Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy											Date: February 2018	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604503N / *SSN-688 & Trident Modernization*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	1,501.188	120.261	130.981	126.932	-	126.932	110.805	102.958	103.720	111.116	Continuing	Continuing
0219: *Sub Sonar Improvement (ENG)*	961.731	65.194	86.718	67.030	-	67.030	61.575	60.651	61.507	62.781	Continuing	Continuing
0742: *Sub Integrated Ant System*	306.311	25.373	15.652	15.426	-	15.426	14.486	14.326	13.779	14.077	Continuing	Continuing
0775: *Submarine Supt Equip Prog*	14.615	13.118	9.117	28.408	-	28.408	15.206	14.906	13.985	14.272	Continuing	Continuing
1411: *Sub Tact Comm System*	218.531	9.806	19.494	16.068	-	16.068	19.538	13.075	14.449	19.986	Continuing	Continuing
9999: *Congressional Adds*	0.000	6.770	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.770

A. Mission Description and Budget Item Justification

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.

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	117.476	130.981	122.278	-	122.278
Current President's Budget	120.261	130.981	126.932	-	126.932
Total Adjustments	2.785	0.000	4.654	-	4.654
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.199	0.000			
• Program Adjustments	0.000	0.000	6.185	-	6.185
• Rate/Misc Adjustments	0.000	0.000	-1.531	-	-1.531

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy					Date: February 2018
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*		R-1 Program Element (Number/Name) PE 0604503N *I SSN-688 & Trident Modernization*			
• Congressional General Reductions Adjustments	-0.016	-	-	-	-
• Congressional Directed Reductions Adjustments	-1.000	-	-	-	-
• Congressional Add Adjustments	7.000	-	-	-	-

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

	FY 2017	FY 2018
Project: 9999: *Congressional Adds*		
Congressional Add: *Program Increase*	6.770	0.000
Congressional Add Subtotals for Project: 9999	6.770	0.000
Congressional Add Totals for all Projects	6.770	0.000

Change Summary Explanation

The FY 2019 funding request was reduced by $6.6 million to account for the availability of prior year execution balances. FY 2019 funding decrease was offset by $6.57 million to provide funding for increased BRR-6 Enhancement Development and Coherent Electronic Attack for Submarines. The FY 2019 request was also reduced by $3.57 million to account for various miscellaneous/rate adjustments. This FY 2019 funding decrease was offset by $8.25 million to provide increased funding for Submarine Imaging and Electronic Warfare Development activities.

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 0604503N / *SSN-688 & Trident Modernization*	Project (Number/Name) 0219 / *Sub Sonar Improvement (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
0219: *Sub Sonar Improvement (ENG)*	961.731	65.194	86.718	67.030	-	67.030	61.575	60.651	61.507	62.781	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

Acoustics Rapid COTS Insertion (A-RCI) provides multi-phased evolutionary development geared toward addressing acoustic superiority issues through the rapid introduction of interim development products applicable to all Classes of Submarines.
- A-RCI Phase I and II introduced Towed Array processing improvements
- Phase III introduced Spherical Array processing improvements
- Phase IV provided High Frequency (HF) Array processing improvements for SSN 688I, SSGN, VIRGINIA, and SSN 21 Class Submarines.

As part of the Navy's plan to maintain acoustic superiority for in-service submarines, a joint cooperative effort was established to deliver annual Advanced Processing Builds (APBs) to prevent obsolescence and deliver ongoing capability improvements.
- Capabilities in the APBs will be integrated as part of A-RCI certified systems.
- Development of the Large Vertical Array (LVA) will improve detection and enhanced tactical situational awareness capability for tracking targets of interest, and supports acoustic superiority objectives for the VIRGINIA and OHIO Cass Submarines.

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: APB Productionization	11.904	12.724	12.519	0.000	12.519
Articles:	-	-	-	-	-
Description: APB Productionization provides for the transition of APB capability improvements to the Fleet for integration, testing and formal certification.					
FY 2018 Plans: -Continue Advanced Processing Build (APB) Sea Testing, Integration, and Certification.					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
-Transition APB software from development to A-RCI for integration, testing, and formal certification. -Incorporate conversion of the SSBN legacy sonar system to the TI/APB model and the introduction of in-board signal processing associated with the Large Vertical Array (LVA). ***FY 2019 Base Plans:*** -Continue Advanced Processing Build (APB) Sea Testing, Integration, and Certification. -Transition 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 and the incorporation of in-board signal processing associated with the Large Vertical Array (LVA). ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 APB Productionization efforts reflect the integration of the TI-18 baseline for SSGN Class Submarines and the completion of the TI-16 baseline for SEAWOLF and VIRGINIA Class Submarines resulting in a funding decrease.					
Title: Integration and Testing	31.987	37.128	34.056	0.000	34.056
Articles:	-	-	-	-	-
Description: Integration and Testing provides support to integrate and test APB's into all Submarine Classes containing multiple sensor systems. ***FY 2018 Plans:*** -Support Advanced Processing Builds installed on SSN 688I, SSN 688, SSN 21, SSGN 726, SSBN, and VA Class Submarines. -Incorporate the integration and testing associated with the refresh of technology and assimilation of capability required for conversion of the SSBN legacy sonar system to the TI/APB model. -Incorporate the integration and testing associated with the introduction of signal processing in support of the Large Vertical Array (LVA). ***FY 2019 Base Plans:*** -Support Advanced Processing Builds installed on SSN 688I, SSN 688, SSN 21, SSGN 726, SSBN, and VA Class Submarines.					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
-Continue the incorporation of integration and testing associated with the conversion of the SSBN legacy sonar system to the TI/APB model; as well as, signal processing in support of the Large Vertical Array (LVA). ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 finalizes the development of the baseline in-board signal processing requirements for the Large Vertical Array (LVA) resulting in a decrease in Integration and Testing requirements.					
Title: SSBN Combat System Modernization ***Articles:*** ***Description:*** SSBN Combat System Modernization develops and completes the incorporation of the APB/TI model into SSBN combat systems. ***FY 2018 Plans:*** N/A ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A	2.050 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Large Vertical Array (LVA) ***Articles:*** ***Description:*** Provides funding for the development of Large Vertical Array (LVA) capability in the areas of detection and tracking for back-fit installation on VIRGINIA Class and OHIO Class Submarines. ***FY 2018 Plans:*** -Continue development of Large Vertical Array (LVA) acoustic modules; to include acoustic sensors, array material, outboard electronics, fairings, and associated cabling, to effectively incorporate the required capabilities into the APB/TI model.	13.265 -	33.283 -	16.800 -	0.000 -	16.800 -

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

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 and initiate fabrication of 2 mechanical fixtures required to manufacture, transport, and install an LVA shipset on a Submarine. ***FY 2019 Base Plans:*** -Finalize development of Large Vertical Array (LVA) acoustic modules; to include acoustic sensors, array material, outboard electronics, fairings, and associated cabling -Finalize development of mechanical fixtures (required to manufacture, transport, and install an LVA ship-set on a submarine), to effectively incorporate the required capabilities into the TI/APB model for back-fit modernization. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 finalizes the development of the Large Vertical Array (LVA) resulting in a decrease in LVA development requirements.					
Title: TB-29X Development ***Articles:*** ***Description:*** Provides funding for the development of TB-29A equivalent Thin Line Array with long range detection and tracking with improved reliability, using improved telemetry. ***FY 2018 Plans:*** N/A ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A	2.475 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: A-RCI Acoustic Superiority Integration ***Articles:*** ***Description:*** Maintain Acoustic Superiority for In-service Submarines to deliver bi-annual Advance Processing Builds (APBs) to prevent obsolescence and deliver emerging capability improvements for current and future threats.	3.513 -	3.583 -	3.655 -	0.000 -	3.655 -

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 Plans: -Continue development of emerging capability improvements for current and future threats by supporting development, integration, and testing of emerging capability improvements in passive long range detection/wide area search for current and future threats in support of Navy SSN/SSBN Acoustic Superiority initiatives. ***FY 2019 Base Plans:*** -Continue development of emerging capability improvements for current and future threats by supporting development, integration, and testing of emerging capability improvements in passive long range detection/wide area search for current and future threats in support of Navy SSN/SSBN Acoustic Superiority initiatives. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 integrates additional software enabled capability enhancements across multiple Submarine Classes resulting in a funding increase.					
Accomplishments/Planned Programs Subtotals	65.194	86.718	67.030	0.000	67.030

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/2150: *SSN Acoustic Equipment*	288.265	331.053	318.189	-	318.189	378.968	441.021	427.711	499.564	Continuing	Continuing

Remarks

D. Acquisition Strategy

Acoustic Systems:
-A-RCI utilizes an open architecture and Commercial Off-the-Shelf (COTS) products in support of new and upgraded sonar systems.
-Program Reviews with the Milestone Decision Authority (MDA) are conducted granting approval for the contract production options.

Large Vertical Array (LVA):
-Performance specification-based contract in support of LVA to enhance SSN/SSBN platform capability and situational awareness.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

E. Performance Metrics

-The A-RCI program will modernize approximately 8-12 SSNs per year through executing bi-annual software Advanced Processor Builds (APBs) and bi-annual Technical Insertions (TIs).

-Beginning with FY 2017 installations, the A-RCI program will modernize approximately 2-3 SSBNs per year through bi-annual APBs/TIs.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	SS/CPIF	LMC : Manassas, VA	347.471	13.217	Dec 2016	15.647	Dec 2017	15.386	Dec 2018	-		15.386	Continuing	Continuing	Continuing
Ancillary Hardware Development	SS/CPFF	ARL University of Texas : Austin, TX	37.403	3.232	Mar 2017	3.468	Mar 2018	3.371	Mar 2019	-		3.371	Continuing	Continuing	Continuing
Systems Engineering	SS/CPFF	Johns Hopkins APL : Baltimore, MD	39.525	3.251	Dec 2016	3.488	Dec 2017	3.391	Dec 2018	-		3.391	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	LMC : VA - Keyport	36.260	3.439	Jan 2017	3.690	Jan 2018	3.591	Jan 2019	-		3.591	Continuing	Continuing	Continuing
Primary Hardware Development	C/CPIF	Progeny Systems : Manassas, VA	64.004	6.635	Jan 2017	7.119	Jan 2018	6.984	Jan 2019	-		6.984	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Newport, RI	172.436	6.115	Dec 2016	6.561	Dec 2017	5.453	Dec 2018	-		5.453	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Carderock, MD	28.312	2.910	Dec 2016	3.122	Dec 2017	2.060	Dec 2018	-		2.060	Continuing	Continuing	Continuing
TB-29X Development	C/CPIF	L-3 CSC : Millersville, MD	13.200	2.475	Mar 2017	0.000		0.000		-		0.000	0.000	15.675	-
LVA Development	C/CPIF	Electric Boat : Groton, CT	0.000	13.265	Nov 2016	33.283	Nov 2017	16.800	Nov 2018	-		16.800	0.000	63.348	-
		Subtotal	738.611	54.539		76.378		57.036		-		57.036	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Software Development	C/CPIF	General Dynamics, AIS : Fairfax, VA	159.945	5.344	Dec 2016	5.184	Dec 2017	5.028	Dec 2018	-		5.028	Continuing	Continuing	Continuing
Primary Software Development	C/CPFF	Sedna Digital, : Manassas, VA	36.599	4.041	Dec 2016	3.920	Dec 2017	3.802	Dec 2018	-		3.802	Continuing	Continuing	Continuing
		Subtotal	196.544	9.385		9.104		8.830		-		8.830	Continuing	Continuing	N/A

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Test and Evaluation	WR	OPTEVFOR : Norfolk, VA	10.281	0.500	Dec 2016	0.485	Dec 2017	0.470	Dec 2018	-		0.470	Continuing	Continuing	Continuing
		Subtotal	10.281	0.500		0.485		0.470		-		0.470	Continuing	Continuing	N/A

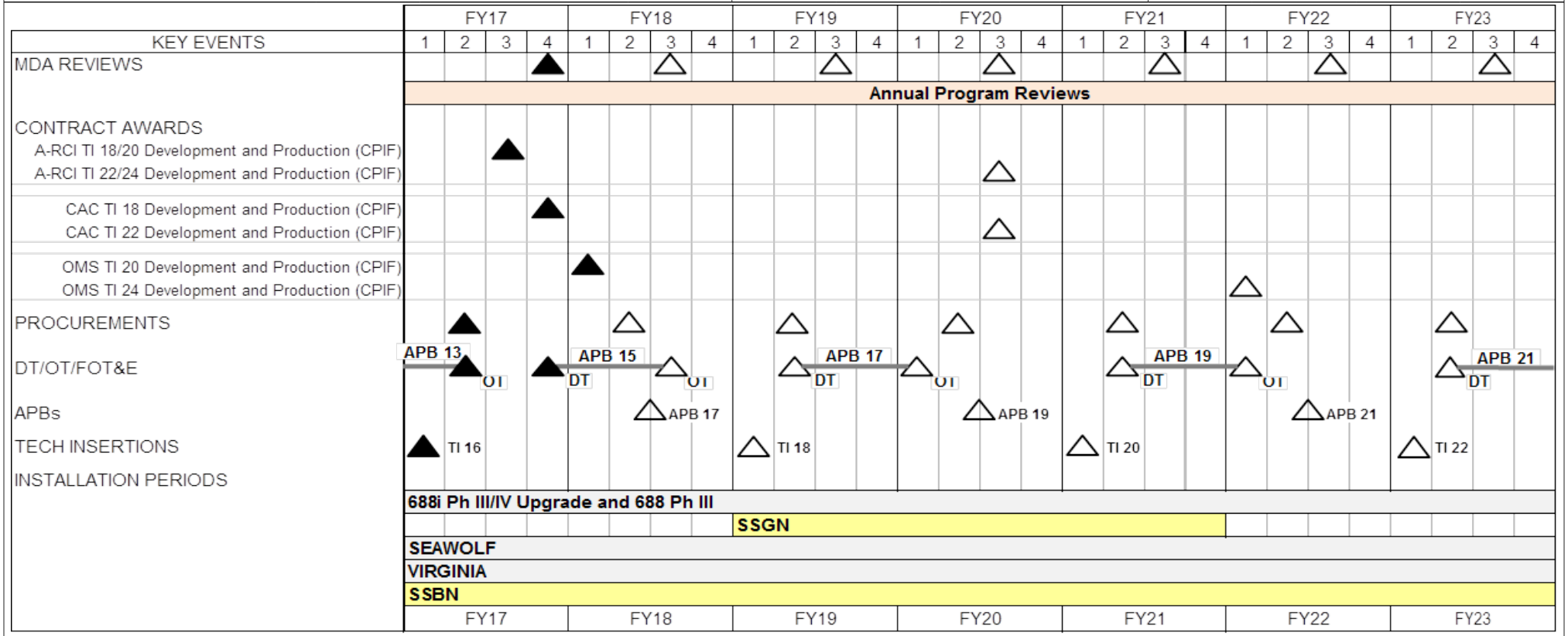
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Support Services	C/FFP	Alion, BAH, AECOM : Washington, DC	13.955	0.673	Dec 2016	0.657	Dec 2017	0.600	Dec 2018	-		0.600	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : Washington, DC	2.340	0.097	Dec 2016	0.094	Dec 2017	0.094	Dec 2018	-		0.094	Continuing	Continuing	Continuing
		Subtotal	16.295	0.770		0.751		0.694		-		0.694	Continuing	Continuing	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	961.731	65.194		86.718		67.030		-		67.030	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
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)*



Completed Milestone

Upcoming Milestone

SSN Installation Period

SSGN/SSBN Installation Period

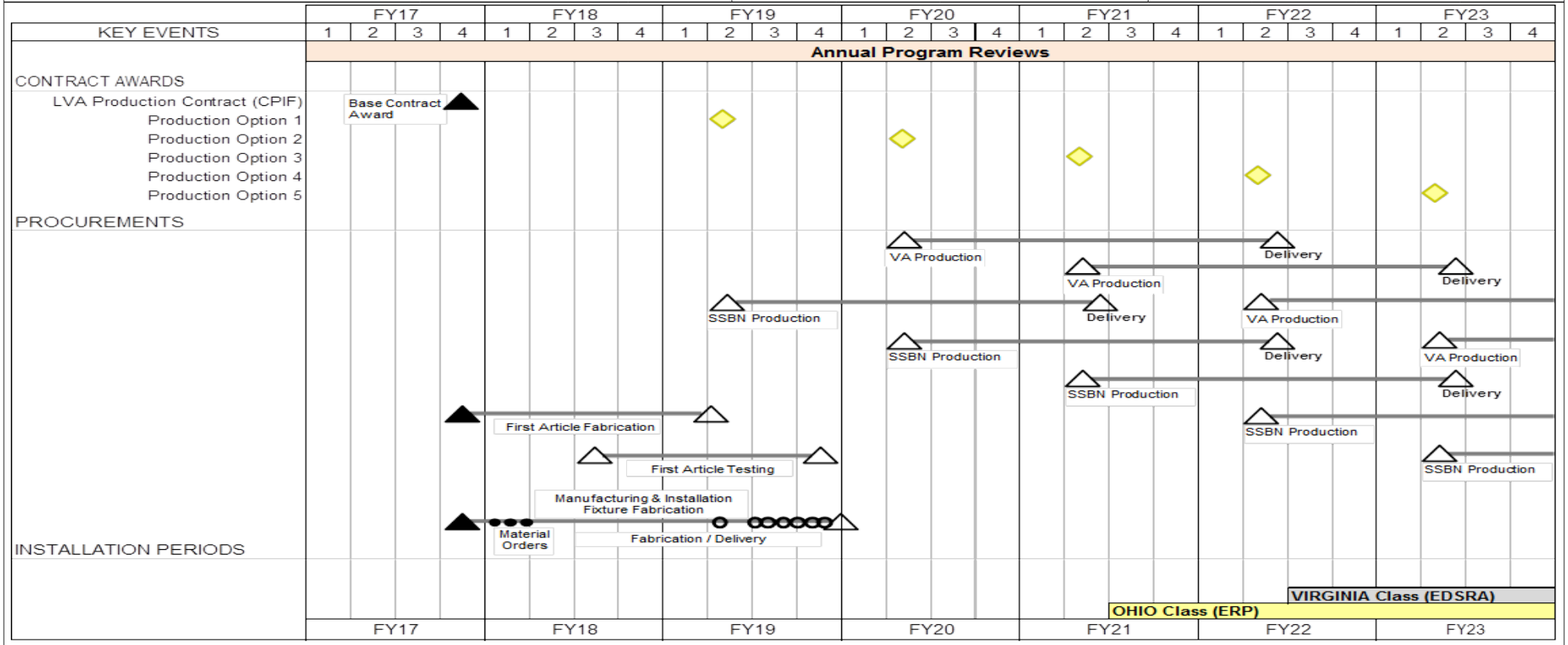
APB: Advanced Processing Builds

A-RCI: Acoustic – Rapid Commercial Off the Shelf (COTS) Insertion

CAC: Common Acoustic Cabinet

OMS: Ownship Monitoring System

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
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)*



KEY:

- Completed Milestone
- Upcoming Milestone
- Production Option
- **SSN Installation Period**
- **SSBN Installation Period**

LVA: Large Vertical Array

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0219 / *Sub Sonar Improvement (ENG)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0219				
ACOUSTICS	1	2017	4	2023
---Acquisition Milestones - Acoustics	4	2017	3	2023
---Annual Program Review	1	2017	4	2023
---Contract Awards - Acoustics	3	2017	4	2020
---Procurements - Acoustics	2	2017	2	2023
---DT/OT/FOT&E Tests	1	2017	4	2023
---APB Deliveries	3	2018	3	2022
---Tech Insertions	1	2017	1	2023
---Installation Periods	1	2017	4	2023
LARGE VERTICAL ARRAY	4	2017	1	2021
---Contract Award - Large Vertical Array	4	2017	4	2017
---Acquisition Milestones - Large Vertical Array	1	2018	4	2019
---Procurements - Large Vertical Array	1	2018	4	2019
---Production	2	2019	1	2021
---First Article Testing	3	2018	4	2019

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 0604503N / *SSN-688 & Trident Modernization*	Project (Number/Name) 0742 / *Sub Integrated Ant 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
0742: *Sub Integrated Ant System*	306.311	25.373	15.652	15.426	-	15.426	14.486	14.326	13.779	14.077	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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 Extremely High Frequency (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 communications and reduce the detectability of the submarines by the adversary utilizing the Optical Communications Project Arrangement with United Kingdom.
The program also researches the Tactically Oriented Tech Insertion Mast (TOTIM), which decreases the size of the imaging sensors, increases modularity, sensor capabilities and supports mission specific payloads.

The TBA AN/BRR-6/6B is installed on OHIO class SSBN submarines and a variant of AN/BRR-6 will be the TBA for COLUMBIA class. Each boat's towed communications buoys (2 each) support its primary mission to receive Emergency Action Messages (EAMs), a critical component of the Navy's Nuclear Command, Controls, and Communications (NC3).

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.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

The Transition Engineering program focuses on technology development and assessment to support Fourth Generation Undersea Warfare objectives. Principal objective will be to complete the Maritime Information System (MIS) Analysis of Alternatives (AoA).

JUSTIFICATION FOR BUDGET ACTIVITY:

FY19 Transition Engineering: Continue development of future undersea communications capabilities in support of Fourth Generation Undersea Warfare.
FY19 Outboard Electronics (OE)-538: Complete OT on operational submarine in support of Full Rate Production (FRP).
FY19 SubHDR: Continue development of Reliability Maintainability, and Availability, (RMA) components identified by research and analysis to maintain Ao throughout the life of the system. FY19 efforts are funded by prior year under-execution funds.
FY19 AdvHDR: Continue Optical Communications Project Arrangement with United Kingdom to reduce the detectability of the submarines by the adversary. Continue research and analysis into communications (COMMS) payloads for the Tactically Oriented Technology Insertion Mast (TOTIM) to improve Low Probability of Detection (LPD).
FY19 Towed Buoy Antenna (TBA)(AN/BRR-6/6B): Provides design specification, component development, system integration, and testing to improve system performance (measured by operational availability Ao) and reliability (measured by mean time between failures MTBF); of buoy shape, combined Radio Frequency (RF) and Depth Canisters, Antenna and Amplifier Improvements, and Inertial Measurement Unit (IMU).
FY19 Antenna Improvements: Continue RMA and P3I improvements in support of current and future submarine antenna applications.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Transition Engineering	4.047	2.577	2.627	0.000	2.627
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue concept engineering, new technology evaluations, and assessments in support of current and future Undersea Warfare. - Continue development of future undersea communication capabilities in support of Fourth Generation Undersea Warfare. - Continue development of the Links of the Chain as a plug in for Virtual Worlds in support of simulation of the Undersea Architecture. - Continue development of Undersea Constellation Security Classification Guide. - Commence development of Subsea and Seabed Warfare (SSW) Initial Capabilities Document (ICD) - Commence Maritime Information System (MIS) Analysis of Alternatives (AoA).					
FY 2019 Base Plans: - Continue concept engineering, new technology evaluations, and assessments in support of current and future Undersea Warfare.					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

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 of future undersea communication capabilities in support of Fourth Generation Undersea Warfare. - Continue development of the Links of the Chain as a plug in for Virtual Worlds in support of simulation of the Undersea Architecture. - Continue development of Subsea and Seabed Warfare (SSW) Initial Capabilities Document (ICD) - Complete development of the Undersea Constellation Security Classification Guide. - Complete Maritime Information System (MIS) Analysis of Alternatives (AoA). ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - Increase in budget between FY18 and FY19 accounts only for inflation.					
Title: Outboard Electronics (OE)-538 ***Articles:*** ***FY 2018 Plans:*** - Complete Developmental Test (DT) on operational submarine in support of Full Rate Production (FRP). - Complete development/update of required FRP acquisition documents. - Continue preparation for Operational Test (OT) in support of FRP. ***FY 2019 Base Plans:*** - Complete OT on operational submarine in support of FRP. - Complete FRP decision review and achieve Initial Operational Capability (IOC). Note: Due to submarine availability for OE-538A, DT delayed from 2QFY17 to 4QFY18 and OT delayed from 3QFY17 to 1QFY19. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - Decrease of $0.1 from FY18 to FY19 is due to a reduction in required tasking for the fiscal year. The only remaining task will be for the completion of OT in 1QFY19.	0.648 -	0.200 -	0.100 -	0.000 -	0.100 -
Title: Submarine High Data Rate (SubHDR) Pre-Planned Product Improvement (P3I)	9.653	2.288	0.253	0.000	0.253

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue development of Reliability Maintainability, and Availability, (RMA) components identified by research and analysis to maintain Ao throughout the life of the system, which includes the continuation of the Multi-Volt Power Supply (MVPS) development and commencing the Mast Motion Sensor (MMS) development. ***FY 2019 Base Plans:*** - Continue oversight of development of Reliability Maintainability, and Availability, (RMA) components identified by research and analysis to maintain Ao throughout the life of the system. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - The FY19 funding request was reduced by $2.035M to account for the availability of prior year execution balances. Remaining FY19 funding will provide for government oversight of FY18 funded contract work.					
Title: Advanced High Data Rate (AdvHDR)	3.033	3.408	3.483	0.000	3.483
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue Optical Communications Project Arrangement with United Kingdom. - Commence Low Probability of intercept/Low Probability of Detection (LPI/LPD) technology development phase. (This effort has been moved to project unit 1411 and referred to as "Undersea Assured Command and Control (UAC2) technology development phase 1) - Continue research and analysis into communications payloads for the TOTIM to improve LPD. ***FY 2019 Base Plans:*** - Continue Optical Communications Project Arrangement with United Kingdom. - Continue research and analysis into communications payloads for the TOTIM to improve LPD. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - Increase in budget between FY18 and FY19 accounts only for inflation.					
Title: Towed Buoy Antenna (AN/BRR-6/6B)	5.472	3.681	6.320	0.000	6.320

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Articles:	-	-	-	-	-
FY 2018 Plans: - Commence development for cybersecurity vulnerability detection and hardening. - Continue design specification, component development, system integration, and testing for reliability improvements of buoy shape and radio frequency and depth canisters. - Complete design specification, component development, system integration, and testing for reliability improvements of antenna and amplifiers and Inertial Measurement Unit (IMU). - Continue support for Towed Buoy Antenna BRR-6 Program on OHIO and COLUMBIA Class providing program, contract, logistics and system engineering management. ***FY 2019 Base Plans:*** - Complete development for cybersecurity vulnerability detection and hardening. - Continue design specification, component development, system integration, and testing for reliability improvements of buoy shape and radio frequency and depth canisters. - Continue support for Towed Buoy Antenna BRR-6 Program on OHIO and COLUMBIA Class providing program, contract, logistics and system engineering management. - Commence design specification, component development, system integration, and testing for reliability improvements of High-lift Auxiliary Wire capability. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - The $2.6M increase from FY18 to FY19 is to support the COLUMBIA Class delivery schedule. A recoloring of OPN to RDT&E occurred in FY19 to provide developmental engineering efforts, including Control Software design, Seated Switch Redesign, and Tow Cable Strength and Throughput design, while also ensuring full maturity of the buoy shape, radio frequency canister and depth sensor canister required to meet the COLUMBIA Class delivery schedule.					
Title: Antenna Improvements	2.520	3.498	2.643	0.000	2.643
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue P3I investigation and RMA development efforts for legacy antennas.					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
. ***FY 2019 Base Plans:*** - Continue P3I investigation and RMA development efforts for legacy antennas. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - The decrease from FY18 to FY19 accounts for the reduction of AN/BRA-24 reliability improvement design due to the transition from development to production. These reliability improvements are required to resolve operational availability issues.					
Accomplishments/Planned Programs Subtotals	25.373	15.652	15.426	0.000	15.426

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/3130: *Submarine Communication Equipment*	62.305	86.204	78.580	-	78.580	73.630	64.510	62.011	60.158	Continuing	Continuing

Remarks

D. Acquisition Strategy

Program Milestones (MS):
Outboard Electronics (OE)-538: 2nd QTR FY19 Full Rate Production (FRP) Decision Review.

Test and Evaluation (T&E) Milestones:
OE-538: 4th QTR FY18 Developmental Test (DT) for FRP; 1st QTR FY19 Operational Test (OT) for FRP.

E. Performance Metrics

FY19 AdvHDR: Optical Communications (OCOMMS) Project Arrangement and Tactically Oriented Technology Insertion Mast (TOTIM) Communications Payload performance specifications.
FY19 TBA (AN/BRR-6/6B): Development of Criticality Analysis, Supply Chain Risk Management, Program Protection Plan, and Security Classification Guide for cybersecurity vulnerability detection and hardening.
FY19 Antenna Improvements: Technical Data Package (TDP) for the Automatic Identification System (AIS) Amplifiers in support of P3I for legacy antennas.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

FY19 Transition Engineering: Continue concept engineering, new technology evaluations, and assessments in support of current and future Undersea Warfare.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Future Capabilites (Trans Eng)	WR	SSC Pacific : San Diego, CA	4.224	1.978	Nov 2016	0.800	Nov 2017	0.865	Nov 2018	-		0.865	Continuing	Continuing	Continuing
Systems Engineering (Trans Eng)	WR	MITRE : McLean, VA	1.950	0.571	Nov 2016	0.545	Nov 2017	0.567	Nov 2018	-		0.567	Continuing	Continuing	Continuing
Systems Engineering (Trans Eng)	WR	NUWC : Newport, RI	39.513	1.270	Nov 2016	0.582	Nov 2017	0.528	Nov 2018	-		0.528	Continuing	Continuing	Continuing
Security Engineering (Trans Eng)	C/CPFF	G2 OPS : San Diego, CA	0.300	0.250	Nov 2016	0.258	Nov 2017	0.267	Nov 2018	-		0.267	0.000	1.075	-
Research and Analysis Reliability Dev (SubHDR)	WR	NUWC : Newport, RI	6.041	1.300	Nov 2016	0.834	Nov 2017	0.253	Nov 2018	-		0.253	Continuing	Continuing	Continuing
Research and Analysis Reliability Dev (SubHDR)	C/CPIF	Raytheon : Marlboro, MA	0.000	4.162	Jun 2017	0.867	Feb 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering (SubHDR)	WR	NUWC : Newport, RI	19.120	0.481	Nov 2016	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
OCOMMS PA Demonstration Systems Development (AdvHDR)	C/CPAF	Aerospace : San Diego, CA	0.159	0.376	Feb 2017	0.144	Feb 2018	0.120	Feb 2019	-		0.120	Continuing	Continuing	Continuing
OCOMMS PA Demonstration System Development (AdvHDR)	C/CPFF	TBD : TBD	0.000	0.000		1.509	May 2018	1.615	May 2019	-		1.615	Continuing	Continuing	Continuing
Systems Engineering (AdvHDR)	WR	SSC Pacific : San Diego, CA	10.410	1.088	Nov 2016	1.000	Nov 2017	1.146	Nov 2018	-		1.146	Continuing	Continuing	Continuing
Systems Engineering (AdvHDR)	WR	NUWC : Newport, RI	0.000	0.773	Nov 2016	0.356	Nov 2017	0.192	Nov 2018	-		0.192	0.000	1.321	-
Security Engineering/ Cybersecurity (BRR-6)	C/CPFF	G2 OPS : San Diego, CA	0.000	0.264	Nov 2016	0.252	Nov 2017	0.250	Nov 2018	-		0.250	Continuing	Continuing	Continuing
Systems Engineering/ Hardware Dev (BRR-6)	WR	NSWC : Philadelphia, PA	4.546	1.878	Nov 2016	0.855	Nov 2017	2.236	Nov 2018	-		2.236	Continuing	Continuing	Continuing
Systems Engineering/ Hardware Dev (BRR-6)	WR	NUWC : Newport, RI	2.360	1.437	Nov 2016	0.687	Nov 2017	1.663	Nov 2018	-		1.663	Continuing	Continuing	Continuing
Systems Engineering/ Hardware Dev (BRR-6)	WR	NSWC : Carderock	0.371	0.567	Nov 2016	0.288	Nov 2017	0.780	Nov 2018	-		0.780	Continuing	Continuing	Continuing

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NSWC : Philadelphia, PA	0.000	2.270	Nov 2016	3.143	Nov 2017	2.383	Nov 2018	-		2.383	Continuing	Continuing	Continuing
Systems Engineering/ Hardware Dev (Antenna Improvements)	WR	NSWC : Carderock	0.000	0.125	Nov 2016	0.130	Nov 2017	0.135	Nov 2018	-		0.135	Continuing	Continuing	Continuing
Product Development Prior Years	Various	Various : Various	168.310	0.000		0.000		0.000		-		0.000	0.000	168.310	110.707
Research and Analysis Reliability Dev (SubHDR)	C/CPAF	BTP Systems : Ludlow, MA	3.049	2.100	Nov 2016	0.167	Feb 2018	0.000		-		0.000	0.000	5.316	-
		Subtotal	260.353	20.890		12.417		13.000		-		13.000	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Logistics Support (SubHDR)	C/CPFF	CSA : San Diego, CA	0.275	0.157	Feb 2017	0.090	Feb 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Cost Estimating (AdvHDR)	C/CPFF	TASC : San Diego, CA	0.075	0.075	Feb 2017	0.075	Feb 2018	0.075	Feb 2019	-		0.075	Continuing	Continuing	Continuing
Integrated Logistics Support (AdvHDR)	C/CPFF	CSA : San Diego, CA	0.075	0.075	Feb 2017	0.075	Feb 2018	0.080	Feb 2019	-		0.080	Continuing	Continuing	Continuing
Integrated logistics Support (BRR-6)	WR	NUWC : Newport, RI	0.097	0.114	Nov 2016	0.116	Nov 2017	0.118	Nov 2018	-		0.118	Continuing	Continuing	Continuing
Configuration Management (BRR-6)	WR	NSWC : Philadelphia, PA	0.000	0.644	Nov 2016	0.303	Nov 2017	0.298	Nov 2018	-		0.298	0.000	1.245	-
Integrated Logistics Support (Antenna Improvements)	C/CPFF	CSA : San Diego, CA	0.000	0.050	Feb 2017	0.050	Feb 2018	0.050	Feb 2019	-		0.050	Continuing	Continuing	Continuing
Support Prior Years	Various	Various : Various	8.609	0.000		0.000		0.000		-		0.000	0.000	8.609	6.630
		Subtotal	9.131	1.115		0.709		0.621		-		0.621	Continuing	Continuing	N/A

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental/ Operational T&E (OE-538)	WR	NUWC : Newport, RI	7.656	0.583	Nov 2016	0.050	Nov 2017	0.050	Nov 2018	-		0.050	Continuing	Continuing	Continuing
Test & Evaluation (OE-538)	WR	COTF : Norfolk, VA	1.309	0.065	Nov 2016	0.150	Nov 2017	0.050	Nov 2018	-		0.050	Continuing	Continuing	Continuing
Test & Evaluation (SubHDR)	WR	NUWC : Newport, RI	2.045	1.013	Feb 2017	0.164	Nov 2017	0.000		-		0.000	Continuing	Continuing	Continuing
Integration, Assembly & Test (BRR-6)	WR	NSWC : Philadelphia, PA	0.000	0.130	Nov 2016	0.283	Nov 2017	0.285	Nov 2018	-		0.285	0.000	0.698	-
Integration, Assembly & Test (BRR-6)	WR	NSWC : Carderock	0.000	0.099	Nov 2016	0.481	Nov 2017	0.345	Nov 2018	-		0.345	0.000	0.925	-
Integration, Assembly & Test (BRR-6)	WR	NUWC : Newport, RI	0.000	0.219	Nov 2016	0.241	Nov 2017	0.244	Nov 2018	-		0.244	0.000	0.704	-
Test and Evaluation Prior Years	Various	Various : Various	5.247	0.000		0.000		0.000		-		0.000	0.000	5.247	4.207
		Subtotal	16.257	2.109		1.369		0.974		-		0.974	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support (Trans Eng)	C/CPFF	CSA : San Diego, CA	4.177	0.384	Feb 2017	0.392	Feb 2018	0.400	Feb 2019	-		0.400	Continuing	Continuing	Continuing
Program Management Support (SubHDR)	C/CPFF	CSA : San Diego, CA	3.822	0.440	Feb 2017	0.166	Feb 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Program Management Support (AdvHDR)	C/CPFF	CSA : San Diego, CA	7.791	0.240	Feb 2017	0.249	Feb 2018	0.255	Feb 2019	-		0.255	Continuing	Continuing	Continuing
Program Management Support (BRR-6)	C/CPFF	CSA : San Diego, CA	0.172	0.120	Feb 2017	0.175	Feb 2018	0.101	Feb 2019	-		0.101	Continuing	Continuing	Continuing
Program Management Support (Antenna Improvements)	C/CPFF	CSA : San Diego, CA	0.000	0.075	Feb 2017	0.175	Feb 2018	0.075	Feb 2019	-		0.075	Continuing	Continuing	Continuing

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

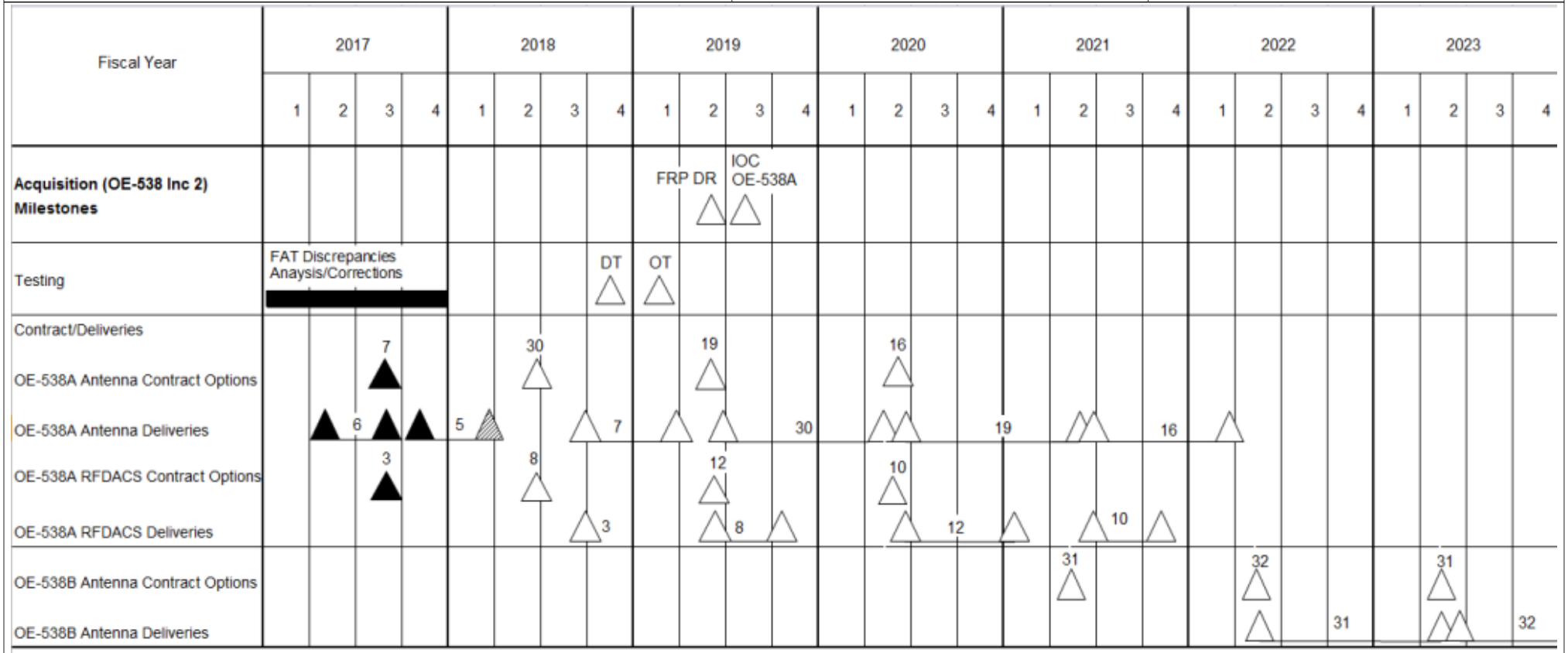
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services Prior Years	Various	Various : Various	4.608	0.000		0.000		0.000		-		0.000	0.000	4.608	Continuing
		Subtotal	20.570	1.259		1.157		0.831		-		0.831	Continuing	Continuing	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	306.311	25.373		15.652		15.426		-		15.426	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

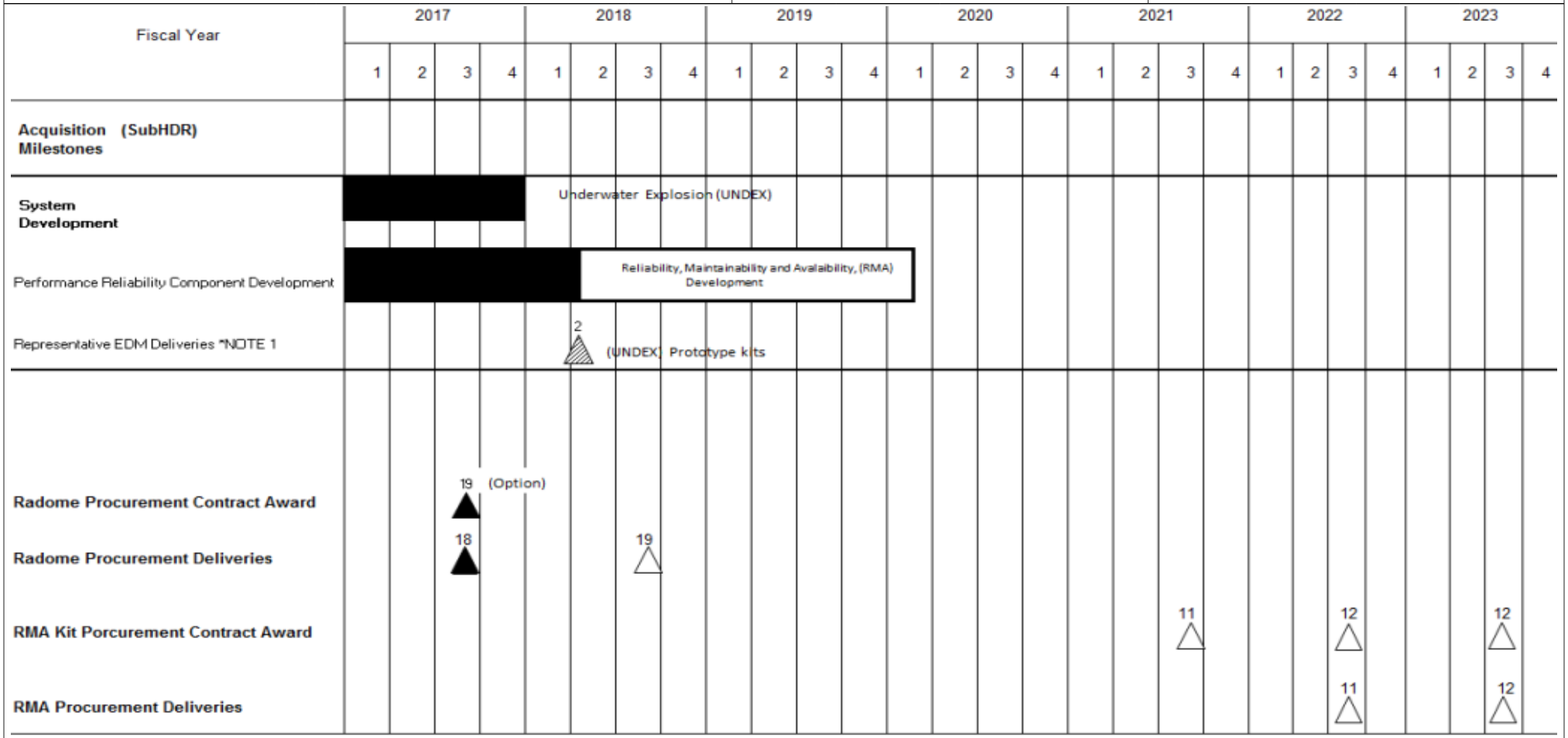


1) OE-538B development efforts funded under PMW170 RDTE Program Element: 0604777N Project Unit: 0921.

ACRONYMS:

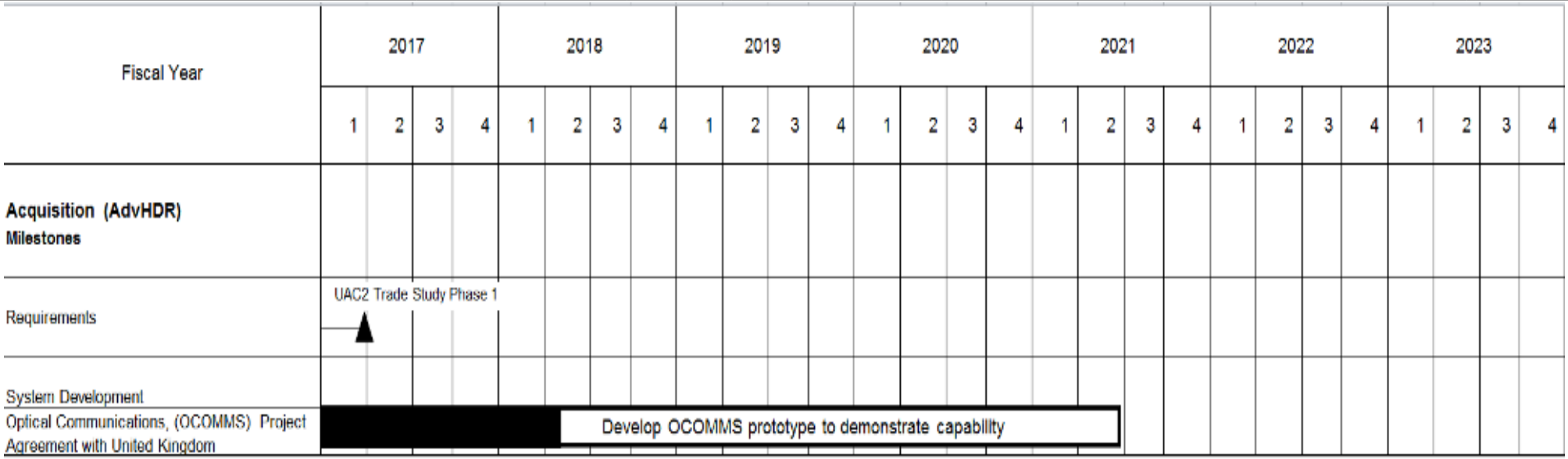
DT - Developmental Test	IOC - Initial Operational Capability
DR - Decision Review	OT - Operational Test
FAT - First Article Test	RFDACS - Radio Frequency Distribution and control System

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*



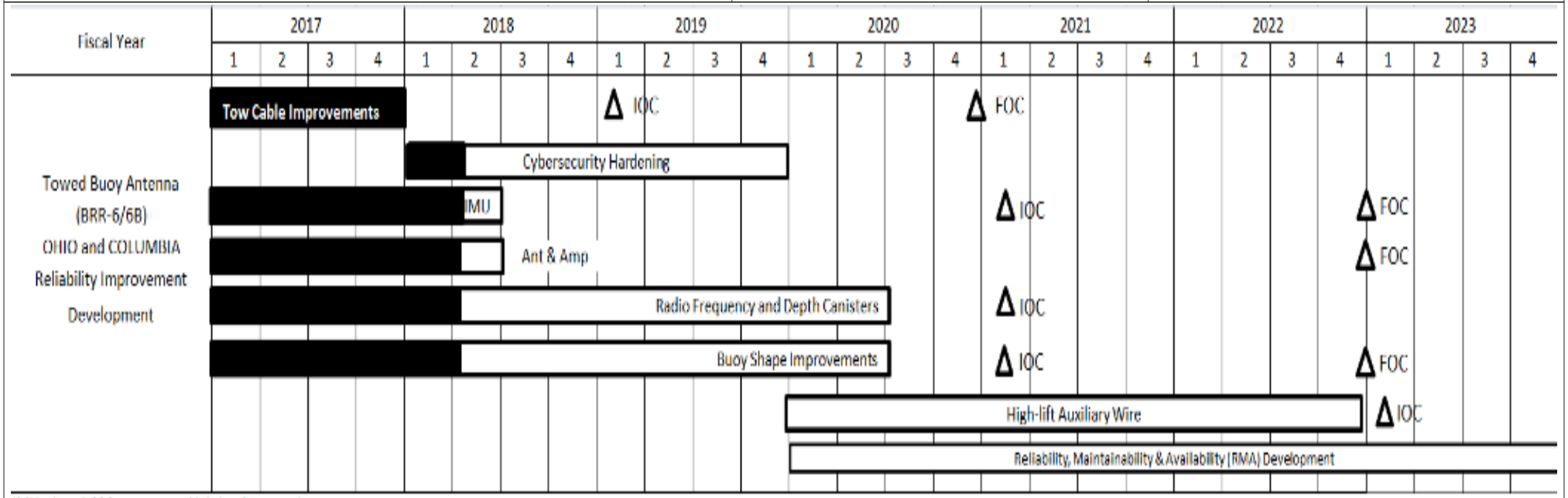
NOTE 1: UNDEX Development has completed. Prototype kit delivery delayed until 2nd quarter due to one long lead item.

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*



Acronyms:
UAC2 Undersea Assured Command & Control
Note: OCOMMS PA is an international Agreement with the U.K.

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*



IMU = Inertial Measurement Unit Implementation

Ant & Amp = Antenna and Amplifier Improvements

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*	

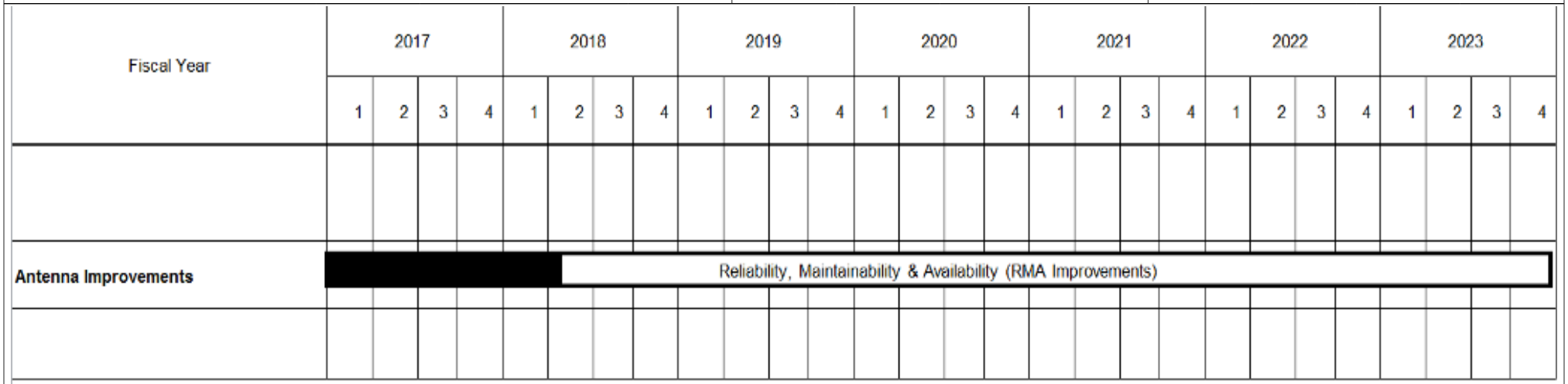
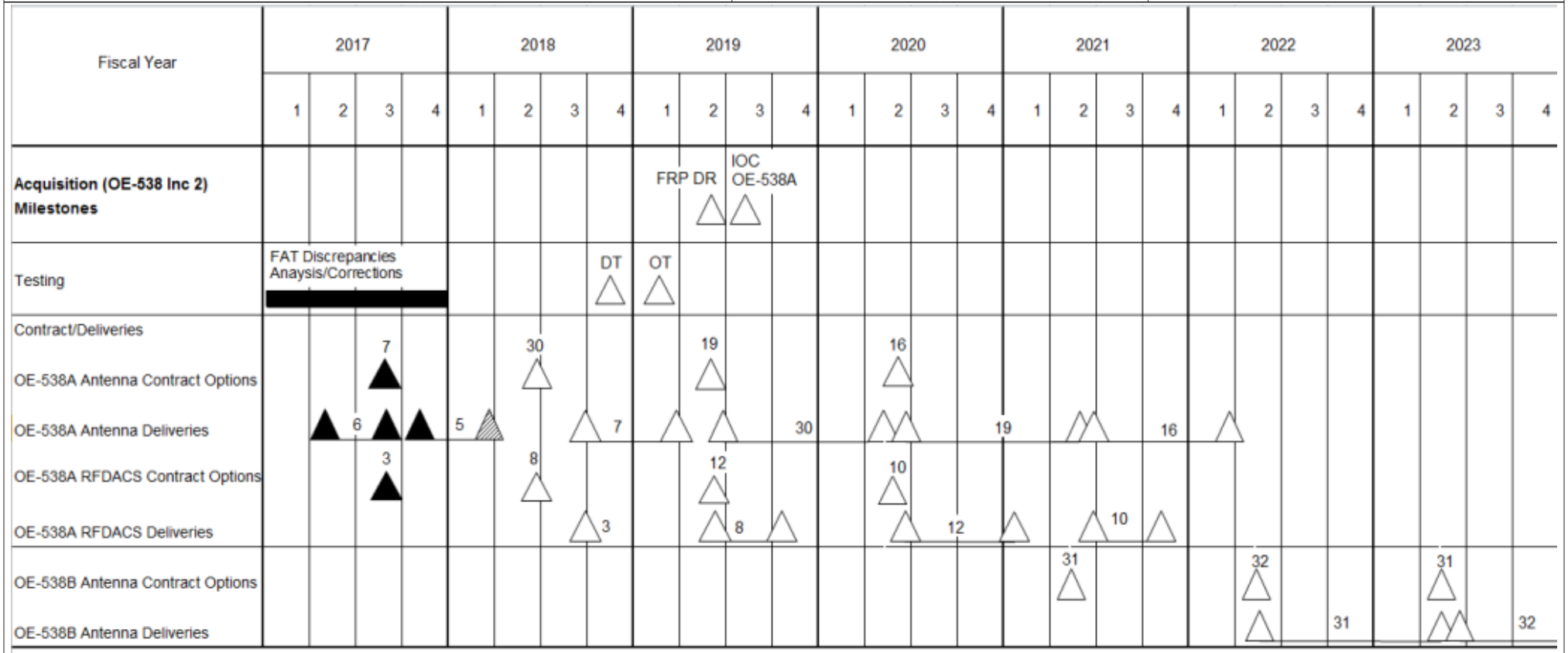


Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*



1) OE-538B development efforts funded under PMW170 RDTE Program Element: 0604777N Project Unit: 0921.

ACRONYMS:

DT - Developmental Test	IOC - Initial Operational Capability
DR - Decision Review	OT - Operational Test
FAT - First Article Test	RFDACS - Radio Frequency Distribution and control System

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0742				
OE-538A Full Rate Production Decision Review (FRP DR)	2	2019	2	2019
OE-538A Initial Operational Capability (IOC)	3	2019	3	2019
OE-538A First Article Test (FAT) Discrepancies Analysis/Corrections	1	2017	4	2017
OE-538A DT for Full Rate Production (FRP)	4	2018	4	2018
OE-538A Operational Test (OT)	1	2019	1	2019
OE-538A Antenna Deliveries Year 1	2	2017	3	2017
OE-538A Antenna Deliveries Year 2	4	2017	2	2018
OE-538A Antenna Contract Option Year 3	3	2017	3	2017
OE-538A Antenna Deliveries Year 3	3	2018	2	2019
OE-538A Antenna Contract Option Year 4	2	2018	2	2018
OE-538A Antenna Deliveries Year 4	2	2019	2	2020
OE-538A Antenna Contract Option Year 5	2	2019	2	2019
OE-538A Antenna Deliveries Year 5	2	2020	2	2021
OE-538A Antenna Contract Option Year 6	2	2020	2	2020
OE-538A Antenna Deliveries Year 6	2	2021	2	2022
OE-538A RFDACS Contract Options Year 1	3	2017	3	2017
OE-538A RFDACS Deliveries Year 1	3	2018	4	2018
OE-538A RFDACS Contract Option Year 2	2	2018	2	2018
OE-538A RFDACS Deliveries Year 2	2	2019	4	2019
OE-538A RFDACS Contract Option Year 3	2	2019	2	2019
OE-538A RFDACS Deliveries Year 3	2	2020	1	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
OE-538A RFDACS Contract Option Year 4	2	2020	2	2020
OE-538A RFDACS Deliveries Year 4	2	2021	4	2021
OE-538B Antenna Contract Option Year 1	2	2021	2	2021
OE-538B Antenna Deliveries Year 1	2	2022	2	2023
OE-538B Antenna Contract Option Year 2	2	2022	2	2022
OE-538B Antenna Deliveries Year 2	2	2023	4	2023
OE-538B Antenna Contract Option Year 3	2	2023	2	2023
Submarine High Data Rate (SubHDR) Under Water Explosion (UNDEX) Development	1	2017	4	2017
SubHDR Performance Reliability Component Development/Test	1	2017	3	2020
SubHDR Production Representative UNDEX Engineering Development Model (EDM) Deliveries	4	2017	1	2018
SubHDR Radome Procurement Contract/Option Awards	3	2017	3	2017
SubHDR Radome Production Deliveries	3	2017	3	2018
SubHDR RMA Kit Procurement Contract Award	3	2021	3	2023
SubHDR RMA Kit Deliveries	3	2022	3	2023
AdvHDR Trade Study for Undersea Assured Command & Control	1	2017	1	2017
AdvHDR Optical Communications Project Agreement with United Kingdom	1	2017	2	2021
Towed Buoy Antenna (AN/BRR-6/6B) reliability improvement development: Tow Cable Strength and Throughput Improvements	1	2017	4	2017
TBA (AN/BRR-6/6B) reliability improvement development development: Buoy Shape Improvements	1	2017	2	2020
TBA (AN/BRR-6/6B) reliability improvement development: Radio Frequency and Depth Canisters	1	2017	2	2020
TBA (AN/BRR-6/6B) reliability improvement development: Antenna and Amplifier Improvements	1	2017	2	2018
TBA (AN/BRR-6/6B) reliability improvement development: Inertial Measurement Unit (IMU) Implementation	1	2017	2	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0742 / *Sub Integrated Ant System*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
TBA (AN/BRR-6/6B) reliability improvement development: High-lift Auxiliary Wire	1	2019	4	2021
TBA (AN/BRR-6/6B) Cybersecurity Hardening	1	2018	4	2019
TBA (AN/BRR-6/6B) Reliability, Maintainability & Availability (RMA) Development	1	2020	4	2022
Antenna Improvements Reliability, Maintainability & Availability (RMA) Development	1	2017	4	2023

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 0604503N / *SSN-688 & Trident Modernization*	Project (Number/Name) 0775 / *Submarine Supt Equip Prog*	

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
0775: *Submarine Supt Equip Prog*	14.615	13.118	9.117	28.408	-	28.408	15.206	14.906	13.985	14.272	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The FY 19 budget continues to update the Multifunction Modular Mast (MMM) payload to meet emergent Fleet needs, expand spectrum digitization and develop technologies for inclusion in future Technical Insertions (TIs) and Advanced Processor Builds (APBs). The Submarine Support Equipment Program (SSEP) seeks to develop or transition from the Advanced Submarine Support Equipment Program (ASSEP) and Future Naval Capability (FNC) efforts to all TIs capabilities for Electronic Attack (EA), tactical communications, EW sensor for future Task-Oriented Technology Insertion Mast (TOTIM) planned for TI-20 platforms, improved digitizers, and EW data processing. It also calls for the development of advanced technology demonstrations for feasibility of systems capable of meeting later TIs and APBs of AN/BLQ-10 for performance and digital data delivery. Submarine Launched Decoy is a tactical speed-to-fleet initiative that meets Fleet need for submarine littoral operations. Tactical Data Link communications is a program designed to increase submarine capability for joint operations.

The SSEP is responsible for the development and improvement of submarine Electronic Warfare (EW) systems in support of effective operations in the following mission areas: Joint Littoral Warfare; Joint Intelligence Surveillance Reconnaissance (ISR), Indications and Warnings; Electronic Warfare; Information Operations including Cyber; and Special Operations Force (SOF) support. The rapid proliferation of complex radar, communications and navigation equipment available to potential adversaries creates an increasingly dense and sophisticated electromagnetic environment. Sustained and significant improvements to submarine EW systems are required to maintain tactical ship safety and operational effectiveness. As such, EW was raised to a submarine primary mission area in FY2012 by Commander Submarine Forces, and EW is listed as the number one modernization requirement by the Submarine Tactical Requirements Group (STRG). The OPNAV letter dated 17 June 12, SER N97/12U144401 further codified this need by directing development of a digital Next Generation EW system as an evolution of the AN/BLQ-10 EW program.

The RDTE funding line supports the entire AN/BLQ-10 EW procurement program. Specific development focus areas include simultaneous transmit and receive apertures, improved antenna sensors, high bandwidth digitizers, high speed networking, large capacity data storage and retrieval, scalable integrated RF and advanced algorithms for improved system performance and new capability.

The FY19 increase supports MMM Payload development and TI-20 hardware and software development. This work is required to upgrade submarine EW systems from analogue, stove-piped passive systems to digital, integrated systems capable of increasing the submarines offensive power as required by Submarine Tactical Requirements Group guidance as well as the DoD EW Strategy.

- The MMM Payload will be developed in three successive generations adding capability as threats and requirements emerge. The first generation provides Unmanned Aerial Systems (UAS) capability. The second generation is planned to add Coherent Electronic Attack (CEAS) and Tactical Data Link (TDL) Communications to the UAS mission. The third generation will improve the ranges and reliability of these mission sets.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0775 / *Submarine Supt Equip Prog*

- TI-20 funding is critical to developing enabling technologies that will provide maximized electronic spectrum digitization and processing, allowing Submarine EW system to continue to pace the threat. The EW environment is increasingly complex and crowded. The paradigms, algorithms, and analogue systems the Navy has relied on for decades are no longer able to maintain tactical relevance in the digital era of low power radars with digital waveforms. Tactical decision makers are unable to maintain awareness of the EW spectrum with current systems. Without significant investment in TI-20, the Submarine Navy will not be able to maintain littoral presence, conduct Anti-Access Area Denial operations, coordinated strike operations, joint ISR, and SOF support.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Submarine Support Equipment Program	13.118	9.117	28.408	0.000	28.408
Articles:	-	-	-	-	-
FY 2018 Plans: -- Conduct TI-16 developmental testing on the Server-Based Radar Narrow Band (SB-RNB) and EW portions of the Low-Profile Photonics Mast. -- Update AN/BLQ-10 software baseline changes for SWFTS and NPES, SPR Resolution and Software Enhancement. Initiate design and development of TI-18 processor upgrades and Tactical Decision Aid. -- Continue development of TI-20 capabilities for MMM payload EW System, EW Server, DF improvements, and Communications Digital Aperture Correlation and Emitter improvements. -- Develop advanced technology demonstrations for feasibility of systems capable of meeting later increments of AN/BLQ-10 for performance and digital data delivery. -- Develop TI-20 configuration and architecture documentation and initial efforts for the development of the TI-20 software design. -- Conduct a Tactical Advancements for the Next Generation (TANG) event to improve the Human Machine Interface (HMI) of the EW system. -- Conduct testing for MMM Payload, Submarine Launched Decoy (SLD) buoy, high speed network, improvements to emitter algorithms, improvements to correlation algorithms and improvements to vulnerability assessment algorithms. Tests include side by side laboratory testing, at sea testing (inclusive of TEMPALT development and crew training), fleet experimentation coordination and support, and technology demonstrations. -- Develop TDL communications capabilities and module specifications.					
FY 2019 Base Plans: -- The $19M increase in funding is to initiate TI-20 development, design, integration of previously developed TI-20 technologies and other Non-Recurring Engineering efforts with industry and procure initial development hardware including racks, cabling, RF simulators, downconverters, signal distribution modules, controls and display units, and initial integration hardware. This funding will support further digitization of the AN/BLQ-10 system with a completely new design removing stove-piped analogue subsystems and replacing them with					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0775 / *Submarine Supt Equip Prog*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
digital components that allows for "spectrum as a service" usage. TI-20 funding is critical to developing enabling technologies that will provide maximized electronic spectrum digitization and processing, allowing Submarine EW system to continue to pace the threat. The EW environment is increasingly complex and crowded. The paradigms, algorithms, and analogue systems the Navy has relied on for decades are no longer able to maintain tactical relevance in the digital era of low power radars with digital waveforms. Tactical decision makers are unable to maintain awareness of the EW spectrum with current systems. Without significant investment in TI-20, the Submarine Navy will not be able to maintain littoral presence, conduct Anti-Access Area Denial operations, coordinated strike operations, joint ISR, and SOF support. -- Commence integration of EW Payloads into the AN/BLQ-10 system to interface with the TI-20 system. -- Commence development of a digital Early Warning Receiver as part of the TI-20 system. -- Complete TI-16 developmental testing on the Server-Based Radar Narrow Band (SB-RNB) and EW portions of the Low-Profile Photonics Mast. -- Update AN/BLQ-10 software baseline changes for SWFTS and NPES, SPR Resolution and Software Enhancement via the Advanced Processor Build (APB) process to fully utilize the new technology being fielded in TI-20 with broader spectrum digitization. -- Continue development of TI-20 capabilities for MMM payload EW System, EW Server, DF improvements, and Communications Digital Aperture Correlation and Emitter improvements. -- Develop advanced technology demonstrations for feasibility of systems capable of meeting later increments of AN/BLQ-10 for performance and digital data delivery. -- Continue TI-20 configuration, architecture documentation and software design. -- Conduct testing for MMM Payload, SLD buoy, improvements to emitter algorithms and improvements to correlation algorithms, improvements to vulnerability assessment algorithms. Tests include side by side laboratory testing, at sea testing (inclusive of TEMPALT development and crew training), fleet experimentation coordination and support, and technology demonstrations. -- Update the MMM Payload to meet emerging Fleet needs and integrate into the AN/BLQ-10 system and combine Gen 1 MMM Payload capabilities with TDL communications capabilities.					
FY 2019 OCO Plans: N/A					
FY 2018 to FY 2019 Increase/Decrease Statement: The $19M increase in funding from FY18 to FY19 is primarily to initiate MMM Payload development, TI-20 hardware and software development, design, integration of previously developed TI-20 technologies and other Non-Recurring Engineering efforts with industry and procure initial development hardware including racks,					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0775 / *Submarine Supt Equip Prog*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
cabling, RF simulators, downconverters, signal distribution modules, controls and display units, and initial integration hardware. This funding will support further digitization of the AN/BLQ-10 system with a completely new design removing stovepiped analogue subsystems and replacing them with digital components that allows for "spectrum as a service" usage.					
Accomplishments/Planned Programs Subtotals	13.118	9.117	28.408	0.000	28.408

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• SCN/2013: *VIRGINIA Class Submarine*	5,040.219	5,225.911	7,169.783	-	7,169.783	7,150.388	6,475.968	6,004.291	6,126.497	40,799.161	150,316.746
• RDT&E/0604558N: *New Design SSN*	127.883	120.087	148.233	-	148.233	118.539	194.800	232.977	277.239	Continuing	Continuing
• RDT&E/0603562N: *Submarine Tactical Warfare Sys*	8.603	13.834	9.374	-	9.374	11.314	11.551	13.365	12.031	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging and Supt Equip Prog*	151.963	151.240	178.421	-	178.421	199.590	224.643	215.012	255.918	Continuing	Continuing
• RDT&E/0603595N: *SSBN New Design*	681.164	776.158	514.846	-	514.846	433.296	313.445	196.082	173.611	Continuing	Continuing

Remarks

D. Acquisition Strategy

AN/BLQ-10 (V) EW System - Procurements are executed/managed in accordance with Acquisition Plan (Rev 10) for AN/BLQ-10(V) EW System dtd 02/01/17 and the Single Acquisition Management Plan dtd 06/12/14.

E. Performance Metrics

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

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware and Software Development	Various	Various : Various	0.000	2.500	Oct 2016	1.323	Oct 2017	1.349	Oct 2018	-		1.349	Continuing	Continuing	Continuing
Hardware and Software Development	WR	NUWC : Newport, RI	10.361	6.269	Oct 2016	1.423	Oct 2017	1.451	Oct 2018	-		1.451	Continuing	Continuing	Continuing
Hardware and S/W Development MMM Payload	C/FFP	Competitive : TBD	0.000	0.000		3.000	Oct 2017	3.570	Oct 2018	-		3.570	Continuing	Continuing	Continuing
Hardware and S/W Development:	C/CPIF	Competitive: : TBD	0.000	0.000		0.000		18.561	Oct 2018	-		18.561	Continuing	Continuing	Continuing
		Subtotal	10.361	8.769		5.746		24.931		-		24.931	Continuing	Continuing	N/A

Remarks

The growth from FY18 to FY19 is due to the RDTE funding line receiving a zero-sum transfer from OPN, starting in FY19, to provide for MMM Payload development and TI-20 hardware and software development. The MMM Payload will be developed in three successive generations adding capability as threats and requirements emerge. The first generation provides Unmanned Aerial Systems (UAS) capability. The second generation is planned to add Coherent Electronic Attack (CEAS) and TDL Communications to the UAS mission. The third generation will improve the ranges and reliability of these mission sets. The funding transfer from OPN to the RDTE funding line will be allocated between NUWC Newport and a new contract to be awarded in FY18.

PMS435 is expecting to award the TI-20 development contract near the beginning of FY19.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Support	WR	COTF : Norfolk, VA	0.514	0.275	Oct 2016	0.310	Oct 2017	0.320	Oct 2018	-		0.320	Continuing	Continuing	Continuing
Systems Engineering & Test Support	WR	NUWC : Newport, RI	3.740	4.074	Oct 2016	3.061	Oct 2017	3.157	Oct 2018	-		3.157	Continuing	Continuing	Continuing
		Subtotal	4.254	4.349		3.371		3.477		-		3.477	Continuing	Continuing	N/A

	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.615	13.118		9.117		28.408		-		28.408	Continuing	Continuing	N/A

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 0604503N / *SSN-688 & Trident Modernization*	Project (Number/Name) 0775 / *Submarine Supt Equip Prog*	

	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

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0775 / *Submarine Supt Equip Prog*

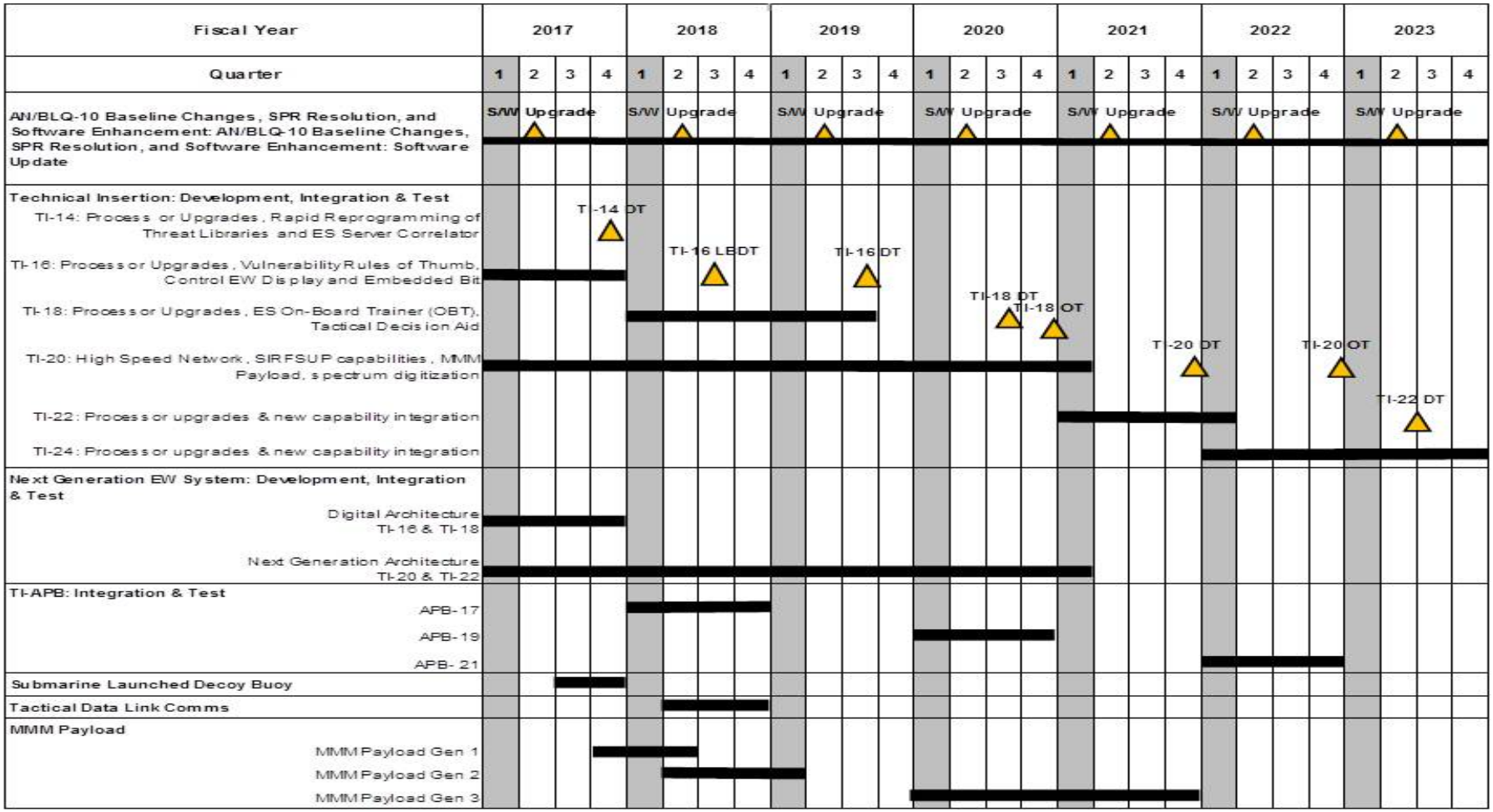

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0775 / *Submarine Supt Equip Prog*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0775				
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY17-18	2	2017	2	2017
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY18-19	2	2018	2	2018
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY19-20	2	2019	2	2019
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY20-21	2	2020	2	2020
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY21-22	2	2021	2	2021
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY22-23	2	2022	2	2022
AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: AN/BLQ-10 Baseline Changes, SPR Resolution, and Software Enhancement: Software Update: FY23-24	2	2023	2	2023
Technical Insertion: Development, Integration & Test: TI-14: Processor Upgrades, Rapid Reprogramming of Threat Libraries and ES Server Correlator: Developmental Testing	4	2017	4	2017

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Technical Insertion: Development, Integration & Test: TI-16: Processor Upgrades, Vulnerability Rules of Thumb, Control EW Display and Embedded Bit:	1	2017	4	2017
Technical Insertion: Development, Integration & Test: TI-16: Processor Upgrades, Vulnerability Rules of Thumb, Control EW Display and Embedded Bit: SB-RNB LBDT	3	2018	3	2018
Technical Insertion: Development, Integration & Test: TI-16: Processor Upgrades, Vulnerability Rules of Thumb, Control EW Display and Embedded Bit: SB-RNB DT	3	2019	3	2019
Technical Insertion: Development, Integration & Test: TI-18: Processor Upgrades, ES On-board Trainer (OBT) Tactical Decision Aid:	1	2018	3	2019
Technical Insertion: Development, Integration & Test: TI-18: Processor Upgrades, ES On-board Trainer (OBT) Tactical Decision Aid: Developmental Testing	3	2020	3	2020
Technical Insertion: Development, Integration & Test: TI-18: Processor Upgrades, ES On-board Trainer (OBT) Tactical Decision Aid: Operational Testing	4	2020	4	2020
Technical Insertion: Development, Integration & Test: TI-20: High Speed Network, SIRFSUP capabilities, MMM Payload, Spectrum Digitization:	1	2017	1	2021
Technical Insertion: Development, Integration & Test: TI-20: High Speed Network, SIRFSUP capabilities, MMM Payload, Spectrum Digitization: Developmental Testing	4	2021	4	2021
Technical Insertion: Development, Integration & Test: TI-20: High Speed Network, SIRFSUP capabilities, MMM Payload, Spectrum Digitization: Operational Testing	4	2022	4	2022
Technical Insertion: Development, Integration & Test: TI-22: Processor Upgrades and New Capability Integration:	1	2021	1	2022
Technical Insertion: Development, Integration & Test: TI-24: Processor Upgrades and New Capability Integration:	1	2022	4	2023
Next Generation EW System: Development, Integration & Test (DI&T): Digital Architecture: TI-16 & TI-18	1	2017	4	2017
Next Generation EW System: Development, Integration & Test (DI&T): Next Generation Architecture: TI-20 & TI-22	1	2017	1	2021
TI-APB: Integration & Test: APB-17:	1	2018	4	2018
TI-APB: Integration & Test: APB-19:	1	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 0775 / *Submarine Supt Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
TI-APB: Integration & Test: APB-21:	1	2022	4	2022
Submarine Launched Decoy Buoy: SLD Buoy:	3	2017	4	2017
Tactical Data Link Comms: Tactical Data Link Comms:	2	2018	4	2018
MMM Payload: MMM Payload Gen 1:	4	2017	2	2018
MMM Payload: MMM Payload Gen 2:	2	2018	1	2019
MMM Payload: MMM Payload Gen 3:	1	2020	4	2021

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 0604503N / *SSN-688 & Trident Modernization*				Project (Number/Name) 1411 / *Sub Tact Comm 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**
1411: *Sub Tact Comm System*	218.531	9.806	19.494	16.068	-	16.068	19.538	13.075	14.449	19.986	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 Nuclear Command, Control, and Communications (NC3), United States and allied/coalition military networks; (e) meet NC3 strategic messaging requirements; and (f) 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, NC3, 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 Increment 1 Version 4 is planned to address equipment obsolescence and End of Support issues. CSRR Increment 1 Version 5 modernizes critical NC3 components supporting the reception of Emergency Action Messages (EAMs) which are required for the Submarine Forces to execute Force Management and Force Execution of the fleet ballistic missile submarines (SSBNs). In addition, CSRR Inc1v5 modernizes obsolete/end-of-life/end-of-support C4I systems and infrastructure minimizing the risk of failure to NC3 and other tactical communication circuits.

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 enabling command and control (C2) in an environment where traditional communications are not available, thereby reducing platform susceptibility of detection and attack by the adversary and (2) Link 16, which provides an enhanced submarine communication system by providing a two-way Tactical Data Link (TDL) processing capability on all Submarine (Nuclear) (SSN), Guided Missile Submarine (Nuclear) (SSGN). 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, Nuclear Command, Control, and Communications (NC3), Joint, and allied/coalition fight to achieve total battlespace information dominance. These efforts are a continuation of the UAC2 and Link 16 efforts previously funded under the Submarine Integrated Antenna System Project (0742)/Advanced High Data Rate (HDR) and Antenna Transition Engineering program/project.

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

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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CSRR: Funding in FY19 will allow for development of CSRR Increment 1 Version 1, 3, and 4 architecture model databases in support of implementing Model Based Systems
Engineering (MBSE) for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class submarines; Environmental Qualification Testing (EQT) for CSRR Increment 1 Version 3 through Version 5; Test and evaluation efforts for CSRR Increment 1 Version 4 in support of a full fielding decision; Software development/upgrade for the Multi-purpose Reconfigurable Training System (MRTS) for CSRR Increment 1 Version 4 and 5; Implementation of Cybersecurity requirements and correction of Cybersecurity deficiencies for CSRR Increment 1 Version 4 and 5; Systems engineering development, modernization, and platform-specific Control and Management software development for Increment 1 Version 5; Development of a reconfigurable Platform Integration and Test Laboratory.

Undersea Assured Command & Control (UAC2): Funding in FY19 is to complete UAC2 Phase 2 Trade Study. Continue shore integration of UAC2 solution sets to support Department of Defense (DoD) Teleports and Department of Navy (DoN) Submarine Broadcast Control Authorities. Continue afloat integration of UAC2 solution sets on LOS ANGELES, OHIO-SSBN, OHIO-SSGN, VIRGINIA, and SEAWOLF Class submarines as well as Environmental Qualification Testing (EQT).

Link 16: Funding in FY19 is to continue systems engineering development of Link 16 tactical network communications capability. Continue Lab integration of the TDL processor with Multifunctional Information Distribution System (MIDS) Joint Tactical Radio System (JTRS) CMN-4 terminal into the submarine architecture. Commence EQT. Commence Submarine radio room to combat system design, development, and integration. Commence updates to applicable Acquisition Documentation to support Link 16.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Common Submarine Radio Room (CSRR)	9.806	10.994	10.616	0.000	10.616
Articles:	-	-	-	-	-
FY 2018 Plans: - Complete update to the CSRR Acquisition Strategy to reflect changes for Increment 1 Version 4 through Version 6. - Complete CSRR Increment 1 Version 4 systems engineering development and modernization for the LOS ANGELES, SSBN, VIRGINIA, SSGN, and SEAWOLF Class submarines. - Complete development of platform specific builds of Increment 1 Version 4 Control and Management software for LOS ANGELES, SSBN, VIRGINIA, SSGN, and SEAWOLF Class capabilities. - Complete development of the Test and Evaluation Master Plan (TEMP) and all preparations for Increment 1 Version 4 Developmental Test (DT) and Operational Test (OT) events. - Complete contract planning and award Control and Management Software contract. - Continue Multi-purpose Reconfigurable Training System (MRTS) software upgrade for Increment 1 Version 4 CSRR baseline for LOS ANGELES, SSBN, and SSGN Class operator trainer and VIRGINIA Class maintenance trainer					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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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 implementation of Increment 1 Version 4 security upgrades to meet Cybersecurity and multiple certification requirements for General Service (GENSER) and Sensitive Compartmented Information (SCI) for all CSRR platforms. - Continue Federal Information Security Management Act (FISMA) statutory requirement for Cybersecurity compliance and correction of Increment 1 Version 1 through Version 4 Cybersecurity deficiencies. - Continue Supply Chain Risk Management (SCRM) assessment as part of Program Protection Plan (PPP) revision. - Commence CSRR Increment 1 Version 5 systems engineering development and modernization for the LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class submarines. - Commence development of platform specific builds of Increment 1 Version 5 Control and Management software for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class capabilities. - Commence implementation of Increment 1 Version 5 security upgrades to meet Cybersecurity and multiple certification requirements for GENSER and SCI for all CSRR platforms. - Commence Federal Information Security Management Act (FISMA) statutory requirement for Cybersecurity compliance of Increment 1 Version 5 Cybersecurity deficiencies.					
FY 2019 Base Plans: CSRR Increment 1 Version 4 efforts: - Complete Multi-purpose Reconfigurable Training System (MRTS) software upgrade for LOS ANGELES, OHIO-SSBN, and OHIO-SSGN Class operator trainer and VIRGINIA Class maintenance trainer - Commence/Complete Test & Evaluation (T&E) on the LOS ANGELES, OHIO-SSBN, OHIO-SSGN, VIRGINIA, and SEAWOLF Class submarines. - Commence/Complete required SSBN Class Emergency Action Message (EAM) certification testing, data analysis and Targeting Change Message (TCM) testing. - Commence/Complete successful Full Fielding Decision - Complete implementation of security upgrades to meet Cybersecurity and multiple certification requirements for General Service (GENSER) and Sensitive Compartmented Information (SCI) for all CSRR platforms. CSRR Increment 1 Version 5 efforts: - Continue engineering development and modernization for the LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class submarines. - Continue development of platform specific builds of Control and Management software for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class capabilities.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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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 implementation of security upgrades to meet Cybersecurity and multiple certification requirements for GENSER and SCI for all CSRR platforms. - Continue FISMA statutory requirement for Cybersecurity compliance of Cybersecurity deficiencies. - Commence MRTS software upgrade for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class operator trainer and VIRGINIA Class maintenance trainer. Respective CSRR Increment 1 Versions: - Complete Federal Information Security Management Act (FISMA) statutory requirement for Cybersecurity compliance and correction of Increment 1 Version 1 through Version 4 Cybersecurity deficiencies. - Commence Environmental Qualification Testing (EQT) for CSRR Increment 1 Version 3 through Version 5. - Commence development of CSRR Increment 1 Version 1, 3, and 4 architecture model databases in support of implementing Model Based Systems Engineering (MBSE) for LOS ANGELES, OHIO-SSBN, OHIO-SSGN, COLUMBIA, VIRGINIA, and SEAWOLF Class submarines. - Continue Supply Chain Risk Management (SCRM) assessment as part of Program Protection Plan (PPP) revision. - Commence development of a reconfigurable Platform Integration and Test Laboratory. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - Decrease from FY18 to FY19 is due to the completion of CSRR Increment 1 Version 4 (Inc1v4) systems engineering development and modernization. Efforts to support the development of platform specific builds of Inc1v4 Control and Management (C&M) software, award of C&M software contract, development of the Test and Evaluation Master Plan (TEMP), and update to the CSRR Acquisition Strategy that occurred in FY18 are no longer required in FY19. CSRR Inc1v4 will complete a successful full fielding decision in FY19.					
Title: Undersea Assured Command & Control (UAC2)	0.000	6.000	1.973	0.000	1.973
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue/Complete UAC2 technology development phase 1. - Commence UAC2 Phase 2 Trade Study Development. Previously funded under the Submarine Integrated Antenna System Project (0742)/Advanced High Data Rate (HDR) program/project. - Commence shore integration of UAC2 solution sets to support Department of Defense (DoD) Teleports.					

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Commence shore integration of UAC2 solution sets to support Department of Navy (DoN) Submarine Broadcast Control Authority. - Commence afloat integration of UAC2 solution sets on LOS ANGELES, OHIO-SSBN, OHIO-SSGN, VIRGINIA, and SEAWOLF Class submarines. - Commence Environmental Qualification Testing (EQT). ***FY 2019 Base Plans:*** - Complete UAC2 Phase 2 Trade Study Development. - Continue shore integration of UAC2 solution sets to support DoD Teleports. - Continue shore integration of UAC2 solution sets to support DoN Submarine Broadcast Control Authority. - Continue afloat integration of UAC2 solution sets on LOS ANGELES, OHIO-SSBN, OHIO-SSGN, VIRGINIA, and SEAWOLF Class submarines. - Continue Environmental Qualification Testing. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - Decrease from FY18 to FY19 is due to the completion of UAC2 technology development for Solution 1. Environmental qualification testing (EQT), initial integration and testing within Common Submarine Radio Room (CSRR), Temporary Alteration (TEMPALT) documentation development, and Enterprise Change Request (ECR) development, all for five submarine classes, that occurred in FY18 are no longer required in FY19. Solution 1 is being procured in FY18 with an Initial Operational Capability Q4 FY18.					
Title: Link 16	0.000	2.500	3.479	0.000	3.479
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue/Complete Link 16 tactical network communications capability Analysis of Alternatives (AoA). - Commence systems engineering development of Link 16 tactical network communications capability. - Commence Lab integration of the Tactical Data Link (TDL) processor with Multifunctional Information Distribution System (MIDS) into the submarine architecture. ***FY 2019 Base Plans:*** - Continue systems engineering development of Link 16 tactical network communications capability. - Continue Lab integration of the TDL processor with MIDS into the submarine architecture.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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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
- Commence Environmental Qualification Testing (EQT). - Commence Submarine radio room to combat system design, development, and integration. - Commence updates to applicable Acquisition Documentation to support Link 16. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** - Increase from FY18 to FY19 is to support Link 16 Environmental Qualification Testing (EQT), initial integration and testing within Common Submarine Radio Room (CSRR), alteration documentation development, and Enterprise Change Request (ECR) development, all for four submarine classes.					
Accomplishments/Planned Programs Subtotals	9.806	19.494	16.068	0.000	16.068

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/3130: *Submarine Communication Equipment*	62.305	86.204	78.580	-	78.580	73.630	64.510	62.011	60.158	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging and Supt Equip Prog*	151.963	151.240	178.421	-	178.421	199.590	224.643	215.012	255.918	Continuing	Continuing

Remarks

D. Acquisition Strategy

CSRR Program Milestones: Increment 1 Version 4 Critical Design Review (CDR) 1Q FY18, Developmental Test (DT) 1Q FY19, Operational Test (OT) 2Q FY19, Fielding Decision 3Q FY19. Increment 1 Version 5 PDR 4Q FY20, CDR 4Q FY21, DT 1Q FY22, OT 2Q FY22, and Fielding Decision 3Q FY22. Acquisition Decision Memorandum signed by Assistant Secretary of Navy for Research, Development & Acquisition dated 15 July 2008 approved consolidating Increments 1 and 2 to a single Increment 1 with multiple block upgrades (Versions). CSRR is currently post Milestone C and in Full Rate Production (FRP) and Deployment until FY 2030.

Link 16 Program Milestones: Developmental Test (DT) 1Q FY21, Operational Test (OT) 2Q FY21. Requirements documented in Commander Naval Surface Force (CNSF) letter dated 24 October 2005.

E. Performance Metrics

FY19 CSRR: Complete successful Full Fielding Decision for Increment 1 Version 4.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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FY19 UAC2: Complete UAC2 Phase 2 Trade Study.
FY19 Link 16: Continue systems engineering development of Link 16 tactical network communications capability.

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Multi-Purpose Reconfigurable Training System (MRTS) Development (CSRR)	WR	SSC LANT : Charleston, SC	4.091	1.038	Dec 2016	1.332	Dec 2017	1.359	Dec 2018	-		1.359	Continuing	Continuing	Continuing
Systems Eng/Design Increment 1 (CSRR)	WR	NUWC : Newport, RI	13.791	4.142	Jan 2017	4.535	Jan 2018	4.626	Jan 2019	-		4.626	Continuing	Continuing	Continuing
Site Platform Integration/ Certification (CSRR)	WR	NUWC : Newport, RI	13.067	0.145	Jan 2017	0.156	Jan 2018	0.247	Jan 2019	-		0.247	Continuing	Continuing	Continuing
Software Development (CSRR)	C/CPFF	TBD : TBD	0.000	0.000		0.709	Mar 2018	1.912	Mar 2019	-		1.912	Continuing	Continuing	Continuing
Software Development (CSRR)	C/CPIF	Lockheed Martin : San Diego, CA	8.673	2.338	Mar 2017	1.832	Nov 2017	0.000		-		0.000	0.000	12.843	11.011
Systems Eng/Integration (UAC2)	WR	NUWC : Newport, RI	0.000	0.000		2.350	Nov 2017	0.850	Nov 2018	-		0.850	Continuing	Continuing	Continuing
Design (UAC2)	WR	SSC PAC : San Diego, CA	0.000	0.000		1.200	Mar 2018	0.350	Nov 2018	-		0.350	Continuing	Continuing	Continuing
Hardware Development (Link 16)	C/CPFF	TBD : TBD	0.000	0.000		0.500	Mar 2018	0.426	Nov 2018	-		0.426	Continuing	Continuing	Continuing
Systems Engineering (Link 16)	WR	NUWC : Newport, RI	0.000	0.000		0.750	Nov 2017	1.510	Nov 2018	-		1.510	Continuing	Continuing	Continuing
Site Platform integration/ Certification (Link 16)	WR	NUWC : Newport, RI	0.000	0.000		0.560	Nov 2017	0.571	Nov 2018	-		0.571	Continuing	Continuing	Continuing
Software Development (Link 16)	C/CPFF	TBD : TBD	0.000	0.000		0.420	Mar 2018	0.344	Nov 2018	-		0.344	Continuing	Continuing	Continuing
Product Development Prior Years	Various	Various : Various	124.155	0.000		0.000		0.000		-		0.000	0.000	124.155	124.155
		Subtotal	163.777	7.663		14.344		12.195		-		12.195	Continuing	Continuing	N/A

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 0604503N / *SSN-688 & Trident Modernization*	Project (Number/Name) 1411 / *Sub Tact Comm System*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Logistics Support (CSRR)	WR	NUWC : Newport, RI	3.880	0.268	Nov 2016	0.290	Nov 2017	0.296	Nov 2018	-		0.296	Continuing	Continuing	Continuing
Software Engineering (CSRR)	WR	SSC PAC : San Diego, CA	3.836	0.207	Nov 2016	0.248	Nov 2017	0.253	Nov 2018	-		0.253	Continuing	Continuing	Continuing
Information Security/ Cyber Security (INFOSEC) Certification/Supply Chain Risk Management (SCRM) Assessment (CSRR)	Various	SSC PAC/SSC LANT/NUWC/ MITRE : San Diego, CA/Charleston, SC/ Newport, RI/San Diego	24.377	1.076	Nov 2016	1.212	Nov 2017	1.236	Nov 2018	-		1.236	Continuing	Continuing	Continuing
Integrated Logistics Support (UAC2)	WR	NUWC : Newport, RI	0.000	0.000		0.650	Nov 2017	0.250	Nov 2018	-		0.250	Continuing	Continuing	Continuing
Trade Study (UAC2)	WR	MITRE : San Diego, CA	0.000	0.000		0.500	Nov 2017	0.300	Nov 2018	-		0.300	0.000	0.800	0.500
Integrated Logistics Support (Link 16)	WR	NUWC : Newport, RI	0.000	0.000		0.050	Nov 2017	0.200	Nov 2018	-		0.200	Continuing	Continuing	Continuing
Software Engineering (Link 16)	WR	SSC PAC : San Diego, CA	0.000	0.000		0.045	Nov 2017	0.245	Nov 2018	-		0.245	Continuing	Continuing	Continuing
		Subtotal	32.093	1.551		2.995		2.780		-		2.780	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental/ Operational Test and Evaluation (T&E) (CSRR)	WR	COTF, JITC : Various	11.285	0.000		0.060	Nov 2017	0.061	Nov 2018	-		0.061	Continuing	Continuing	Continuing
Test and Evaluation (T&E) (UAC2)	WR	COTF, JITC : Various	0.000	0.000		0.700	Nov 2017	0.023	Nov 2018	-		0.023	Continuing	Continuing	Continuing
Developmental/ Operational Test and Evaluation (T&E) (Link 16)	WR	COTF, JITC : Various	0.000	0.000		0.025	Nov 2017	0.030	Nov 2018	-		0.030	Continuing	Continuing	Continuing

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 0604503N / *SSN-688 & Trident Modernization*	Project (Number/Name) 1411 / *Sub Tact Comm System*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			11.285	0.000		0.785		0.114		-		0.114	Continuing	Continuing	N/A

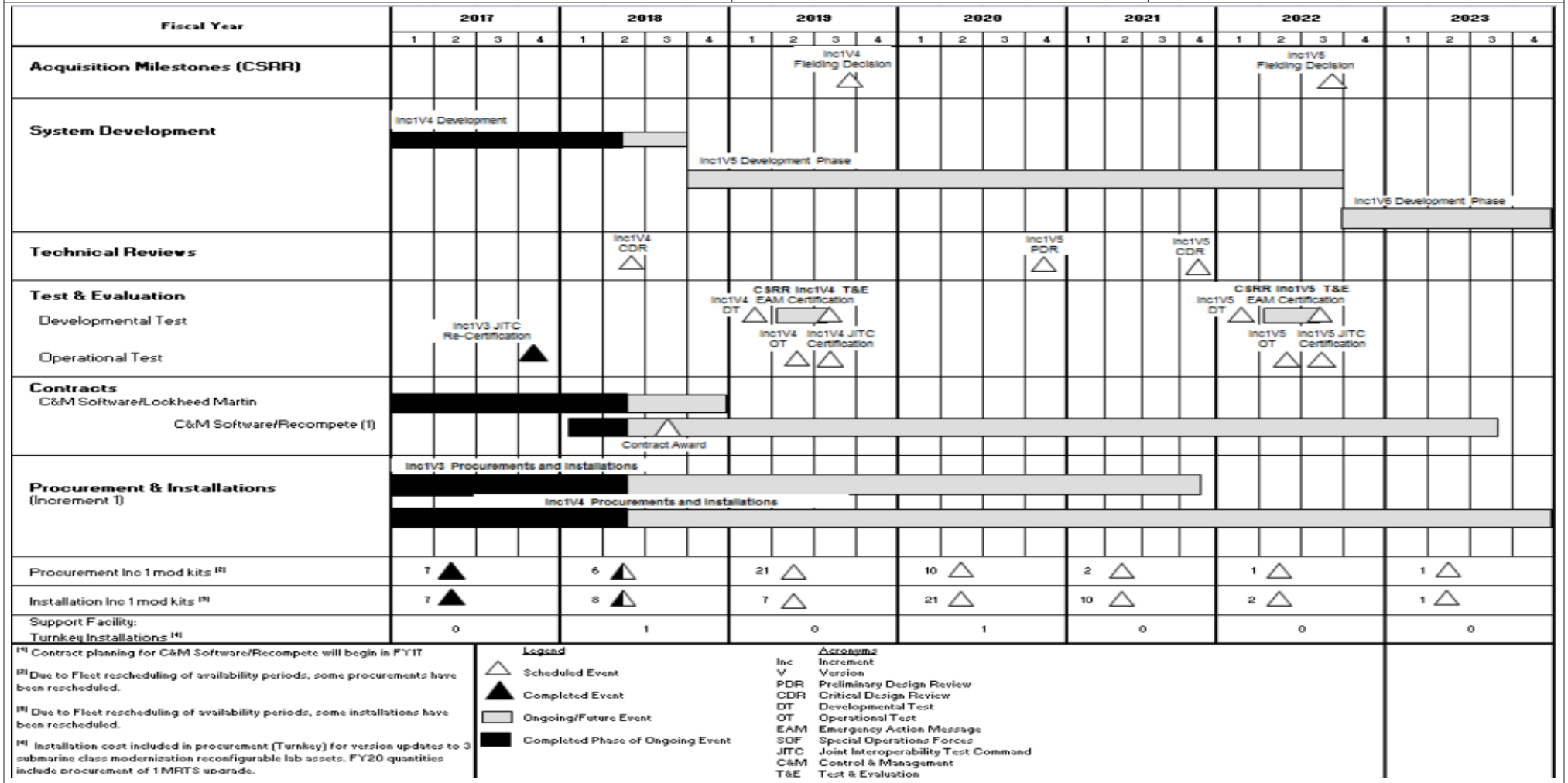
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support (CSRR)	C/CPFF	CSA : San Diego, CA	11.376	0.592	Nov 2016	0.620	Nov 2017	0.626	Nov 2018	-		0.626	Continuing	Continuing	Continuing
Program Management Support (UAC2)	C/CPFF	CSA : San Diego, CA	0.000	0.000		0.600	Nov 2017	0.200	Nov 2018	-		0.200	Continuing	Continuing	Continuing
Program Management Support (Link 16)	C/CPFF	CSA : San Diego, CA	0.000	0.000		0.150	Nov 2017	0.153	Nov 2018	-		0.153	Continuing	Continuing	Continuing
Subtotal			11.376	0.592		1.370		0.979		-		0.979	Continuing	Continuing	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	218.531	9.806		19.494		16.068		-		16.068	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*



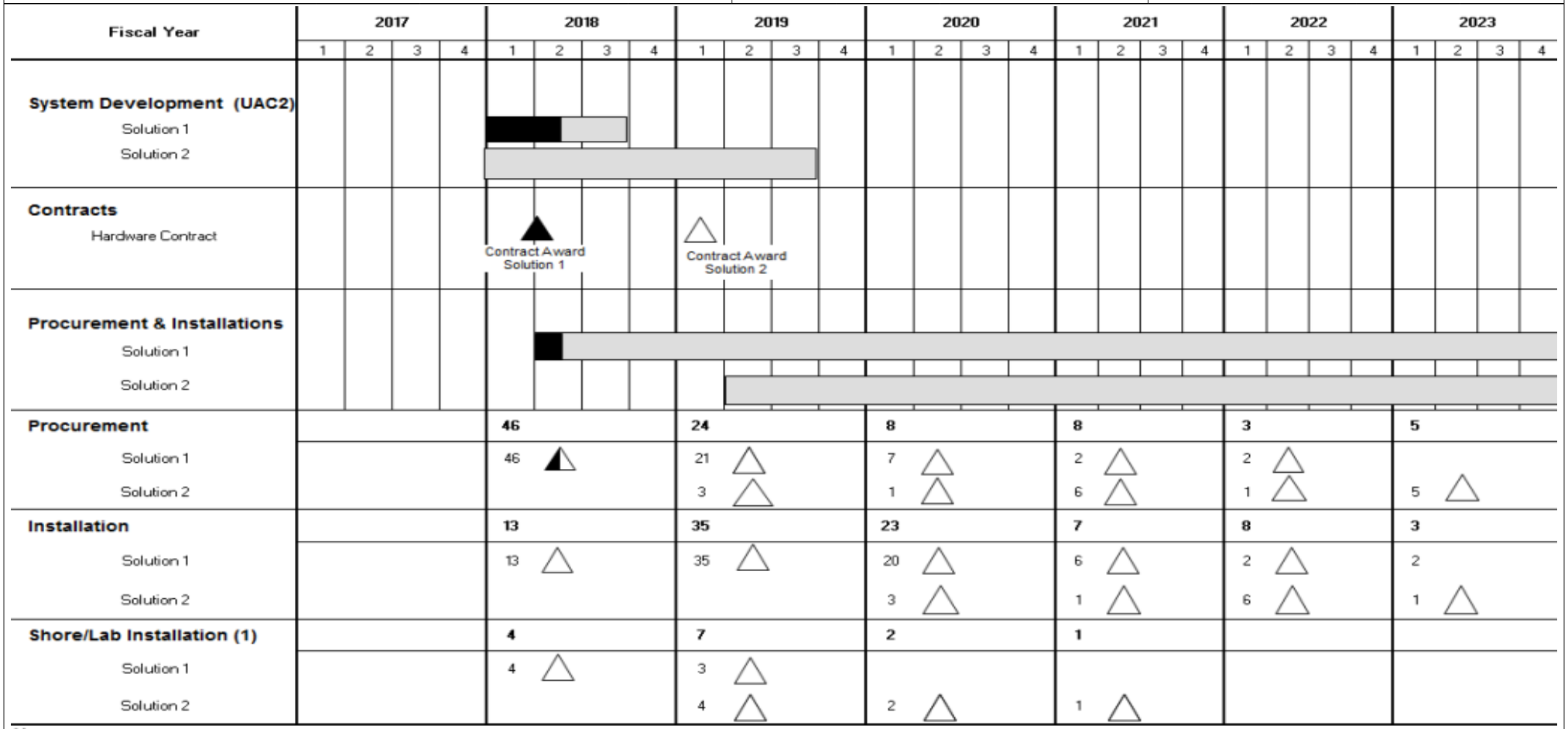
[1] Contract planning for C&M Software/Recompete will begin in FY17

[2] Due to Fleet rescheduling of availability periods, some procurements have been rescheduled.

[3] Due to Fleet rescheduling of availability periods, some installations have been rescheduled.

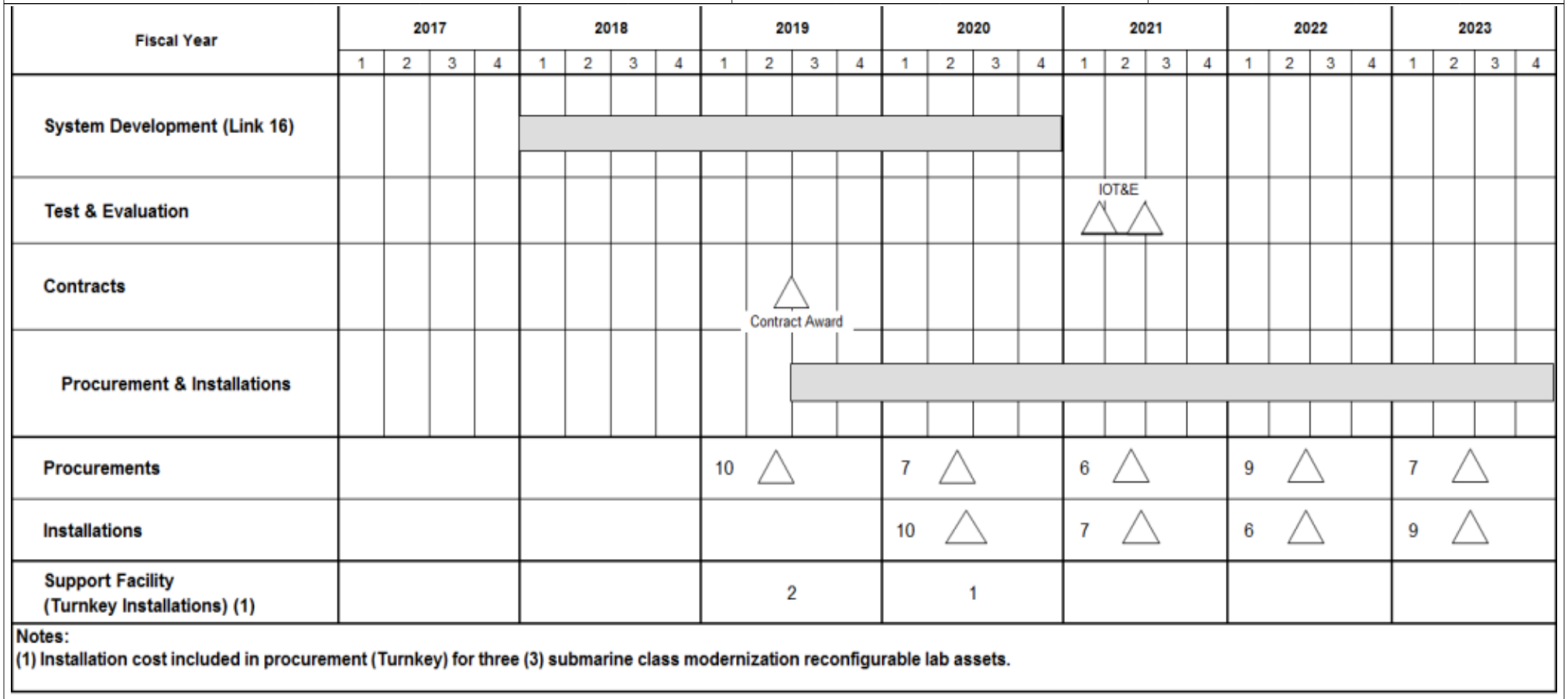
[4] Installation cost included in procurement (Turnkey) for version updates to 3 submarine class modernization reconfigurable lab assets. FY20 quantities include procurement of 1 MRTS upgrade.

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*



Notes:
(1) Installation cost included in procurement (Turnkey) for three (3) submarine class modernization reconfigurable lab assets and four (4) Shore sites.

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*



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

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1411				
Fielding Decision (Increment 1 Version 4)	3	2019	3	2019
Fielding Decision (Increment 1 Version 5)	3	2022	3	2022
Technical Reviews (Increment 1 Version 4 Critical Design Review (CDR))	2	2018	2	2018
Technical Reviews (Increment 1 Version 5 Preliminary Design Review (PDR))	4	2020	4	2020
Technical Reviews (Increment 1 Version 5 Critical Design Review (CDR))	4	2021	4	2021
System Development (Increment 1 Version 4)	1	2017	3	2018
System Development (Increment 1 Version 5)	4	2018	3	2022
System Development (Increment 1 Version 6)	4	2022	4	2023
Contracts (Software---Lockheed Martin)	1	2017	4	2018
Contracts (Software-Recompete)	1	2018	3	2023
Emergency Action Message (EAM) Certification (Increment 1 Version 4)	2	2019	3	2019
Emergency Action Message (EAM) Certification (Increment 1 Version 5)	2	2022	3	2022
Increment 1 Version 3 Joint Interoperability Test Command (JITC) Re-Certification	4	2017	4	2017
Increment 1 Version 4 Joint Interoperability Test Command (JITC) Re-Certification	3	2019	3	2019
Increment 1 Version 5 Joint Interoperability Test Command (JITC) Re-Certification	3	2022	3	2022
Developmental Test (DT) (Increment 1 Version 4)	1	2019	1	2019
Operational Test (OT) (Increment 1 Version 4)	2	2019	2	2019
Developmental Test (DT) (Increment 1 Version 5)	1	2022	1	2022
Operational Test (OT) (Increment 1 Version 5)	2	2022	2	2022
Procurement/Installation (Increment 1 Version 3 Modernization Kits)	1	2017	4	2021
Procurement/Installation (Increment 1 Version 4 Modernization Kits)	1	2017	4	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 1411 / *Sub Tact Comm System*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
System Development (Undersea Assured Command & Control (UAC2) Solution 1)	1	2018	3	2018
System Development (UAC2) Solution 2)	1	2018	3	2019
Contract Award (UAC2) Solution 1)	2	2018	2	2018
Contract Award (UAC2) Solution 2)	1	2019	1	2019
Procurement/Installation (UAC2) Solution 1)	2	2018	4	2023
Procurement/Installation (UAC2) Solution 2)	2	2019	4	2023
System Development (Link 16)	1	2018	4	2020
Contract Award (Link 16)	2	2020	2	2020
Initial Operational Test and Evaluation (IOT&E) (Link 16)	1	2021	2	2021
Procurement (Link 16)	3	2019	4	2023

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 0604503N / *SSN-688 & Trident Modernization*	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*	0.000	6.770	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.770
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018
Congressional Add: Program Increase	6.770	0.000
FY 2017 Accomplishments: -- Developed and integrated the required software and hardware solutions into the AN/BLQ-10 Electronic Warfare (EW) System that enabled improved human to machine interface (HMI) in the areas of RADAR low probably of interception (LPI), onboard training (OBT) and data recording. -- Developed the EW Tactical TempAlt to deliver EW Server HMI improvements in the areas of RADAR LPI, RADAR narrowband and communications acquisition and direction finding (CADF) signal processing.		
FY 2018 Plans: N/A		
Congressional Adds Subtotals	6.770	0.000

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• RDTE/0604503N: *SSN-688 & Trident Modernization*	13.118	9.117	28.408	-	28.408	15.206	14.906	13.985	14.272	Continuing	Continuing
• SCN/2013: *VIRGINIA Class Submarine*	49.168	50.406	51.414	-	51.414	52.442	53.645	54.667	55.706	Continuing	Continuing
• RDT&E/0604558N: *New Design SSN Combat Sys Development*	8.152	1.000	1.020	-	1.020	1.040	1.061	1.082	1.104	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging and Supt Equip Prog*	151.963	151.240	178.421	-	178.421	199.590	224.643	215.012	255.918	Continuing	Continuing
• RDT&E/0603595N: *Advanced Submarine System Development*	2.966	2.956	1.965	-	1.965	0.617	0.820	0.974	0.993	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

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

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 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 9999 / *Congressional Adds*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
H/W & S/W Development	WR	NUWC : Newport, RI	0.000	0.524	Jul 2017	0.000		0.000		-		0.000	0.000	0.524	-
HW & SW Development	C/CPFF	Progeny : Manassas, VA	0.000	5.801	Jul 2017	0.000		0.000		-		0.000	0.000	5.801	-
		Subtotal	0.000	6.325		0.000		0.000		-		0.000	0.000	6.325	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering and Test Support	WR	NUWC : Newport, RI	0.000	0.445	Jul 2017	0.000		0.000		-		0.000	0.000	0.445	-
		Subtotal	0.000	0.445		0.000		0.000		-		0.000	0.000	0.445	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	0.000	6.770		0.000		0.000		-		0.000	0.000	6.770	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 9999 / *Congressional Adds*

Fiscal Year	2017				2018				2019				2020				2021				2022				2023			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
SBIR Topic N151-036 Manning Reduction and Automation																												
SBIR Topic N151-036 Next Generation Electronic Warfare Human Machine Interface for Submarines																												
EW Server Development and Side-by-Side Digital Server Based-Radar Narrow Band (SB-RNB) technology testing																												

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604503N / *SSN-688 & Trident Modernization*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
AN/BLQ-10A EW Server Build: SBIR Topic N151-036 Manning Reduction and Automation	4	2017	1	2018
AN/BLQ-10A EW Server Build: SBIR Topic N151-036 Next Generation Electronic Warfare Human Machine Interface for Submarines	1	2018	2	2018
AN/BLQ-10A EW Server Build: EW Server Development and Side-by-Side Digital Server Based-Radar Narrow Band (SB-RNB) technology testing	4	2017	1	2018