.398	28,976.120	148,078.924
• RDT&E/0604558N: New Design SSN Combat Sys Development	117.887	180.233	121.010	-	121.010	201.638	248.406	277.648	283.190	Continuing	Continuing
• OPN/0840: Sub Periscope, Imaging and Supt Equip Prog	172.740	176.621	160.803	-	160.803	210.461	280.369	289.212	290.378	Continuing	Continuing
• RDT&E/0603595N: SSBN New Design	775.624	542.846	419.051	-	419.051	313.582	196.261	171.766	187.173	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
N/A											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 9999 / Congressional Adds

E. Performance Metrics

The Research Development and Demonstration (RDD) program goal is to respond to urgent operational needs within 30 days and provide for rapid development and fielding of prototype solutions within 270 days.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization				Project (Number/Name) 9999 / Congressional Adds					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
H/W & S/W Development	WR	NUWC : Newport, RI	0.524	0.000		0.000		0.000		-		0.000	0.000	0.524	-
HW & SW Development	C/CPFF	Progeny : Manassas, VA	5.801	18.112	Aug 2018	0.000		0.000		-		0.000	0.000	23.913	-
Subtotal			6.325	18.112		0.000		0.000		-		0.000	0.000	24.437	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Systems Engineering and Test Support	WR	NUWC : Newport, RI	0.445	1.189	Jul 2018	0.000		0.000		-		0.000	0.000	1.634	-
Subtotal			0.445	1.189		0.000		0.000		-		0.000	0.000	1.634	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			6.770	19.301		0.000		0.000		-		0.000	0.000	26.071	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

Appropriation/Budget Activity

1319 / 5

R-1 Program Element (Number/Name)

PE 0604503N / SSN-688 & Trident
Modernization

Project (Number/Name)

9999 / Congressional Adds

Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
SBIR Topic N151-036 Manning Reduction and Automation: Phase 2	■																											
N00024-13-C-6283: Manning Reduction and Automation: Phase 3 SBIR			■	■	■	■	■																					
SBIR Topic N151-036 Next Generation Electronic Warfare Human Machine Interface for Submarines: Phase 2	■	■																										
N68335-18-C-0183: Next Generation Electronic Warfare Human Machine Interface for Submarines: Phase 3 SBIR			■	■	■	■	■																					
APB-19 Step 4 Testing Development			■	■	■	■																						

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604503N / SSN-688 & Trident Modernization	Project (Number/Name) 9999 / Congressional Adds	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 9999				
AN/BLQ-10A EW Server Build: SBIR Topic N151-036 Manning Reduction and Automation: Phase 2	1	2018	1	2018
AN/BLQ-10A EW Server Build: N00024-13-C-6283: Manning Reduction and Automation: Phase 3 SBIR	3	2018	2	2019
AN/BLQ-10A EW Server Build: SBIR Topic N151-036 Next Generation Electronic Warfare Human Machine Interface for Submarines: Phase 2	1	2018	2	2018
AN/BLQ-10A EW Server Build: N68335-18-C-0183: Next Generation Electronic Warfare Human Machine Interface for Submarines: Phase 3 SBIR	4	2018	4	2019
AN/BLQ-10A EW Server Build: APB-19 Step 4 Testing Development	3	2018	2	2019