

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2021 Navy **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319: <i>Research, Development, Test &amp; Evaluation, Navy / BA 5: System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / <i>SSN-688 &amp; Trident Modernization</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	1,701.003	119.911	78.625	93.097	-	93.097	94.788	95.811	96.480	98.399	Continuing	Continuing
0219: <i>Sub Sonar Improvement (ENG)</i>	1,095.324	64.404	57.390	62.982	-	62.982	62.789	62.432	63.672	64.932	Continuing	Continuing
0742: <i>Sub Integrated Ant System</i>	326.084	14.999	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	341.083
0775: <i>Submarine Supt Equip Prog</i>	36.815	24.796	21.235	30.115	-	30.115	31.999	33.379	32.808	33.467	Continuing	Continuing
1411: <i>Sub Tact Comm System</i>	242.780	15.712	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	258.492

**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 2021 funding request was reduced by \$0.400 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.

FY 2021 funding request reflects a net increase of \$14.472 million from FY 2020 to FY 2021. The increase is associated with efforts to fully test new in-board capabilities associated with the fielding of Large Vertical Array (LVA); transition of A-RCI to the Development, Cyber Security, and Operations (DevSecOps) software development model; increased focus on machine learning, automation, and behavioral analysis; and an emergent requirement to develop the PATRIOT Phase C RADAR.

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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
Previous President's Budget	126.932	84.663	82.685	-	82.685
Current President's Budget	119.911	78.625	93.097	-	93.097
Total Adjustments	-7.021	-6.038	10.412	-	10.412
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-6.038			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-2.590	0.000			
• SBIR/STTR Transfer	-4.431	0.000			
• Program Adjustments	0.000	0.000	10.259	-	10.259
• Rate/Misc Adjustments	0.000	0.000	0.153	-	0.153

**Change Summary Explanation**

FY 2021 reflects an increase of \$10.4 million associated with advanced submarine electronic warfare systems development. These funds support the acceleration of capability development and system procurement to keep pace with an increasingly challenging environment.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 1319 / 5					<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization					<b>Project (Number/Name)</b> 0219 / Sub Sonar Improvement (ENG)		
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
0219: Sub Sonar Improvement (ENG)	1,095.324	64.404	57.390	62.982	-	62.982	62.789	62.432	63.672	64.932	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

FY 2021 funding request reflects a net increase of \$5.393 million from FY 2020 to FY 2021. Increase associated with efforts to fully test new in-board capabilities associated with the fielding of Large Vertical Array (LVA); transition of A-RCI to the Development, Cyber Security, and Operations (DevSecOps) software development model; as well as increased focus on machine learning, automation, and behavioral analysis.

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, SSBN, 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)**

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
<b>Title:</b> APB Productionization	12.519	14.461	14.751	0.000	14.751
<b>Articles:</b>	-	-	-	-	-

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
<p><b>Description:</b> APB Productionization provides for the transition of APB capability improvements to the Fleet for integration, testing and formal certification.</p> <p><b>FY 2020 Plans:</b>                      -Continue Advanced Processing Build (APB) Sea Testing, Integration, and Certification.                      -Continue transition of APB software from development to A-RCI for integration, testing, and formal certification.                      -Ensure continued transition of the SSBN legacy sonar system to the TI/APB model.                      -Continue in-board signal processing development associated with the Large Vertical Array (LVA) for OHIO Class modernization.</p> <p><b>FY 2021 Base Plans:</b>                      -Continue Advanced Processing Build (APB) development and transition of APB software from development to A-RCI for integration, testing, and formal certification.                      -Ensure continued transition of the SSBN legacy sonar system to the TI/APB model.                      -Transition development of in-board signal processing associated with the Large Vertical Array (LVA) to VIRGINIA Class modernization.</p> <p><b>FY 2021 OCO Plans:</b>                      N/A</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b>                      Funding increase is associated with the transition of APB development for LVA to VIRGINIA Class modernization.</p>					
<p><b>Title:</b> Integration and Testing</p> <p align="right"><b>Articles:</b></p>	31.430	39.201	44.429	0.000	44.429
<p><b>Description:</b> Integration and Testing provides support to integrate and test APB's into all Submarine Classes containing multiple sensor systems.</p> <p><b>FY 2020 Plans:</b>                      -Continue support of Advanced Processing Builds installed on SSN 688I, SSN 21, SSGN 726, SSBN, and VA Class Submarines.                      -Continue the incorporation of integration and testing associated with the conversion of the SSBN legacy sonar system to the TI/APB model.</p>	-	-	-	-	-

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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>					
-Continue integration and testing associated with signal processing in support of Large Vertical Array (LVA) on SSBN and VA Class submarines.					
<b>FY 2021 Base Plans:</b>					
-Continue support of Advanced Processing Builds installed on SSN 21, SSBN, and VA Class Submarines.					
-Continue the incorporation of integration and testing associated with the conversion of the SSBN legacy sonar system to the TI/APB model.					
-Continue integration and testing associated with signal processing in support of Large Vertical Array (LVA) on VA Class submarines.					
-Transitions A-RCI to the Development, Cyber Security, and Operations (DevSecOps) software development model to better enable fleet demand for rapid capability deliveries.					
<b>FY 2021 OCO Plans:</b>					
N/A					
<b>FY 2020 to FY 2021 Increase/Decrease Statement:</b>					
Funding increase associated with APB-21 design, integration, and testing efforts associated with TI-22, which transitions A-RCI to Development, Cyber Security, and Operations (DevSecOps) in the TI/APB process to better align with software development industry standards and meet fleet demands for rapid capability deliveries. These efforts increase focus on machine learning, automation, and behavioral analysis as well as fully test new in-board capabilities associated with the fielding of Large Vertical Array.					
<b>Title:</b> Large Vertical Array (LVA)					
<b>Articles:</b>					
	16.800	0.000	0.000	0.000	0.000
	-	-	-	-	-
<b>Description:</b> 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.					
<b>FY 2020 Plans:</b>					
N/A					
<b>FY 2021 Base Plans:</b>					
N/A					
<b>FY 2021 OCO Plans:</b>					
N/A					
<b>Title:</b> A-RCI Acoustic Superiority Integration					
	3.655	3.728	3.802	0.000	3.802

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<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0219 / Sub Sonar Improvement (ENG)

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<b>Articles:</b>	-	-	-	-	-
<p><b>Description:</b> 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><b>FY 2020 Plans:</b> -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><b>FY 2021 Base Plans:</b> -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><b>FY 2021 OCO Plans:</b> N/A</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funds increase is associated with the A-RCI transition to Development, Security, and Operations (DevSecOps) in the TI/APB process.</p>					
<b>Accomplishments/Planned Programs Subtotals</b>	64.404	57.390	62.982	0.000	62.982

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• OPN/2150: SSN Acoustic Equipment	331.338	367.620	374.737	-	374.737	422.187	481.140	497.198	516.966	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.

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<p>-Program Reviews with the Milestone Decision Authority (MDA) are conducted granting approval for the contract production options.</p> <p>Large Vertical Array (LVA):</p> <p>-Performance specification-based contract in support of LVA to enhance SSN/SSBN platform capability and situational awareness.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy												Date: February 2020			
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 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	376.335	14.777	Dec 2018	21.526	Dec 2019	23.557	Dec 2020	-		23.557	Continuing	Continuing	Continuing
Ancillary Hardware Development	SS/CPFF	ARL University of Texas : Austin, TX	44.060	3.238	Mar 2019	2.903	Mar 2020	3.185	Mar 2021	-		3.185	Continuing	Continuing	Continuing
Systems Engineering	SS/CPFF	Johns Hopkins APL : Baltimore, MD	46.209	3.257	Dec 2018	2.919	Dec 2019	3.202	Dec 2020	-		3.202	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	LMC : VA - Keyport	43.389	3.449	Jan 2019	3.089	Jan 2020	3.389	Jan 2021	-		3.389	Continuing	Continuing	Continuing
Primary Hardware Development	C/CPIF	Progeny Systems : Manassas, VA	77.308	6.708	Jan 2019	5.959	Jan 2020	6.538	Jan 2021	-		6.538	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Newport, RI	184.112	5.237	Dec 2018	9.142	Dec 2019	10.029	Dec 2020	-		10.029	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Carderock, MD	33.385	1.978	Dec 2018	2.613	Dec 2019	2.867	Dec 2020	-		2.867	Continuing	Continuing	Continuing
LVA Development	C/CPIF	Electric Boat : Groton, CT	46.548	16.135	Nov 2018	0.000		0.000		-		0.000	0.000	62.683	-
<b>Subtotal</b>			851.346	54.779		48.151		52.767		-		52.767	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	170.336	4.829	Dec 2018	4.619	Dec 2019	5.145	Dec 2020	-		5.145	Continuing	Continuing	Continuing
Primary Software Development	C/CPFF	Sedna Digital, : Manassas, VA	44.560	3.651	Dec 2018	3.493	Dec 2019	3.891	Dec 2020	-		3.891	Continuing	Continuing	Continuing
<b>Subtotal</b>			214.896	8.480		8.112		9.036		-		9.036	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
1319 / 5				PE 0604503N / SSN-688 & Trident Modernization				0219 / Sub Sonar Improvement (ENG)							
<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	11.266	0.451	Dec 2018	0.432	Dec 2019	0.481	Dec 2020	-		0.481	Continuing	Continuing	Continuing
<b>Subtotal</b>			11.266	0.451		0.432		0.481		-		0.481	Continuing	Continuing	N/A
<b>Management Services (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	15.285	0.600	Dec 2018	0.601	Dec 2019	0.604	Dec 2020	-		0.604	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : Washington, DC	2.531	0.094	Dec 2018	0.094	Dec 2019	0.094	Dec 2020	-		0.094	Continuing	Continuing	Continuing
<b>Subtotal</b>			17.816	0.694		0.695		0.698		-		0.698	Continuing	Continuing	N/A
<b>Project Cost Totals</b>			1,095.324	64.404		57.390		62.982		-		62.982	Continuing	Continuing	N/A
<b>Remarks</b>															

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2021 Navy</b>		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0219 / Sub Sonar Improvement (ENG)

KEY EVENTS	FY19				FY20				FY21				FY22				FY23				FY24				FY25																																																																																																																																																																											
	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																																																																																																																																																																								
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INSTALLATION PERIODS	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="28"><b>688i Ph III/IV Upgrade and 688 Ph III</b></td> </tr> <tr> <td colspan="12" style="background-color: yellow;"><b>SSGN</b></td> <td colspan="16"></td> </tr> <tr> <td colspan="28"><b>SEAWOLF</b></td> </tr> <tr> <td colspan="28"><b>VIRGINIA</b></td> </tr> <tr> <td colspan="12" style="background-color: yellow;"><b>SSBN</b></td> <td colspan="16"></td> </tr> <tr> <td colspan="4">FY19</td> <td colspan="4">FY20</td> <td colspan="4">FY21</td> <td colspan="4">FY22</td> <td colspan="4">FY23</td> <td colspan="4">FY24</td> <td colspan="4">FY25</td> </tr> </table>																												<b>688i Ph III/IV Upgrade and 688 Ph III</b>																												<b>SSGN</b>																												<b>SEAWOLF</b>																												<b>VIRGINIA</b>																												<b>SSBN</b>																												FY19				FY20				FY21				FY22				FY23				FY24				FY25			
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▲ Completed Milestone  
 △ Upcoming Milestone

APB: Advanced Processing Builds  
 A-RCI: Acoustic – Rapid Commercial Off the Shelf (COTS) Insertion  
 CAC: Common Acoustic Cabinet  
 TSMS: Total Ship Monitoring System

<b>SSN Installation Period</b>
<b>SSGN/SSBN Installation Period</b>



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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0219 / Sub Sonar Improvement (ENG)

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Proj 0219</b>				
ACOUSTICS	1	2019	4	2025
---Acquisition Milestones - Acoustics	3	2019	3	2025
---Annual Program Reviews - Acoustics	1	2019	4	2025
---Contract Awards - Acoustics	3	2019	2	2024
---Procurements - Acoustics	2	2019	2	2025
---DT/OT/FOT&E Tests	2	2019	4	2025
---APB Deliveries	2	2019	3	2024
---Tech Insertions	1	2019	1	2025
---Installation Periods - Acoustics	1	2019	4	2025
LARGE VERTICAL ARRAY	1	2019	4	2025
---Annual Program Reviews - Large Vertical Array	1	2019	4	2025
---Contract Awards - Large Vertical Array	2	2019	2	2025
---Procurements - Large Vertical Array	2	2019	2	2025
---First Article Fabrication	1	2019	4	2019
---First Article Testing	1	2019	4	2019
---Material & Installation Fixture Fabrication	1	2019	4	2019
---Installation Periods - Large Vertical Array	3	2021	4	2025

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 1319 / 5					<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization					<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System		
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
0742: <i>Sub Integrated Ant System</i>	326.084	14.999	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	341.083
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. Additional details available at higher classification.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 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, Slot Buoys (AN/BRT-1) and AN/BRM-2,

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
<p><b>Title:</b> Transition Engineering</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2020 Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.</p> <p><b>FY 2021 Base Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.</p> <p><b>FY 2021 OCO Plans:</b> N/A</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.</p>	2.517	0.000	0.000	0.000	0.000
	-	-	-	-	-
<p><b>Title:</b> Outboard Electronics (OE)-538</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2020 Plans:</b> N/A</p> <p><b>FY 2021 Base Plans:</b> N/A</p> <p><b>FY 2021 OCO Plans:</b> N/A</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> N/A</p>	0.100	0.000	0.000	0.000	0.000
	-	-	-	-	-
<p><b>Title:</b> Submarine High Data Rate (SubHDR) Pre-Planned Product Improvement (P3I)</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2020 Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.</p> <p><b>FY 2021 Base Plans:</b></p>	0.253	0.000	0.000	0.000	0.000
	-	-	-	-	-

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy				<b>Date:</b> February 2020	
<b>Appropriation/Budget Activity</b> 1319 / 5		<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization		<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System	
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>					
	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation. <b>FY 2021 OCO Plans:</b> N/A <b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.					
<b>Title:</b> Advanced High Data Rate (AdvHDR)	3.394	0.000	0.000	0.000	0.000
<b>Articles:</b>	-	-	-	-	-
<b>FY 2020 Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation. <b>FY 2021 Base Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation. <b>FY 2021 OCO Plans:</b> N/A <b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.					
<b>Title:</b> Towed Buoy Antenna (AN/BRR-6/6B)	6.159	0.000	0.000	0.000	0.000
<b>Articles:</b>	-	-	-	-	-
<b>FY 2020 Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation. <b>FY 2021 Base Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation. <b>FY 2021 OCO Plans:</b> N/A <b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.					
<b>Title:</b> Antenna Improvements	2.576	0.000	0.000	0.000	0.000
<b>Articles:</b>	-	-	-	-	-

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
<b>FY 2020 Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.					
<b>FY 2021 Base Plans:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.					
<b>FY 2021 OCO Plans:</b> N/A					
<b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding for FY20 and out has been realigned to PE 0604280N Project 0742 as part of PE Consolidation.					
<b>Accomplishments/Planned Programs Subtotals</b>	14.999	0.000	0.000	0.000	0.000

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

<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• OPN/3130: <i>Submarine Communication Equipment</i>	71.190	60.794	62.214	-	62.214	73.899	73.227	74.121	75.594	Continuing	Continuing
• 0604280N/0742: <i>Submarine Integrated Antenna System</i>	15.000	18.925	14.077	-	14.077	13.568	11.785	12.027	12.266	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: 3rd 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-3, RDT&E Project Cost Analysis: PB 2021 Navy												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
1319 / 5				PE 0604503N / SSN-688 & Trident Modernization				0742 / Sub Integrated Ant System							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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 Capabilities (Trans Eng)	WR	NIWC Pacific : San Diego, CA	6.938	1.060	Nov 2018	0.000		0.000		-		0.000	0.000	7.998	-
Systems Engineering (Trans Eng)	Various	Available at higher classification : Available at higher classification	3.066	0.251	Nov 2018	0.000		0.000		-		0.000	0.000	3.317	-
Systems Engineering (Trans Eng)	WR	NUWC : Newport, RI	41.365	0.551	Nov 2018	0.000		0.000		-		0.000	0.000	41.916	-
Security Engineering (Trans Eng)	Various	Available at higher classification : Available at higher classification	0.808	0.255	Nov 2018	0.000		0.000		-		0.000	0.000	1.063	-
Research and Analysis Reliability Dev (SubHDR)	WR	NUWC : Newport, RI	8.147	0.253	Nov 2018	0.000		0.000		-		0.000	0.000	8.400	-
Research and Analysis Reliability Dev (SubHDR)	Various	Available at higher classification : Available at higher classification	5.000	0.000		0.000		0.000		-		0.000	0.000	5.000	-
OCOMMS PA Demonstration System Development (AdvHDR)	C/CPFF	Available at higher classification : Available at higher classification	1.924	2.334	Feb 2019	0.000		0.000		-		0.000	0.000	4.258	-
Technology Development (AdvHDR)	C/CPFF	Available at higher classification : Available at higher classification	0.250	0.000		0.000		0.000		-		0.000	0.000	0.250	-
Systems Engineering (AdvHDR)	WR	NIWC Pacific : San Diego, CA	12.498	0.724	Nov 2018	0.000		0.000		-		0.000	0.000	13.222	-
Security Engineering/ Cybersecurity (BRR-6)	Various	Available at higher classification : Available at higher classification	0.516	0.250	Oct 2018	0.000		0.000		-		0.000	0.000	0.766	-
Systems Engineering/ Hardware Dev (BRR-6)	WR	NSWC : Philadelphia, PA	7.158	1.590	Oct 2018	0.000		0.000		-		0.000	0.000	8.748	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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<b>Product Development (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Systems Engineering/ Hardware Dev (BRR-6)	WR	NUWC : Newport, RI	4.438	0.499	Oct 2018	0.000		0.000		-		0.000	0.000	4.937	-
Systems Engineering/ Hardware Dev (BRR-6)	WR	NSWC : Carderock	1.226	0.099	Oct 2018	0.000		0.000		-		0.000	0.000	1.325	-
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NSWC : Philadelphia, PA	3.703	0.959	Nov 2018	0.000		0.000		-		0.000	0.000	4.662	-
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NSWC : Carderock	0.255	0.135	Nov 2018	0.000		0.000		-		0.000	0.000	0.390	-
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NUWC : Newport, RI	1.556	1.357	Nov 2018	0.000		0.000		-		0.000	0.000	2.913	-
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-	5.316	0.000		0.000		0.000		-		0.000	0.000	5.316	-
<b>Subtotal</b>			272.474	10.317		0.000		0.000		-		0.000	0.000	282.791	N/A

**Remarks**  
FY20 and FY21 Cost data is provided under PE 0604280N Project 0742

<b>Support (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Integrated Logistics Support (SubHDR)	Various	Available at higher classification : Available at higher classification	0.522	0.000		0.000		0.000		-		0.000	0.000	0.522	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Cost Estimating (AdvHDR)	Various	Available at higher classification : Available at higher classification	0.225	0.000		0.000		0.000		-		0.000	0.000	0.225	-
Integrated Logistics Support (AdvHDR)	Various	Available at higher classification : Available at higher classification	0.225	0.080	Feb 2019	0.000		0.000		-		0.000	0.000	0.305	-
Cost Estimating (BRR-6)	Various	Available at higher classification : Available at higher classification	0.109	0.053	Oct 2018	0.000		0.000		-		0.000	0.000	0.162	-
Integrated logistics Support (BRR-6)	WR	NUWC : Newport, RI	0.327	0.134	Oct 2018	0.000		0.000		-		0.000	0.000	0.461	-
Configuration Management (BRR-6)	WR	NSWC : Philadelphia, PA	0.947	0.054	Oct 2018	0.000		0.000		-		0.000	0.000	1.001	-
Systems Engineering Support (BRR-6)	Various	Available at higher classification : Available at higher classification	0.000	0.060	Oct 2018	0.000		0.000		-		0.000	0.000	0.060	-
Integrated Logistics Support (Antenna Improvements)	Various	Available at higher classification : Available at higher classification	0.100	0.050	Nov 2018	0.000		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	-
<b>Subtotal</b>			11.064	0.431		0.000		0.000		-		0.000	0.000	11.495	N/A

**Remarks**  
FY20 and FY21 Cost data is provided under PE 0604280N Project 0742

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental/Operational T&E (OE-538)	WR	NUWC : Newport, RI	8.289	0.050	Nov 2018	0.000		0.000		-		0.000	0.000	8.339	-
Test & Evaluation (OE-538)	WR	COTF : Norfolk, VA	1.524	0.050	Nov 2018	0.000		0.000		-		0.000	0.000	1.574	-
Test & Evaluation (SubHDR)	WR	NUWC : Newport, RI	3.222	0.000		0.000		0.000		-		0.000	0.000	3.222	-
Integration, Assembly & Test (BRR-6)	WR	NSWC : Philadelphia, PA	0.413	0.919	Oct 2018	0.000		0.000		-		0.000	0.000	1.332	-
Integration, Assembly & Test (BRR-6)	WR	NSWC : Carderock	0.580	1.384	Oct 2018	0.000		0.000		-		0.000	0.000	1.964	-
Integration, Assembly & Test (BRR-6)	WR	NUWC : Newport, RI	0.460	0.180	Oct 2018	0.000		0.000		-		0.000	0.000	0.640	-
Integration, Assembly & Test (BRR-6)	WR	NIWC Pacific : San Diego, CA	0.000	0.300	Oct 2018	0.000		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	-
<b>Subtotal</b>			19.735	2.883		0.000		0.000		-		0.000	0.000	22.618	N/A

**Remarks**  
FY20 and FY21 Cost data is provided under PE 0604280N Project 0742

<b>Management Services (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support (Trans Eng)	Various	Available at higher classification : Available at higher classification	4.953	0.400	Feb 2019	0.000		0.000		-		0.000	0.000	5.353	-
Program Management Support (SubHDR)	Various	Available at higher classification : Available at higher classification	4.428	0.000		0.000		0.000		-		0.000	0.000	4.428	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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<b>Management Services (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support (AdvHDR)	Various	Available at higher classification : Available at higher classification	8.280	0.255	Feb 2019	0.000		0.000		-		0.000	0.000	8.535	-
Program Management Support (BRR-6)	Various	Available at higher classification : Available at higher classification	0.292	0.638	Feb 2019	0.000		0.000		-		0.000	0.000	0.930	-
Program Management Support (Antenna Improvements)	Various	Available at higher classification : Available at higher classification	0.250	0.075	Feb 2019	0.000		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	-
<b>Subtotal</b>			22.811	1.368		0.000		0.000		-		0.000	0.000	24.179	N/A

**Remarks**  
FY20 and FY21 Cost data is provided under PE 0604280N Project 0742

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	326.084	14.999	0.000	0.000	-	0.000	0.000	341.083	N/A

**Remarks**  
FY20 and FY21 Cost data is provided under PE 0604280N Project 0742

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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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Fiscal Year	2019				2020				2021				2022				2023				2024				2025			
	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
<b>Acquisition (Transition Engineering) Milestones</b>																												
Concept Engineering and Future Fourth Generation Undersea Warfare Communications																												
Under C-WOLF Requirements, Development, and Demonstration																												

Efforts in FY20 and out are funded under PE 0604280N Project 0742  
 Under C-WOLF - Undersea Communications with Optical Laser Frequencies

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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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Fiscal Year	2019				2020				2021				2022				2023				2024				2025			
	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
<b>Acquisition (OE-538 Inc 2) Milestones</b>			FRP DR ▲																									
<b>Testing</b>	OT ▲																											
<b>Contract/Deliveries</b>																												
OE-538A Antenna Contract Options			10 ▲																									
OE-538A RFDACS Contract Options			5 ▲																									

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

ACRONYMS:  
 FRP - Full Rate Production  
 DR - Decision Review  
 OT - Operational Test

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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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Fiscal Year	2019				2020				2021				2022				2023				2024				2025							
	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				
<b>Acquisition (SubHDR) Milestones</b>																																
<b>Performance Reliability, Maintainability &amp; Availability (RMA) Development</b>																																
<b>Component Development Mast Motion Sensor (MMS)</b>																																

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

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2021 Navy</b>															<b>Date: February 2020</b>				
<b>Appropriation/Budget Activity</b> 1319 / 5										<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization					<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System				

Fiscal Year	2019				2020				2021				2022				2023				2024				2025							
	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				
<b>Acquisition (ADVHDR)</b>																																
<b>Milestones</b>																																
Development and Integration of OCOMMS																																

Efforts in FY20 and out are funded under PE 0604280N Project 0742  
 OCOMMS - Optical Communications

**UNCLASSIFIED**

**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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Fiscal Year	2019				2020				2021				2022				2023				2024				2025			
	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)					Cybersecurity Hardening																							
OHIO and COLUMBIA Reliability Improvement Development					Radio Frequency and Depth Canisters																							
Tow Cable Equipment and Nests Procurement Contract Award			134																									

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

Additional details available at higher classification

**UNCLASSIFIED**

**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System
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Fiscal Year	2019				2020				2021				2022				2023				2024				2025							
	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				
<b>Acquisition (Antenna Improvements) Milestones</b>																																
<b>Reliability, Maintainability &amp; Availability (RMA) Improvements</b>																																
<b>Component development (TRAAM)</b>																																

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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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0742 / Sub Integrated Ant System

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Proj 0742</b>				
Transition Engineering Concept Engineering and Future Fourth Generation Undersea Warfare Communications	1	2019	4	2019
Transition Engineering Under C-WOLF Requirements, Development, and Demonstration	1	2019	4	2019
OE-538A Full Rate Production Decision Review (FRP DR)	3	2019	3	2019
OE-538A Operational Test (OT)	1	2019	1	2019
OE-538A Antenna Contract Option Year 5	3	2019	3	2019
OE-538A RFDACS Contract Option Year 3	3	2019	3	2019
SubHDR Performance Reliability Component Development/Test	1	2019	4	2019
SubHDR Component Development Mast Motion Sensor (MMS)	1	2019	4	2019
AdvHDR Development and Integration of Optical Communications (OCOMMS)	1	2019	4	2019
TBA (AN/BRR-6/6B) reliability improvement development: Cybersecurity Hardening	1	2019	4	2019
TBA (AN/BRR-6/6B) reliability improvement development: Radio Frequency and Depth Canisters	1	2019	4	2019
TBA (AN/BRR-6/6B) Buoy Shape Improvements	1	2019	4	2019
TBA (AN/BRR-6/6B) Tow Cable Equipment & Nests Procurement Contract Award	3	2019	3	2019
Antenna Improvements Reliability, Maintainability & Availability (RMA) Development	1	2019	4	2019
Antenna Improvemnts Component development (TRAAM)	1	2019	4	2019

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 1319 / 5					<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization				<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
0775: Submarine Supt Equip Prog	36.815	24.796	21.235	30.115	-	30.115	31.999	33.379	32.808	33.467	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

FY21 funding increases for two efforts to support Electronic Warfare development to pace the expanding threat posed in this area of warfare. First, funding for development of AN/BLQ-10 Technical Insertions (TI) and Advanced Processor Build (APB) is increased by \$6.3M to support new technology development and incorporation including a new Communications Acquisition and Direction Finding capability on the SSN 21 and 688 class ships and integrating advanced payloads into the AN/BLQ-10 system to provide for rapid expansion of capabilities and expanding the submarine ability to control the RF spectrum. These efforts to incorporate new technologies such as payloads will be ongoing. Level funding will support development of a digital server-based wide band capability that will allow the AN/BLQ-10 to meet probability of intercept requirements, meet recording requirements and improve the capability of on-board training to improve operator efficiency. Secondly, development of a PATRIOT Phase C RADAR increases funding by \$2.6M to improve the capability and stealth of this critical technology which provides operational commanders covert RADAR capabilities but requires a refreshed design to counter current counter-detection threats.

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 a Tier 1 modernization requirement by the Submarine Tactical Requirements Group (STRG).

- 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.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy	<b>Date:</b> February 2020
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<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog
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- PATRIOT Phase C RADAR improves upon the PATRIOT by updating components for obsolescence, reducing adversary detectability, and improving reliability. PATRIOT RADAR provides a covert RADAR capability for submarines when submerged.

- APB-21 continues to bring new capabilities to the AN/BLQ-10 system: Voice to Text, improved Direction Finding for Photonics Masts, EW contact followers, and passive ranging techniques.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p><b>Title:</b> Submarine Support Equipment Program</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2020 Plans:</b></p> <ul style="list-style-type: none"> <li>-- Continue TI-20 development, design, integration, configuration, architecture documentation and software design.</li> <li>-- Complete APB-19 development.</li> <li>-- Finalize plans for APB-21 and commence development.</li> <li>-- Conduct operational evaluation of Electronic Warfare Tactical Upgrade (EWTU).</li> <li>-- 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.</li> <li>-- Coordinate with ONR and NUWC Newport to develop FNC capabilities to a high technology readiness level and transition to EW systems as appropriate.</li> <li>-- Develop advanced technology demonstrations for feasibility of systems capable of meeting later increments of AN/BLQ-10 for performance and digital data delivery.</li> </ul> <p><b>FY 2021 Base Plans:</b></p> <ul style="list-style-type: none"> <li>-- In the SWFTS TI/APB model, develop a CADF capability for incorporation into the AN/BLQ-10 system to enhance the capabilities of the SSN 688 and 21 class ships.</li> <li>-- Initiate development of the PATRIOT Phase C RADAR.</li> <li>-- Commence TI-22 development, design, integration, configuration, architecture documentation and software design.</li> <li>-- Complete TI-20 development and laboratory testing.</li> <li>-- Continue APB-21 development.</li> <li>-- Complete APB-19 integration into TI-20.</li> </ul>	24.796	21.235	30.115	0.000	30.115
	-	-	-	-	-

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
-- 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. -- 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  <b>FY 2021 OCO Plans:</b> N/A  <b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding increases by \$8.880M from FY 2020 to FY 2021 to continue development of EW capabilities on the SWFTS model and initiate the development of the PATRIOT Phase C RADAR. The 688 and 21 class ships require upgrades to the Communications Acquisition and Direction Finding system similar to the VA class is receiving in VA new construction for Block V. Failing to provide this upgrade will increase sustainment costs of the current system and provide a less capable system to the Fleet. The PATRIOT RADAR provides the submarine a covert RADAR capability while submerged. PATRIOT Phase A is deployed on LOS ANGELES, SEAWOLF, and SSGN class platforms and faces obsolescence issues and is susceptible to counter-detection. PATRIOT Phase C will increase the operational capability of submarines in high contact density environments.					
<b>Accomplishments/Planned Programs Subtotals</b>	24.796	21.235	30.115	0.000	30.115

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• SCN/2013: VIRGINIA Class Submarine	54.121	61.277	59.436	-	59.436	60.623	61.836	63.073	64.334	Continuing	Continuing
• RDT&E/0604558N: New Design SSN	1.250	1.160	1.250	-	1.250	1.350	1.500	1.620	1.730	Continuing	Continuing
• RDT&E/0603562N/0770: Adv Sub Supp Equip Prog	4.264	4.557	4.773	-	4.773	4.810	4.890	4.980	5.077	Continuing	Continuing
• OPN/0840: Sub Periscope, Imaging and Supt Equip Prog	179.293	160.803	204.806	-	204.806	269.548	308.122	290.661	302.296	Continuing	Continuing
• RDT&E/0603595N: SSBN New Design	0.350	0.798	2.100	-	2.100	2.142	2.184	2.228	2.273	Continuing	Continuing

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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**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-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog
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<b>Product Development (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Hardware and Software Development	Various	Various : Various	3.823	1.349	Oct 2018	0.679	Oct 2019	0.693	Oct 2020	-		0.693	Continuing	Continuing	Continuing
Hardware and Software Development	WR	NUWC : Newport, RI	18.053	1.451	Oct 2018	0.782	Oct 2019	0.797	Oct 2020	-		0.797	Continuing	Continuing	Continuing
H/W and S/W Development MMM Payload	C/FFP	SEACORP : Newport, RI	3.000	3.570	Oct 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
H/W and S/W Development EW TI/APB	C/CPIF	Lockheed Martin : Syracuse, NY	0.000	16.061	Feb 2019	17.884	Oct 2019	24.096	Oct 2020	-		24.096	Continuing	Continuing	Continuing
PATRIOT Phase C Development	WR	NAWC : China Lake, CA	0.000	0.000		0.000		2.600	Oct 2020	-		2.600	Continuing	Continuing	Continuing
<b>Subtotal</b>			24.876	22.431		19.345		28.186		-		28.186	Continuing	Continuing	N/A

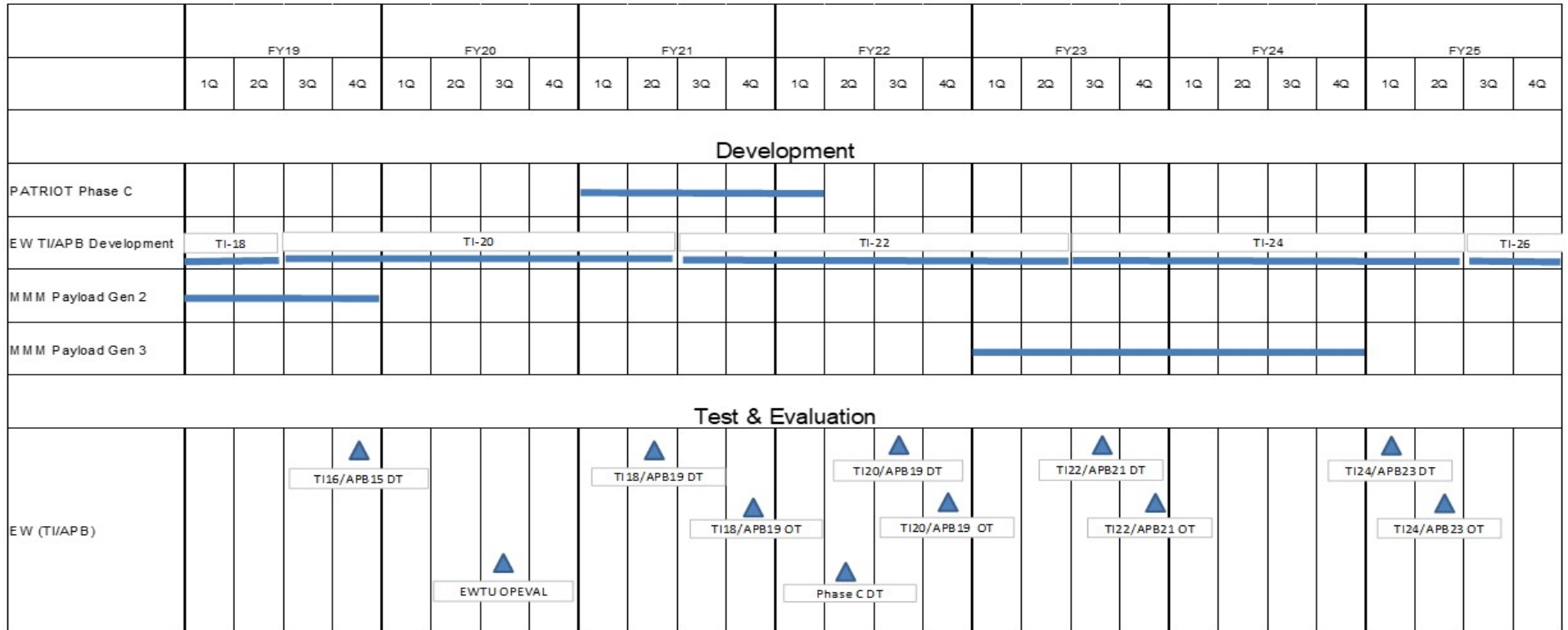
<b>Test and Evaluation (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Test Support	WR	COTF : Norfolk, VA	1.064	0.320	Oct 2018	0.330	Oct 2019	0.337	Oct 2020	-		0.337	Continuing	Continuing	Continuing
Systems Engineering & Test Support	WR	NUWC : Newport, RI	10.875	2.045	Oct 2018	1.560	Oct 2019	1.592	Oct 2020	-		1.592	Continuing	Continuing	Continuing
<b>Subtotal</b>			11.939	2.365		1.890		1.929		-		1.929	Continuing	Continuing	N/A

<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>		36.815	24.796	21.235	30.115	-	30.115	Continuing

**Remarks**

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2021 Navy</b>															<b>Date: February 2020</b>				
<b>Appropriation/Budget Activity</b> 1319 / 5										<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization					<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog				



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<b>Exhibit R-4A, RDT&amp;E Schedule Details: PB 2021 Navy</b>		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 0775 / Submarine Supt Equip Prog

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Proj 0775</b>				
Developments: PATRIOT Phase C:	1	2021	1	2022
Developments: EW TI/APB Development: EW TI/APB Development: TI-18	1	2019	2	2019
Developments: EW TI/APB Development: EW TI/APB Development: TI-20	3	2019	2	2021
Developments: EW TI/APB Development: EW TI/APB Development: TI-22	3	2021	2	2023
Developments: EW TI/APB Development: EW TI/APB Development: TI-24	3	2023	2	2025
Developments: EW TI/APB Development: EW TI/APB Development: TI-26	3	2025	4	2025
Developments: MMM Payload Gen 2:	1	2019	4	2019
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	2021	2	2021
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
Test and Evaluation: TI-24/APB-23: Developmental Testing	1	2025	1	2025
Test and Evaluation: TI-24/APB-23: Operational Testing	2	2025	2	2025
Test and Evaluation: EWTU OPEVAL	3	2020	3	2020
Test and Evaluation: PATRIOT Phase C Developmental Testing	2	2022	2	2022

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 1319 / 5					<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization				<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
1411: <i>Sub Tact Comm System</i>	242.780	15.712	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	258.492
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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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy			<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System				
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>						
		<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
<b>Title:</b> Common Submarine Radio Room (CSRR)	<b>Articles:</b>	10.617	0.000	0.000	0.000	0.000
		-	-	-	-	-
<b>FY 2020 Plans:</b> FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation						
<b>FY 2021 Base Plans:</b> FY21 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation						
<b>FY 2021 OCO Plans:</b> N/A						
<b>Title:</b> Undersea Assured Command & Control (UAC2)	<b>Articles:</b>	1.103	0.000	0.000	0.000	0.000
		-	-	-	-	-
<b>FY 2020 Plans:</b> FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation						
<b>FY 2021 Base Plans:</b> N/A						
<b>FY 2021 OCO Plans:</b> N/A						
<b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> N/A						
<b>Title:</b> Link 16	<b>Articles:</b>	3.402	0.000	0.000	0.000	0.000
		-	-	-	-	-
<b>FY 2020 Plans:</b> FY20 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation						
<b>FY 2021 Base Plans:</b> FY21 funding has been realigned to PE 0604280N Project 1411 as part of PE Consolidation						
<b>FY 2021 OCO Plans:</b> N/A						
<b>Title:</b> S3S		0.590	0.000	0.000	0.000	0.000

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
<i>Articles:</i>	-	-	-	-	-
<b>Description:</b> Detailed information available at a higher classification.					
<b>FY 2020 Plans:</b> N/A					
<b>FY 2021 Base Plans:</b> N/A					
<b>FY 2021 OCO Plans:</b> N/A					
<b>Accomplishments/Planned Programs Subtotals</b>	15.712	0.000	0.000	0.000	0.000

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• OPN/3130: Submarine Communication Equipment	71.190	60.794	62.214	-	62.214	73.899	73.227	74.121	75.594	Continuing	Continuing
• 0604280N/1411: Submarine Tactical Communication System	0.000	14.175	14.374	-	14.374	14.874	14.574	15.140	15.444	Continuing	Continuing

**Remarks**

**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).

-S3S: Detailed information available at a higher classification.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Multi-Purpose Reconfigurable Training System (MRTS) Development (CSRR)	WR	NIWC LANT : Charleston, SC	6.461	1.387	Dec 2018	0.000		0.000		-		0.000	0.000	7.848	-
Systems Eng/Design Increment 1 (CSRR)	WR	NUWC : Newport, RI	22.598	4.676	Dec 2018	0.000		0.000		-		0.000	0.000	27.274	-
Site Platform Integration/ Certification (CSRR)	WR	NUWC : Newport, RI	13.467	0.263	Dec 2018	0.000		0.000		-		0.000	0.000	13.730	-
Software Development (CSRR)	Various	Available at higher classification : Available at higher classification	13.176	1.757	Dec 2018	0.000		0.000		-		0.000	0.000	14.933	-
Systems Eng/Integration (UAC2)	WR	NUWC : Newport, RI	1.560	0.130	Nov 2018	0.000		0.000		-		0.000	0.000	1.690	-
Design (UAC2)	WR	NIWC PAC : San Diego, CA	0.200	0.000	Nov 2018	0.000		0.000		-		0.000	0.000	0.200	-
Hardware Development (Link 16)	C/CPFF	Various : Various	0.000	0.500	Apr 2019	0.000		0.000		-		0.000	0.000	0.500	-
Systems Engineering (Link 16)	WR	NUWC : Newport, RI	0.497	1.273	Nov 2018	0.000		0.000		-		0.000	0.000	1.770	-
Site Platform integration/ Certification (Link 16)	WR	NUWC : Newport, RI	0.353	0.930	Nov 2018	0.000		0.000		-		0.000	0.000	1.283	-
Software Development (Link 16)	C/CPFF	TBD : TBD	0.000	0.421	Aug 2019	0.000		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	-
S3S Platform Integration	MIPR	Army/TSMO : Redstone Arsenal, AL	0.000	0.590	Sep 2019	0.000		0.000		-		0.000	0.000	0.590	-
<b>Subtotal</b>			182.467	11.927		0.000		0.000		-		0.000	0.000	194.394	N/A

**Remarks**  
FY20 and outyears cost data is provided under PE 0604280N Project 1411

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System
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<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Integrated Logistics Support (CSRR)	WR	NUWC : Newport, RI	4.438	0.296	Nov 2018	0.000		0.000		-		0.000	0.000	4.734	-
Software Engineering (CSRR)	WR	NIWC PAC : San Diego, CA	4.291	0.155	Nov 2018	0.000		0.000		-		0.000	0.000	4.446	-
Information Security/ Cyber Security (INFOSEC) Certification/Supply Chain Risk Management (SCRM) Assessment (CSRR)	Various	NIWC PAC/NIWC LANT/NUWC : San Diego, CA/ Charleston, SC/ Newport, RI/San Diego	26.774	1.346	Nov 2018	0.000		0.000		-		0.000	0.000	28.120	-
Integrated Logistics Support (UAC2)	WR	NUWC : Newport, RI	0.000	0.250	Nov 2018	0.000		0.000		-		0.000	0.000	0.250	-
Trade Study (UAC2)	Various	Available at higher classification : Available at higher classification	0.075	0.500	Nov 2018	0.000		0.000		-		0.000	0.000	0.575	-
Integrated Logistics Support (Link 16)	WR	NUWC : Newport, RI	0.000	0.050	Nov 2018	0.000		0.000		-		0.000	0.000	0.050	-
Software Engineering (Link 16)	WR	NIWC PAC : San Diego, CA	0.000	0.045	Nov 2018	0.000		0.000		-		0.000	0.000	0.045	-
<b>Subtotal</b>			35.578	2.642		0.000		0.000		-		0.000	0.000	38.220	N/A

**Remarks**  
FY20 and outyears cost data is provided under PE 0604280N Project 1411

<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental/ Operational Test and Evaluation (T&E) (CSRR)	WR	COTF, JITC : Various	11.345	0.090	Nov 2018	0.000		0.000		-		0.000	0.000	11.435	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System
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<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test and Evaluation (T&E) (UAC2)	WR	COTF, JITC : Various	0.461	0.023	Nov 2018	0.000		0.000		-		0.000	0.000	0.484	-
Developmental/Operational Test and Evaluation (T&E) (Link 16)	WR	COTF, JITC : Various	0.000	0.030	Nov 2018	0.000		0.000		-		0.000	0.000	0.030	-
<b>Subtotal</b>			11.806	0.143		0.000		0.000		-		0.000	0.000	11.949	N/A

**Remarks**  
FY20 and outyears cost data is provided under PE 0604280N Project 1411

<b>Management Services (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support (CSRR)	Various	Available at higher classification : Available at higher classification	12.610	0.647	Nov 2018	0.000		0.000		-		0.000	0.000	13.257	-
Program Management Support (UAC2)	Various	Available at higher classification : Available at higher classification	0.200	0.200	Nov 2018	0.000		0.000		-		0.000	0.000	0.400	-
Program Management Support (Link 16)	Various	Available at higher classification : Available at higher classification	0.119	0.153	Nov 2018	0.000		0.000		-		0.000	0.000	0.272	-
<b>Subtotal</b>			12.929	1.000		0.000		0.000		-		0.000	0.000	13.929	N/A

**Remarks**  
FY20 and outyears cost data is provided under PE 0604280N Project 1411

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Navy</b>								<b>Date:</b> February 2020				
<b>Appropriation/Budget Activity</b> 1319 / 5				<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization				<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System				
	<b>Prior Years</b>	<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>	242.780	15.712		0.000		0.000	-		0.000	0.000	258.492	N/A

**Remarks**  
 FY20 and outyears cost data is provided under PE 0604280N Project 1411


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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System
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**CSRR Program Schedule (PB 21)**

Fiscal Year	2019				2020				2021				2022				2023				2024				2025							
	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				
<b>Acquisition Milestones (CSRR)</b>																																
<b>System Development</b>	Inc1V4 Development Phase																															
<b>Technical Reviews</b>																																
<b>Contracts</b> C&M Software Development/Implementation																																
<b>Procurement &amp; Installations (Increment 1)</b>	Inc1V3 Procurements and Installations																															
	Inc1V4 Procurements and Installations																															
Procurement Inc 1 mod kits <sup>(1)</sup>	3	▲																														
Installation Inc 1 mod kits <sup>(2)</sup>	5	▲																														
Support Facility: Turnkey Installations																																

<p><sup>(1)</sup> Due to Fleet rescheduling of availability periods, some procurements have been rescheduled.</p> <p><sup>(2)</sup> Due to Fleet rescheduling of availability periods, some installations have been rescheduled.</p>		<p><b>Legend</b></p> <p>△ Scheduled Event</p> <p>▲ Completed Event</p> <p>▒ Ongoing/Future Event</p> <p>■ Completed Phase of Ongoing Event</p>	<p><b>Acronyms</b></p> <p>Inc Increment</p> <p>V Version</p> <p>CDR Critical Design Review</p> <p>C&amp;M Control &amp; Management</p>
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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System
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**UAC2 Program Schedule (PB21)**

Fiscal Year	2019				2020				2021				2022				2023				2024				2025							
	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				
<b>Procurement &amp; Installations (UAC2)</b>  Solution 1																																
<b>Procurement</b>	28		▲																													
<b>Installation</b>	26		▲																													
<b>Shore/Lab Installation <sup>(1)</sup></b>	2		▲																													

**Notes:**  
 (1) Installation cost included in procurement (Turnkey) for two (2) 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 2021 Navy** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System
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**Link 16 Program Schedule (PB21)**

Fiscal Year	2019				2020				2021				2022				2023				2024				2025			
	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
<b>System Development (Link 16)</b>																												
<b>Contracts</b>			▲ Contract Award																									
<b>Procurement &amp; Installations</b>																												
<b>Procurements</b>	12	▲																										
<b>Installations</b>																												

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

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Navy		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604503N / SSN-688 & Trident Modernization	<b>Project (Number/Name)</b> 1411 / Sub Tact Comm System

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Proj 1411</b>				
Technical Reviews (Increment 1 Version 4 Critical Design Review (CDR))	2	2019	2	2019
System Development (Increment 1 Version 4)	1	2019	4	2019
Contracts (Software-Follow-on to include planning)	1	2019	4	2019
Procurement/Installation (Increment 1 Version 3 Modernization Kits)	1	2019	4	2019
Procurement/Installation (Increment 1 Version 4 Modernization Kits)	1	2019	4	2019
Procurement/Installation (UAC2) Solution 1)	1	2019	4	2019
System Development (Link 16)	1	2019	4	2019
Procurement (Link 16)	3	2019	4	2019