

# UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604562N / Submarine Tactical Warfare System							
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	591.315	50.069	50.850	60.824	-	60.824	63.853	65.186	66.491	67.876	Continuing	Continuing
0236: SSN Comb Cont Sys Imprvmnt (ENG)	582.143	41.365	50.850	60.824	-	60.824	63.853	65.186	66.491	67.876	Continuing	Continuing
9999: Congressional Adds	9.172	8.704	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.876

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

Project Unit 0236: This program develops Commercial-Off-The-Shelf (COTS) based software and hardware upgrades to integrate improved tactical and weapons control capabilities for multiple submarine Classes (SSN-688, SSGN, SEAWOLF, SSBN and VIRGINIA (Post Shakedown Availability)). The AN/BYG-1 is the combat control system common across submarine platforms which incorporates tactical control, payload control, and tactical Local Area Network (LAN) functions into a single development program. AN/BYG-1 allows the submarine to rapidly update the ship safety tactical picture, integrate the common tactical picture into the battlegroup, improve torpedo interfaces, and provide Tactical TOMAHAWK (TOMAHAWK Block IV) capability. The hardware upgrades, Technology Insertions (TI) are developed on a biennial basis to provide improved capability and address COTS obsolescence. Funding also accommodates the biennial integration of software Advanced Processing Builds (APB) for both tactical control (APB(T)) and payload control (APB(P)) subsystems. The tactical control integration effort incorporates the integration of other sensor (ESM, sonar, radar, etc.) inputs to provide a common operational picture and improved situational awareness in an information assurance (IA) compliant environment.

The Weapons Control development effort is winding down with pending completion of TI-16 APB15. The Payload Control System upgrade provides a modernized PCS open architecture to support future payloads and integrate a common unmanned system controller. Advanced Weapons Enhanced by Submarine Unmanned Aerial System Against Mobile Targets (AWESUM), Joint Capability Technical Demonstration (JCTD), Experimental Fuel Cell (XFC), Unmanned Ariel System integration and transition to production.

Provides funding for the development of Payloads Launch System, Multi-tube Weapons System (MTWS), Information Assurance (IA) system, Onboard Team Trainer (OBTT), and Command, Control, Computer and Intelligence Maintenance Tool (C3IMT). FY 18 adds development of a Common Infrastructure Services (CIS) subsystem. This involves integration of Onboard Team Trainer - Master Controller (OBTT - MC) & Command, Control, Computer and Intelligence Maintenance Tool (C3IMT)/Inter-Subsystem Monitoring Tool (ISMT) efforts as well as other common services within SWFTS. CIS will be an independent subsystem with its own software development and testing efforts, requiring additional funding to complete product delivery to platforms.

FY18 integrates additional Tactical Data Link (TDL) capabilities for Command & Control situational awareness. FY18 also provides additional R&D effort for payload integration to support MK48, APB 5+, APB 6 effort.

FY19 provides funding to commence development of APB 19 which will add two new software baselines in support of VA BLK IV Virginia Pay Module (VPM) and the COLUMBIA class. Cyber security efforts continue to grow due increasing interconnection complexity, more IP based traffic in future baselines, and development of

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<b>Appropriation/Budget Activity</b> 1319: <i>Research, Development, Test &amp; Evaluation, Navy I BA 5: System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604562N / <i>Submarine Tactical Warfare System</i>
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Cyber Safe Controls. Common Infrastructure Services (CIS) development efforts begin under a new contract for APB 19 and continue on APB 17 under the current Tactical Control System contract. As additional software applications are migrated to CIS additional funding of this effort is required. Additional funding for early integration efforts for submarine payloads including Contender, Maritime Strike Tomahawk (MST), Next Generation Countermeasure, Anti-Torpedo Torpedo Compact Rapid Attack Weapons program (ATT CRAW) is also included in the FY 19 funding.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>
Previous President's Budget	43.160	50.850	62.064	-	62.064
Current President's Budget	50.069	50.850	60.824	-	60.824
Total Adjustments	6.909	0.000	-1.240	-	-1.240
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.247	0.000			
• SBIR/STTR Transfer	-1.844	0.000			
• Program Adjustments	0.000	0.000	-0.485	-	-0.485
• Rate/Misc Adjustments	0.000	0.000	-0.755	-	-0.755
• Congressional Add Adjustments	9.000	-	-	-	-

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

**Project:** 9999: *Congressional Adds*

Congressional Add: *Combat and Weapons Systems Modernization*

Congressional Add Subtotals for Project: 9999

Congressional Add Totals for all Projects

<b>FY 2017</b>	<b>FY 2018</b>
8.704	0.000
8.704	0.000
8.704	0.000

**Change Summary Explanation**

The FY 2019 funding request was reduced by \$0.485 million to reflect the Department of Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.

Details on funding increase/decrease from FY18 to FY19 totaling to +\$10 million are contained in each sub-project.

FY19 provides funding to commence development of APB 19 which will add two new software baselines in support of Virginia Block V Virginia Pay Module (VPM) and the COLUMBIA class. Cyber security efforts continue to grow due to increasing interconnection complexity, more IP based traffic in future baselines, and

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development of Cyber Safe Controls. Common Infrastructure Services (CIS) development efforts begin under a new contract for APB 19 and continue on APB 17 under the current Tactical Control System contract. As additional software applications are migrated to CIS additional funding of this effort is required. Additional funding for early integration efforts for submarine payloads including Contender, Maritime Strike Tomahawk (MST), Next Generation Countermeasure, Anti-Torpedo Torpedo Compact Rapid Attack Weapons program (ATT CRAW) is also included in the FY 19 funding.		

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Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604562N / Submarine Tactical Warfare System				Project (Number/Name) 0236 / SSN Comb Cont Sys Imprvmnt (ENG)			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0236: SSN Comb Cont Sys Imprvmnt (ENG)	582.143	41.365	50.850	60.824	-	60.824	63.853	65.186	66.491	67.876	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

## A. Mission Description and Budget Item Justification

Project Unit 0236: This program develops Commercial-Off-The-Shelf (COTS) based software and hardware upgrades to integrate improved tactical and weapons control capabilities for multiple submarine Classes (SSN-688, SSGN, SEAWOLF, SSBN and VIRGINIA (Post Shakedown Availability)). The AN/BYG-1 is the combat control system common across submarine platforms which incorporates tactical control, payload control, and tactical Local Area Network (LAN) functions into a single development program. AN/BYG-1 allows the submarine to rapidly update the ship safety tactical picture, integrate the common tactical picture into the battlegroup, improve torpedo interfaces, and provide Tactical TOMAHAWK (TOMAHAWK Block IV) capability. The hardware upgrades, Technology Insertions (TI) are developed on a biennial basis to provide improved capability and address COTS obsolescence. Funding also accommodates the biennial integration of software Advanced Processing Builds (APB) for both tactical control (APB(T)) and payload control (APB(P)) subsystems. The tactical control integration effort incorporates the integration of other sensor (ESM, sonar, radar, etc.) inputs to provide a common operational picture and improved situational awareness in an information assurance (IA) compliant environment.

The Weapons Control development effort is winding down with pending completion of TI-16 APB15. The Payload Control System upgrade provides a modernized PCS open architecture to support future payloads and integrate a common unmanned system controller. Advanced Weapons Enhanced by Submarine Unmanned Aerial System Against Mobile Targets (AWESUM), Joint Capability Technical Demonstration (JCTD), Experimental Fuel Cell (XFC), Unmanned Ariel System integration and transition to production.

Provides funding for the development of Payloads Launch System, Multi-tube Weapons System (MTWS), Information Assurance (IA) system, Onboard Team Trainer (OBTT), and Command, Control, Computer and Intelligence Maintenance Tool (C3IMT). FY 18 adds development of a Common Infrastructure Services (CIS) subsystem. This involves integration of Onboard Team Trainer - Master Controller (OBTT - MC) & Command, Control, Computer and Intelligence Maintenance Tool (C3IMT)/Inter-Subsystem Monitoring Tool (ISMT) efforts as well as other common services within SWFTS. CIS will be an independent subsystem with its own software development and testing efforts, requiring additional funding to complete product delivery to platforms.

FY18 integrates additional Tactical Data Link (TDL) capabilities for Command & Control situational awareness. FY18 also provides additional R&D effort for payload integration to support MK48, APB 5+, APB 6 efforts and early integration efforts for submarine payloads including Contender, Maritime Strike Tomahawk (MST), Next Generation Countermeasure, Anti-Torpedo Torpedo Compact Rapid Attack Weapons program (ATT CRAW) as well as development of CyberSafe Controls.

FY19 provides funding to commence development of APB 19 which will add two new software baselines in support of VA BLK IV Virginia Pay Module (VPM) and the COLUMBIA class. Cyber security efforts continue to grow due increasing interconnection complexity, more IP based traffic in future baselines, and development of Cyber Safe Controls. Common Infrastructure Services (CIS) development efforts begin under a new contract for APB 19 and continue on APB 17 under the current

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Tactical Control System contract. As additional software applications are migrated to CIS additional funding of this effort is required. Additional funding for early integration efforts for submarine payloads including Contender, Maritime Strike Tomahawk (MST), Next Generation Countermeasure, Anti-Torpedo Torpedo Compact Rapid Attack Weapons program (ATT CRAW) is also included in the FY 19 funding.								
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)				FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<b>Title:</b> Advanced Processing Builds  <b>Articles:</b>				15.461	19.245	20.282	0.000	20.282
				-	-	-	-	-
				<b>FY 2018 Plans:</b> Complete development of APB-17 into AN/BYG-1 (TI-16) baseline. Support development of APB-19 into AN/BYG-1 baseline (TI-18).  Included in the APB effort for FY 18 is the addition of the SSBN software baseline needed for the conversion of the SSBN Combat Control System from legacy to the TI/APB model. FY 18 also adds development of a Common Infrastructure Services (CIS) subsystem.  <b>FY 2019 Base Plans:</b> Begin development of APB-17 into AN/BYG-1 (TI-18) baseline. Continue development of APB-19 into AN/BYG-1 (TI-18)baseline. Adds 2 new software baselines in APB19 (VPM & Columbia).  <b>FY 2019 OCO Plans:</b> N/A  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> Increased effort to add VCS VPM and Columbia software baselines				
<b>Title:</b> AN/BYG-1 TI-20  <b>Articles:</b>				0.000	0.000	5.737	0.000	5.737
				-	-	-	-	-
				<b>FY 2018 Plans:</b> N/A  <b>FY 2019 Base Plans:</b> Begin development, integration and test of the next generation AN/BYG-1 (TI-20) for SSN VA Class and COLUMBIA SSBN submarines to include Common Weapons Launcher (CWL) modernization development.  <b>FY 2019 OCO Plans:</b> N/A  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b>				

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Increase due to first year of TI-20 effort.						
Title: AN/BYG-1 TI-16  Articles:  FY 2018 Plans: Complete development, integration and test of the next generation AN/BYG-1 (TI-16) for SSN SEAWOLF/SSBN/VA Class submarines.  FY 2019 Base Plans: N/A  FY 2019 OCO Plans: N/A  FY 2018 to FY 2019 Increase/Decrease Statement: TI-16 efforts complete.		6.782 -	3.996 -	0.000 -	0.000 -	0.000 -
Title: AN/BYG-1 TI-18  Articles:  FY 2018 Plans: Continue development, integration and test of the next generation AN/BYG-1 (TI-18) for SSN 688/SSGN/SSBN Class submarines.  FY 2019 Base Plans: Complete development, integration and test of the next generation AN/BYG-1 (TI-18) for SSN 688/SSGN/SSBN Class submarines.  FY 2019 OCO Plans: N/A  FY 2018 to FY 2019 Increase/Decrease Statement: Decrease from FY18 to FY19 is in accordance with planned program profile and is not due to a negative action against this effort.		4.570 -	8.178 -	7.707 -	0.000 -	7.707 -
Title: Payload Integration  Articles:  FY 2018 Plans:		0.000 -	1.777 -	5.947 -	0.000 -	5.947 -

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)				FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Software development efforts to support Mk 48 APB5+. This funding was included in sub project "Advanced Processing Builds" in the FY 18 budget. With the addition of multiple future payloads, the integration effort has been split out into its own subproject.  <b>FY 2019 Base Plans:</b> Continue software development efforts to support Mk 48 APB5+ efforts. Additional funding for early integration efforts for submarine payloads including MK 48 APB6, Contender, Maritime Strike Tomahawk (MST), Next Generation Countermeasure, and Anti-Torpedo Torpedo Compact Rapid Attack Weapons program (ATT CRAW).  <b>FY 2019 OCO Plans:</b> N/A  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> Additional funding for early integration efforts for submarine payloads including MK-48 APB6, Contender , Maritime Strike Tomahawk (MST), Next Generation Countermeasure, and Anti-Torpedo Torpedo Compact Rapid Attack Weapons program (ATT CRAW).								
<b>Title:</b> Testing  <b>Articles:</b>				3.987 -	3.113 -	3.176 -	0.000 -	3.176 -
<b>FY 2018 Plans:</b> Begin DT/OT for AN/BYG-1 APB-17 on SSN 688/SEAWOLF/SSBN/SSGN/VA Class submarines.  <b>FY 2019 Base Plans:</b> Continue DT/OT for AN/BYG-1 APB-17 on SSN 688/SEAWOLF/SSBN/SSGN/VA Class submarines.  <b>FY 2019 OCO Plans:</b> N/A  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> Increase is due to inflation.								
<b>Title:</b> Payload Control System Upgrade  <b>Articles:</b>				5.911 -	6.029 -	4.224 -	0.000 -	4.224 -
<b>FY 2018 Plans:</b>								

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Continue development to modernize the Payload Control System software code and architecture. An open system architecture supports more efficient future integration of payloads. FY18 is a ramp up in effort as APB 17 efforts ramp up. APB 17 will be the first baseline to include PCS in place of WCS. <b>FY 2019 Base Plans:</b> Complete development to modernize the Payload Control System software code and architecture. Contains additional efforts to integrate of a common UxV interface that will be delivered with APB 19. <b>FY 2019 OCO Plans:</b> N/A <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> Effort ramping down as rearchitecture completes and deployed in APB17. Recurring PCS efforts captured in APB subproject.						
<b>Title:</b> Information Assurance (IA)  <b>Articles:</b>		2.082 -	4.190 -	7.474 -	0.000 -	7.474 -
<b>FY 2018 Plans:</b> Develop integration of IA Toolkit and continue IA Certification Testing on BYG-1 TI-18.  FY18 growth supports the identification and development of CYBERSAFE controls including the development of Cyber Conditions of Readiness (X, Y, Z), the implementation of Risk Management Framework (RMF), the execution of Cybersecurity Vulnerability Assessments and the addition of new of SPAWAR IT/IA standards (host level protection, boundary protection, security information, event management and more). Continues growth of Cyber Security efforts in support of CyberSafe implementation, RMF continuous monitoring, and implementation of SPAWAR IA Technical Authority Board (TAB) standards. <b>FY 2019 Base Plans:</b> Complete development integration of IA Toolkit and continue IA Certification Testing on BYG-1 TI-18. Develop IA Toolkit and commence IA certification Testing on BYG-1 TI-20. Continue RMF accreditations for various systems. Cyber security efforts continue to grow due increasing interconnection complexity, more IP based traffic in future baselines, and implementation of Cyber Safe Controls. <b>FY 2019 OCO Plans:</b>						



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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A						
FY 2018 to FY 2019 Increase/Decrease Statement: Cyber security efforts continue to grow due increasing interconnection complexity, more IP based traffic in future baselines, and implementation of Cyber Safe Controls.						
Title: Unmanned Aerial System (UAS)  Articles:		2.572 -	2.622 -	1.147 -	0.000 -	1.147 -
FY 2018 Plans: Continue Unmanned Aerial System (UAS) development and integration efforts for 3 Submarine launched UAS (SLUAS). Begin development and integration efforts for 21 inch Submarine launched UAS (SLUAS).						
FY 2019 Base Plans: Continue Unmanned Aerial System (UAS) development and integration efforts for 3 and 21 inch Submarine launched UAS (SLUAS).						
FY 2019 OCO Plans: N/A						
FY 2018 to FY 2019 Increase/Decrease Statement: Reduced R&D as 3 inch UAS transitions to production phase.						
Title: Common Infrastructure Services (CIS)  Articles:		0.000 -	1.700 -	5.130 -	0.000 -	5.130 -
FY 2018 Plans: Initial funding for Common Infrastructure Services integrates Onboard Team Trainer - Master Controller (OBTT - MC) & Command, Control, Computer and Intelligence Maintenance Tool (C3IMT)/Inter-Subsystem Monitoring Tool (ISMT) efforts as well as other common services within SWFTS. CIS will be an independent subsystem with its own software development and testing efforts, requiring additional funding to complete product delivery to platforms. FY18 consists of one TI/APB baseline.						
FY 2019 Base Plans: Continue funding for Common Infrastructure Services integrates Onboard Team Trainer - Master Controller (OBTT - MC) & Command, Control, Computer and Intelligence Maintenance Tool (C3IMT)/Inter-Subsystem Monitoring Tool (ISMT) efforts as well as other common services within SWFTS. CIS will be an independent subsystem with its own software development and testing efforts, requiring additional funding to complete						

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<b>Appropriation/Budget Activity</b> 1319 / 5		<b>R-1 Program Element (Number/Name)</b> PE 0604562N / Submarine Tactical Warfare System		<b>Project (Number/Name)</b> 0236 / SSN Comb Cont Sys Imprvmnt (ENG)	

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>  product delivery to platforms. Common Information Subsystem (CIS) development efforts begin under a new contract for APB 19 and continue on APB 17 under the current Tactical Control System contract. As additional software applications are migrated to CIS additional funding of this effort is required.  <b>FY 2019 OCO Plans:</b> N/A  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> CIS consists of three TI/APB baselines in FY19 vice one TI/APB baseline in FY18. The increase in funding is directly attributable to the increase in the number of baselines.	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>
<b>Accomplishments/Planned Programs Subtotals</b>	41.365	50.850	60.824	0.000	60.824

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
	<u><b>FY 2017</b></u>	<u><b>FY 2018</b></u>	<u><b>FY 2019 Base</b></u>	<u><b>FY 2019 OCO</b></u>	<u><b>FY 2019 Total</b></u>	<u><b>FY 2020</b></u>	<u><b>FY 2021</b></u>	<u><b>FY 2022</b></u>	<u><b>FY 2023</b></u>	<u><b>Cost To Complete</b></u>	<u><b>Total Cost</b></u>
• OPN/5420: SSN Combat Control Systems	144.715	129.972	129.501	-	129.501	149.915	225.596	197.049	261.229	Continuing	Continuing
<b>Remarks</b> OPN BA4 Ordinance Support & Equipment. BLI 5420 SSN Combat Control Systems											
<b>D. Acquisition Strategy</b> This budget integrates APBs developed by the advanced development community. This program has been tailored in accordance with the new DoD5000 directive to incorporate annual MDA production reviews. Advanced Processing Builds (APB) products associated with AN/BYG-1 Release-To-Fleet 3Q 2017, 3Q 2019 and 3Q 2021.											
<b>E. Performance Metrics</b> AN/BYG-1 Submarine Combat and Payload Control System performance metrics for each Advanced Processor Build (APB) and Technology Insertion (TI) cycle are contained in the classified Capability Production Document (CPD) annex to the overarching system requirements as laid out in the Capabilities Development Document (CDD). Each APB cycle receives an updated CPD based on fleet required capabilities.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
AN/BYG-1 TECH INSERTION	C/CPIF	GENERAL DYNAMICS (GDAIS) : FAIR LAKES, VA	95.368	5.113	Oct 2016	6.645	Oct 2017	9.623	Oct 2018	-		9.623	Continuing	Continuing	Continuing
AN/BYG-1 TECH INSERTION	C/CPIF	GENERAL DYNAMICS (GDAIS) : PITTSFIELD, MA	41.333	0.661	Oct 2016	0.200	Oct 2017	0.000	Oct 2018	-		0.000	Continuing	Continuing	Continuing
AN/BYG-1 TECH INSERTION	C/CPIF	PROGENY (PCS) : MANASSAS, VA	1.616	2.027	Oct 2016	6.537	Oct 2017	9.594	Oct 2018	-		9.594	Continuing	Continuing	Continuing
GOVERNMENT ENGINEERING	WR	NUWC : NEWPORT, RI	83.551	1.427	Oct 2016	1.812	Oct 2017	3.848	Oct 2018	-		3.848	Continuing	Continuing	Continuing
INFORMATION ASSURANCE	C/CPAF	PROGENY : MANASSAS, VA	37.255	2.082	Oct 2016	4.190	Oct 2017	7.474	Oct 2018	-		7.474	Continuing	Continuing	Continuing
UNMANNED AERIAL SYSTEM	C/CPIF	GENERAL DYNAMICS : FAIR LAKES, VA	0.000	1.087	Oct 2016	0.432	Oct 2017	0.216	Oct 2018	-		0.216	Continuing	Continuing	Continuing
UNMANNED AERIAL SYSTEM	WR	NUWC : NEWPORT, RI	0.000	1.061	Oct 2016	1.082	Oct 2017	0.459	Oct 2018	-		0.459	Continuing	Continuing	Continuing
UNMANNED AERIAL SYSEM	C/CPIF	PROGENY (PCS) : MANASSAS, VA	0.000	0.424	Oct 2016	1.108	Oct 2017	0.472	Oct 2018	-		0.472	Continuing	Continuing	Continuing
Subtotal			259.123	13.882		22.006		31.686		-		31.686	Continuing	Continuing	N/A
Remarks															
Progeny, NUWC NPT, and General Dynamics AN/BYG-1 tech insertion funding amounts increase above inflation in FY19 due to the ramping up of payload integration, Common Infrastructure Services, and Tactical Data Link efforts. Progeny IA funding increases due to ramping up of Cybersafe initiatives.															
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
APB SOFTWARE INTEGRATION	C/CPIF	GENERAL DYNAMICS	81.413	7.300	Oct 2016	7.446	Oct 2017	7.594	Oct 2018	-		7.594	Continuing	Continuing	Continuing

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Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		(GDAIS) : FAIRLAKES, VA													
APB SOFTWARE INTEGRATION	C/CPIF	GENERAL DYNAMICS : PITTSFIELD, MA	27.250	0.600	Oct 2016	0.272	Oct 2017	0.000		-		0.000	Continuing	Continuing	Continuing
APB SOFTWARE INTEGRATION	WR	NUWC : NEWPORT, RI	54.162	4.672	Oct 2016	4.765	Oct 2017	4.860	Oct 2018	-		4.860	Continuing	Continuing	Continuing
APB SOFTWARE INTEGRATION	C/CPAF	LOCKHEED MARTIN (LM-MSS) : MANASSAS, VA	14.680	3.600	Oct 2016	3.672	Oct 2017	3.745	Oct 2018	-		3.745	Continuing	Continuing	Continuing
APB SOFTWARE INTEGRATION	C/CPFF	PROGENY (PCS) : MANASSAS, VA	0.870	4.208	Oct 2016	4.705	Oct 2017	4.799	Oct 2018	-		4.799	Continuing	Continuing	Continuing
SOFTWARE DEVELOPMENT	Various	VARIOUS : VARIOUS:Not Specified	51.875	2.283	Oct 2016	2.329	Oct 2017	2.375	Oct 2018	-		2.375	Continuing	Continuing	Continuing
Subtotal			230.250	22.663		23.189		23.373		-		23.373	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
DEVELOPMENT TEST & EVALUATION	WR	NUWC : NEWPORT, RI	37.113	0.949	Oct 2016	0.968	Oct 2017	0.987	Oct 2018	-		0.987	Continuing	Continuing	Continuing
TEST & EVALUATION	C/CPIF	GENERAL DYNAMICS : FAIRLAKES, VA	9.408	0.724	Oct 2016	0.739	Oct 2017	0.753	Oct 2018	-		0.753	Continuing	Continuing	Continuing
TEST & EVALUATION	C/CPIF	GENERAL DYNAMICS : PITTSFIELD, MA	3.512	0.724	Oct 2016	0.739	Oct 2017	0.753	Oct 2018	-		0.753	Continuing	Continuing	Continuing
TEST & EVALUATION	C/CPAF	PROGENY : MANASSAS, VA	1.839	0.474	Oct 2016	0.483	Oct 2017	0.492	Oct 2018	-		0.492	Continuing	Continuing	Continuing
OPERATIONAL TEST & EVALUATION	WR	COMOPTEVFOR : NORFOLK, VA	16.832	0.080	Oct 2016	0.820	Oct 2017	0.836	Oct 2018	-		0.836	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2019 Navy</b>													<b>Date:</b> February 2018		
<b>Appropriation/Budget Activity</b> 1319 / 5						<b>R-1 Program Element (Number/Name)</b> PE 0604562N / Submarine Tactical Warfare System				<b>Project (Number/Name)</b> 0236 / SSN Comb Cont Sys Imprvmnt (ENG)					
<b>Test and Evaluation (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</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>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Subtotal</b>			68.704	2.951		3.749		3.821		-		3.821	Continuing	Continuing	N/A
<b>Management Services (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</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>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
PROGRAM MANAGEMENT SUPPORT	C/CPFF	VARIOUS : VARIOUS:Not Specified	24.066	1.869	Oct 2016	1.906	Oct 2017	1.944	Oct 2018	-		1.944	Continuing	Continuing	Continuing
<b>Subtotal</b>			24.066	1.869		1.906		1.944		-		1.944	Continuing	Continuing	N/A
			<b>Prior Years</b>	<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>			582.143	41.365		50.850		60.824		-		60.824	Continuing	Continuing	N/A
<b>Remarks</b>															

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Exhibit R-4, RDT&amp;E Schedule Profile: PB 2019 Navy

Date: February 2018

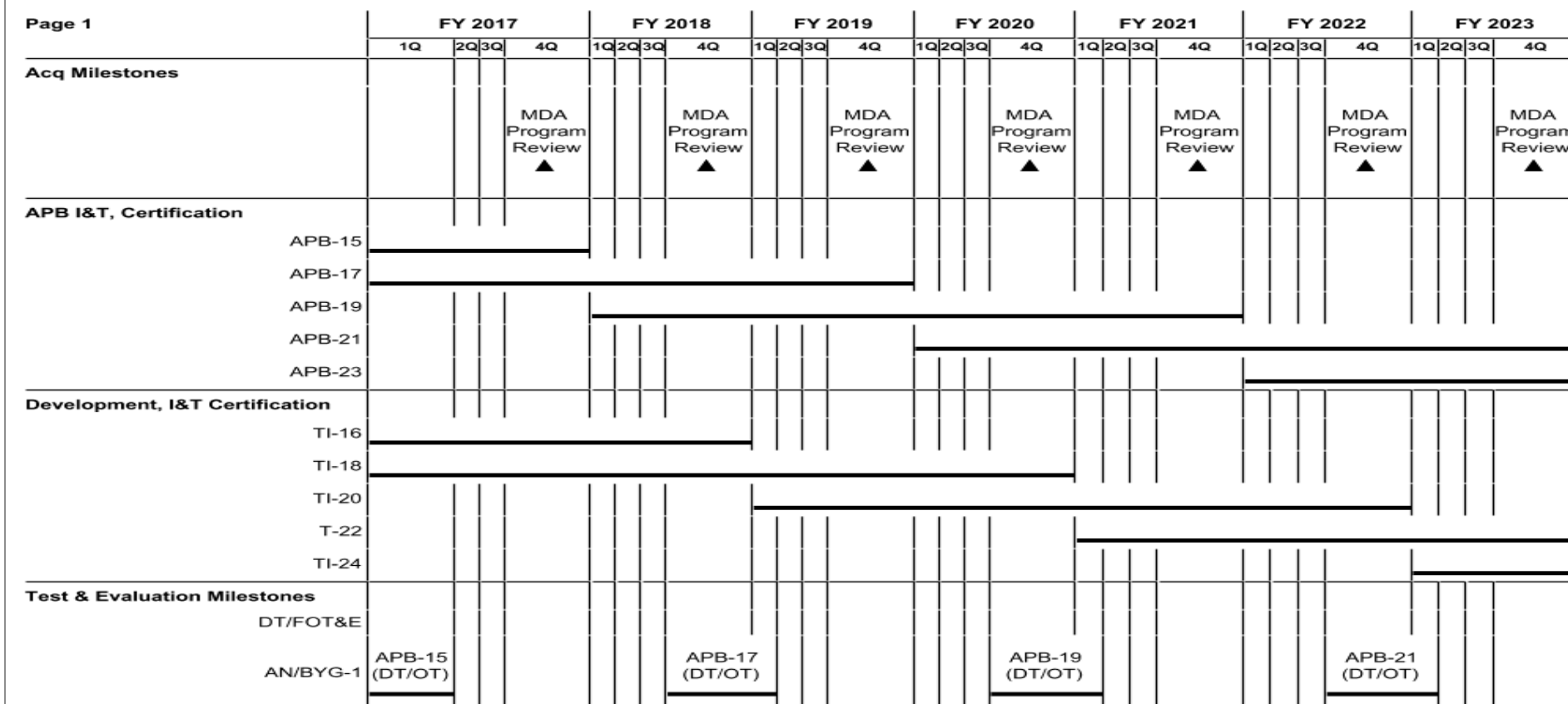
Appropriation/Budget Activity

1319 / 5

R-1 Program Element (Number/Name)

PE 0604562N / Submarine Tactical Warfare  
System

Project (Number/Name)

0236 / SSN Comb Cont Sys Imprvmt  
(ENG)

2019DON - 0604562N - 0236

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Exhibit R-4A, RDT&amp;E Schedule Details: PB 2019 Navy

Date: February 2018

## Appropriation/Budget Activity

1319 / 5

## R-1 Program Element (Number/Name)

PE 0604562N / Submarine Tactical Warfare System

## Project (Number/Name)

0236 / SSN Comb Cont Sys Imprvmnt (ENG)

## Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Page 1</b>				
Acq Milestones: Annual MDA Program Review - FY17	4	2017	4	2017
Acq Milestones: Annual MDA Program Review - FY18	4	2018	4	2018
Acq Milestones: Annual MDA Program Review - FY19	4	2019	4	2019
Acq Milestones: Annual MDA Program Review - FY20	4	2020	4	2020
Acq Milestones: Annual MDA Program Review - FY21	4	2021	4	2021
Acq Milestones: Annual MDA Program Review - FY22	4	2022	4	2022
Acq Milestones: Annual MDA Program Review - FY23	4	2023	4	2023
APB I&T, Certification: APB-15: APB-15	1	2017	4	2017
APB I&T, Certification: APB-17: APB-17	1	2017	4	2019
APB I&T, Certification: APB-19: APB-19	1	2018	4	2021
APB I&T, Certification: APB-21: APB-21	1	2020	4	2023
APB I&T, Certification: APB-23: APB-23	1	2022	4	2023
Development, I&T Certification: TI-16: TI-16	1	2017	4	2018
Development, I&T Certification: TI-18: TI-18	1	2017	4	2020
Development, I&T Certification: TI-20: TI-20	1	2019	4	2022
Development, I&T Certification: T-22: TI-22	1	2021	4	2023
Development, I&T Certification: TI-24: TI-24	1	2023	4	2023
Test & Evaluation Milestones: AN/BYG-1: APB-15 DT/OT	1	2017	1	2017
Test & Evaluation Milestones: AN/BYG-1: APB-17 DT/OT	4	2018	1	2019
Test & Evaluation Milestones: AN/BYG-1: APB-19 DT/OT	4	2020	1	2021
Test & Evaluation Milestones: AN/BYG-1: APB-21 DT/OT	4	2022	1	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604562N / Submarine Tactical Warfare System				Project (Number/Name) 9999 / Congressional Adds			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
9999: Congressional Adds	9.172	8.704	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.876
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
Project Unit 9999:												
FY17 congressional add provides funding to modernize Advanced Weapons Enhanced by Submarine Unmanned Aerial System Against Mobile Targets (AWESUM)												
Provides funding to continue Submarine Launched Unmanned Aerial Systems (SLUAS) development and that of the All Up Round (AUR) derived from the Office of Secretary Defense AWESUM Joint Capabilities Technology Demonstration (JCTD) in the efforts below. The AWESUM AUR is defined as the combination of the Blackwing UAV and the Hammerhead Cannister.												
Execute AUR reliability and manufacturing improvement plan:												
-Hammerhead canister and Blackwing UAV hardware and software improvements												
-Focus on reliability and manufacturing efficiencies to reduce unit cost												
-Establish and incorporate comprehensive test program												
-Maximize AUR modularity of design and growth potential for future capabilities												
-Perform select capability, performance and cyber compliance improvements												
-Explore AUR endurance improvement, shipboard transmission control and bandwidth management												
Perform schedule alignment with TI-18/APB-19.												
Increase UAS/BYG-1 interface security by improving encryption and achieving IA certification for unrestricted use.												
Perform BYG-1 and Controller Interface update.												
Procure one shipset of AURs for use on current SLUAS capable ship for training, CONOPS, and Techniques and Procedures (TTP) development. Resolve training issues with Type Commanders.												
Support the development of a common communications solution that enables employment of the SLUAS across multiple submarine platforms.												
Develop a Capabilities Production Document and Performance Specification in support of establishment of Program of Record.												
Procure Hardware in the Loop (HWIL) and Plane on a Board (POAB) simulators in support of training and BYG-1 integration and testing.												
Establish MISSIONALT for use on 688I's.												



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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2019 Navy		<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604562N / <i>Submarine Tactical Warfare System</i>	<b>Project (Number/Name)</b> 9999 / <i>Congressional Adds</i>
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		
	<b>FY 2017</b>	<b>FY 2018</b>
<b>Congressional Add:</b> Combat and Weapons Systems Modernization	8.704	0.000
<b>FY 2017 Accomplishments:</b> Continue development of the AWESUM AUR that derived from its JCTD, and initial fleet fielding of 2-3 SSN 688I submarines.		
<b>FY 2018 Plans:</b> N/A		
<b>Congressional Adds Subtotals</b>	8.704	0.000
<b>C. Other Program Funding Summary (\$ in Millions)</b>		
N/A		
<b>Remarks</b>		
<b>D. Acquisition Strategy</b>		
<p>Once developed, these modernization upgrades will be part of the TI/APB software baselines, utilizing the same Acquisition Strategy as the Tactical Warfare System. The program budget integrates APBs developed by the advanced development community.</p> <p>This program has been tailored in accordance with the new DoD5000 directive to incorporate annual MDA production reviews.</p> <p>Advanced Processing Builds (APB) products associated with AN/BYG-1 Release-To-Fleet 3Q 2017, 3Q 2019 and 3Q 2021.</p> <p>Near term: Continued refinement of the AWESUM AUR with improvements in reliability, maturity of design, IA compliance and compatibility with the Common Communications solution being developed with PMS 425 and SEA 073.</p> <p>Far term: Within Five years, leveraging the discovery from near term efforts and achieving actual feedback from fleet operations, the Program expects to go to submit a RFP to best produce the next generation of AUR development and system employment.</p> <p>SLUAS Controller modernization upgrades will be incorporated into the TI/APB software baselines, utilizing the same Acquisition Strategy as the Tactical Warfare System for BYG-1.</p> <p>This program has been tailored in accordance with the new DoD 5000 directive to incorporate annual MDA production reviews.</p>		
<b>E. Performance Metrics</b>		
<p>AN/BYG-1 Submarine Combat and Payload Control System performance metrics for each Advanced Processor Build (APB) and Technology Insertion (TI) cycle are contained in the classified Capability Production Document (CPD) annex to the overarching system requirements as laid out in the Capabilities Development Document (CDD). Each APB cycle receives an updated CPD based on Fleet required capabilities.</p> <p>In transition from the JCTD, initial Key Performance Parameters and Key Attributes are contained in the Functional Requirements Document, as established by COMSUBPAC and modified by OPNAV N97.</p> <p>In establishing the Program of Record, a Performance Specification and a Capability Production Document (CPD) are being developed.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604562N / <i>Submarine Tactical Warfare System</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
<p>AN/BYG-1 Submarine Combat and Payload Control System performance metrics for each Advanced Processor Build (APB) and Technology Insertion (TI) cycle are contained in the classified CPD annex to the overarching system requirements as laid out in the Capabilities Development Document (CDD). Each APB cycle receives an updated CPD based on Fleet required capabilities.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604562N / Submarine Tactical Warfare System				Project (Number/Name) 9999 / Congressional Adds					
Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Attack in a Minute	C/CPIF	General Dynamics : Pittsfield, MA	1.016	0.000		0.000		0.000		-		0.000	0.000	1.016	-
Cyber Security	C/CPAF	Progeny : Manassas, VA	1.750	0.000		0.000		0.000		-		0.000	0.000	1.750	-
WCS Code Modernization	C/CPIF	General Dynamics : Pittsfield, MA	1.056	0.000		0.000		0.000		-		0.000	0.000	1.056	-
APB5+	C/CPIF	General Dynamics : Pittsfield, MA	0.234	0.000		0.000		0.000		-		0.000	0.000	0.234	-
Common Infrastructure Services	C/CPIF	General Dynamics : Fairlakes, VA	1.800	0.000		0.000		0.000		-		0.000	0.000	1.800	-
Government Engineering	WR	NUWC : Newport, RI	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Combat System of the Future (CSOF)	Various	Various (Not specified) : Not Specified	1.300	0.000		0.000		0.000		-		0.000	0.000	1.300	-
Payload Control System (PCS)	C/CPAF	Progeny : Manassas, VA	1.422	0.000		0.000		0.000		-		0.000	0.000	1.422	-
Multi-Tube Weapon Simulator (MTWS)	C/CPFF	Progeny : Manassas, VA	0.144	0.000		0.000		0.000		-		0.000	0.000	0.144	-
Combat System Engineering	C/CPFF	Raytheon : Portsmouth, RI	0.250	0.000		0.000		0.000		-		0.000	0.000	0.250	-
UAV Development	Various	Defense Innovation Unit Experimental : Mountain View, CA	0.000	5.100	Mar 2018	0.000		0.000		-		0.000	0.000	5.100	-
Canister Development	Various	Sparton : DeLeon Springs, FL	0.000	1.600	Mar 2018	0.000		0.000		-		0.000	0.000	1.600	-
Government Engineering	WR	NUWC NPT : Newport, RI	0.000	2.004	Sep 2017	0.000		0.000		-		0.000	0.000	2.004	-
Subtotal			9.172	8.704		0.000		0.000		-		0.000	0.000	17.876	N/A
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			9.172	8.704		0.000		0.000		-		0.000	0.000	17.876	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy							Date: February 2018			
Appropriation/Budget Activity 1319 / 5			R-1 Program Element (Number/Name) PE 0604562N / Submarine Tactical Warfare System			Project (Number/Name) 9999 / Congressional Adds				
	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract	
Remarks										

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PE 0604562N: *Submarine Tactical Warfare System*  
Navy

R-1 Line #140

<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604562N / <i>Submarine Tactical Warfare System</i>
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<b>Project (Number/Name)</b>	9999 / Congressional Adds
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Page 1		FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Acquisition Milestones					■				■																				
APB I&T, Certification																													
	APB-17																												
Test and Evaluation Milestones																													
	DT/FOT&E																												
	AN/BYG-1																												

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Navy		<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 1319 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604562N / <i>Submarine Tactical Warfare System</i>	<b>Project (Number/Name)</b> 9999 / <i>Congressional Adds</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Page 1</b>				
Acquisition Milestones: Annual MDA Program Review - FY17	4	2017	4	2017
Acquisition Milestones: Annual MDA Program Review - FY18	4	2018	4	2018
APB I&T, Certification: APB-17: APB-17	1	2017	4	2018
Test and Evaluation Milestones: AN/BYG-1: APB-17 DT/OT	4	2017	4	2018