Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy											Date: February 2020	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604756N *I Ship Self Def (Engage: Hard Kill)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	1,158.678	185.971	115.130	121.761	-	121.761	96.206	60.317	41.161	41.989	Continuing	Continuing
0167: *5in Rolling Airframe Missile*	299.249	25.282	21.956	6.170	-	6.170	4.083	4.171	4.256	4.343	Continuing	Continuing
0173: *NATO Sea Sparrow*	801.217	83.977	72.373	89.217	-	89.217	80.941	47.890	36.905	37.646	Continuing	Continuing
0243: *ALaMO*	40.635	23.792	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	64.427
2070: *OTH Missile*	0.000	19.307	12.401	26.374	-	26.374	11.182	8.256	0.000	0.000	0.000	77.520
9081: *Phalanx CIWS SEARAM*	17.577	9.495	8.400	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	35.472
9999: *Congressional Adds*	0.000	24.118	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.118

A. Mission Description and Budget Item Justification

This program element provides funding for the development of systems that fulfill a portion of the third phase of the Ship Self Defense: Engage Hard Kill. Development in this line will focus on hard kill capabilities in which missiles are used to intercept incoming Anti-Ship Cruise Missiles (ASCM), as well as a Surface-to Surface Strike weapon system. Missile and system improvements necessary to meet their requirements are being addressed via NATO SEASPARROW Missile System (NSSMS) (0173), Rolling Airframe Missile (RAM) (0167), Advanced Low Cost Munition Ordnance (ALaMO) (0243), Over-The-Horizon (OTH) missile (2070), and Phalanx Close-In Weapon System (CIWS) SeaRAM (9081). Missile improvements include improved kinematic performance plus advanced seeker and low elevation fusing/warhead capability improvements. CIWS System improvements include Technology Refresh for current and future fleet population. ALaMO (0243) qualifies a guided 57mm projectile with an active seeker for United States Navy (USN) use. ALaMO provides enhanced lethality against Fast In-shore Attack Craft (FIAC) when compared to existing 57mm ammunition.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	193.244	137.268	121.853	-	121.853
Current President's Budget	185.971	115.130	121.761	-	121.761
Total Adjustments	-7.273	-22.138	-0.092	-	-0.092
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-22.138			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-7.273	0.000			
• Rate/Misc Adjustments	0.000	0.000	-0.092	-	-0.092

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604756N *I Ship Self Def (Engage: Hard Kill)*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: 9999: *Congressional Adds*		
Congressional Add: *Condition Based Maintenance*	7.718	0.000
Congressional Add: *Next Generation Phalanx*	6.753	0.000
Congressional Add: *Alamo Munition Systems*	9.647	0.000
Congressional Add Subtotals for Project: 9999	24.118	0.000
Congressional Add Totals for all Projects	24.118	0.000

Change Summary Explanation

FY20 decrease of $22.138M due to reduction for OTH Missile excess test assets, Blk 2 obsolescence/redesign early to need and MK 73 tracker-illuminator unjustified new start.

FY21 decrease of $0.092M due to small rate adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0167 / *5in Rolling Airframe Missile*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
0167: *5in Rolling Airframe Missile*	299.249	25.282	21.956	6.170	-	6.170	4.083	4.171	4.256	4.343	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The RAM program is an international cooperative program with the government of the Federal Republic of Germany. The purpose of this program is to develop, test, and field a surface to-air self-defense system utilizing a dual mode, passive radio frequency/infrared RAM. The baseline system RAM Block 0/1/1A provide defense capability against active and passive anti-ship missiles, very low altitude missiles, and maneuvering missiles through the utilization of passive radio frequency and infrared seekers and a maritime optimized fuse. The RAM Block 2 upgrade programs are a cooperative requirement of the U.S. and Federal Republic of Germany, as agreed to in an international Memorandum of Understanding (MOU), and allows RAM to counter emerging, highly maneuverable ASCM threats utilizing advanced seekers while maintaining all the proven capabilities of RAM Block 0/1/1A's accurate terminal guidance, proven lethality, and no shipboard post launch dependence. The first Block 2 upgrade, the RAM BLK 2A Fire Control Loop Improvement Project (FCLIP) ECP provided software only modifications to the missile and launcher to improve raid performance. The second Block 2 upgrade, RAM BLK 2B Raid ECP will provide an upgraded seeker and Missile-to-Missile Link (MML) capability to counter emerging complex raid threats. Development and ground and flight testing of RAM BLK 2B Raid ECP will occur through FY 2022. Funding supports missile/launcher engineering development and testing scheduled through FY 2022, data analysis, operational/test driven studies, support of combat system performance analysis and identification of operationally relevant improvements.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Rolling Airframe Missile Block 2 Development and Test	25.282	21.956	6.170	0.000	6.170
Articles:	-	-	-	-	-
FY 2020 Plans: Integrate new seeker and MML in All Up Round (AUR)in preparation for flight testing. Execute Control Test Vehicle (CTV) 1A in Q1 followed by CTV1B in Q4 FY20. Conduct post flight analysis incorporating changes into new flight software builds.					
FY 2021 Base Plans: Execute Guided Tests Vehicle (GTV) 1A and 1C development flights in Q2 FY21. Execute GTV2B development flight test in Q2 FY21.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
The FY20 to FY21 decrease due to more of the Cooperative US/German RAM Block 2B Development Program being funded by Germany in FY21. In the RAM Development US/German international agreement (MOU), the US paid more in the early years of development and Germany funds more on the back end.					
Accomplishments/Planned Programs Subtotals	25.282	21.956	6.170	0.000	6.170

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• WPN 2242: *RAM*	96.221	106.765	90.533	-	90.533	94.280	107.616	112.159	114.400	Continuing	Continuing
• OPN 5231: *Ship Missile Support Equipment*	9.758	7.464	9.930	-	9.930	7.209	6.875	6.969	7.102	Continuing	Continuing

Remarks

D. Acquisition Strategy

The RAM Program uses directed sole source contracts with Raytheon Missile Systems Company, Tucson, AZ.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Block 2 Upgrade	C/CPAF	Various : Various	154.650	0.000		0.000		0.000		-		0.000	0.000	154.650	-
Primary Hardware Dev/Blk 1	Various	Various : Various	10.081	0.000		0.000		0.000		-		0.000	0.000	10.081	-
FCLIP	WR	PHD : CA	0.193	0.584	Dec 2018	0.000		0.000		-		0.000	0.000	0.777	-
FCLIP	SS/CPFF	AECOM : VA	0.717	0.265	Dec 2018	0.244	Dec 2019	0.000		-		0.000	0.000	1.226	-
Raid ECP	SS/CPFF	Raytheon : Tucson/ Louisville	41.297	15.299	Dec 2018	18.162	Dec 2019	4.448	Dec 2020	-		4.448	0.000	79.206	-
FCLIP	SS/CPFF	Raytheon : Tucson/ Louisville	36.825	2.569	Dec 2018	1.169	Dec 2019	0.000		-		0.000	0.000	40.563	-
Raid ECP	SS/CPFF	JHU/APL : MD	0.655	0.360	Dec 2018	0.050	Dec 2019	0.050	Dec 2020	-		0.050	0.000	1.115	-
FCLIP	WR	China Lake : CA	5.047	3.230	Nov 2018	0.458	Nov 2019	0.000		-		0.000	0.000	8.735	-
Raid ECP	WR	China Lake : CA	1.638	1.115	Nov 2018	0.380	Nov 2019	0.380	Nov 2020	-		0.380	0.000	3.513	-
FCLIP	SS/CPFF	JHU/APL : MD	0.417	0.175	Dec 2018	0.100	Dec 2019	0.000		-		0.000	0.000	0.692	-
Raid ECP	WR	PHD : CA	0.050	0.000		0.000		0.000		-		0.000	0.000	0.050	-
Raid ECP	SS/CPFF	AECOM : VA	0.713	0.491	Dec 2018	0.378	Dec 2019	0.378	Dec 2020	-		0.378	0.000	1.960	-
FCLIP	WR	PT Mugu : CA	0.025	0.000		0.000		0.000		-		0.000	0.000	0.025	-
FCLIP	WR	NSWC DD : VA	0.373	0.325	Dec 2018	0.146	May 2020	0.000		-		0.000	0.000	0.844	-
Various	Various	Various : Various	1.722	0.112	Sep 2019	0.112	Sep 2020	0.114	Sep 2021	-		0.114	0.000	2.060	-
		Subtotal	254.403	24.525		21.199		5.370		-		5.370	0.000	305.497	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies and Analysis	Various	Various : Various	1.410	0.200	May 2019	0.200	May 2020	0.000		-		0.000	0.000	1.810	-
		Subtotal	1.410	0.200		0.200		0.000		-		0.000	0.000	1.810	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0167 / *5in Rolling Airframe Missile*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Support	C/CPFF	Raytheon : Tucson	17.887	0.300	Nov 2018	0.300	Nov 2019	0.300	Nov 2020	-		0.300	0.000	18.787	-
Test Support	WR	China Lake/PHD : CA/CA	12.600	0.157	Oct 2018	0.157	Oct 2019	0.500	Oct 2020	-		0.500	Continuing	Continuing	Continuing
FOT&E	WR	China Lake : PHD, CA	4.701	0.000		0.000		0.000		-		0.000	0.000	4.701	-
Miscellaneous	Various	Various : Various	5.765	0.000		0.000		0.000		-		0.000	0.000	5.765	-
Test Support	SS/CPFF	JHU/APL : MD	0.617	0.100	Nov 2018	0.100	Nov 2019	0.000		-		0.000	0.000	0.817	-
Integration	Various	Various : Various	1.719	0.000		0.000		0.000		-		0.000	0.000	1.719	-
		Subtotal	43.289	0.557		0.557		0.800		-		0.800	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Defense Acquisition Workforce Development Fund	Various	various : various	0.147	0.000		0.000		0.000		-		0.000	0.000	0.147	-
		Subtotal	0.147	0.000		0.000		0.000		-		0.000	0.000	0.147	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	299.249	25.282		21.956		6.170		-		6.170	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

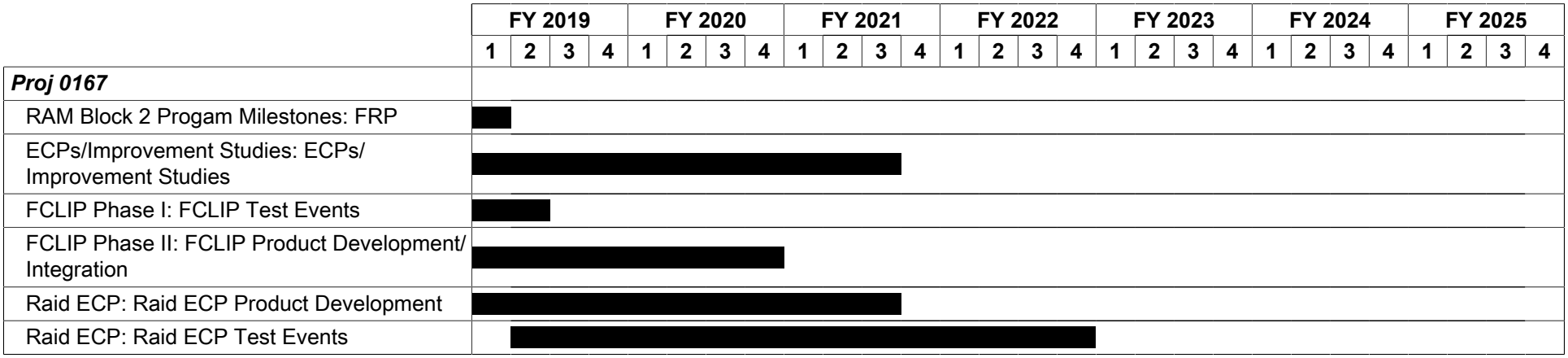

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0167				
RAM Block 2 Progam Milestones: FRP	1	2019	1	2019
ECPs/Improvement Studies: ECPs/Improvement Studies	1	2019	3	2021
FCLIP Phase I: FCLIP Test Events	1	2019	2	2019
FCLIP Phase II: FCLIP Product Development/Integration	1	2019	4	2020
Raid ECP: Raid ECP Product Development	1	2019	3	2021
Raid ECP: Raid ECP Test Events	2	2019	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0173 / *NATO Sea Sparrow*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
0173: *NATO Sea Sparrow*	801.217	83.977	72.373	89.217	-	89.217	80.941	47.890	36.905	37.646	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project encompasses fourteen (14) primary efforts to enhance ship self-defense:

1. Evolved SEASPARROW Missile (ESSM) Blk 1 is a cooperative effort among ten (10) NATO SEASPARROW Nations and the U.S. to provide crucial defense battlespace and fire power against the fast, low altitude, highly maneuverable Anti-Ship Cruise Missile (ASCM) threat. Modifications were made to both the MK 41 Vertical Launch System (VLS) to fire from a single cell with 4 ESSM (QuadPack) and the NATO SEASPARROW Surface Missile System (NSSMS), fielding ESSM Blk 1 onboard CVN 68, LHD 1, LHA 7, CG 47, and DDG 51 class ships. ESSM Blk 1 integration efforts continue to bring the capability to CVN 78 and DDG 1000. Testing scheduled for FY20 includes ESSM Blk 1 firings from the lead ship in support of DDG 1000 and CVN 78 class activation, AEGIS Baseline (B/L) 9C2 live fire testing, and Combat Systems Ship Qualification Trials (CSSQT) live fire tests aboard CVN 78 and LHA 7.

2. Blk 2 Follow-on Test & Evaluation (FOT&E): The ESSM Blk 2 Milestone Decision Authority mandated that ESSM Blk 2 conduct FOT&E on Ship Self-Defense System (SSDS) platform and fully support DDG flight III operational testing. Blk 2 Engineering and Manufacturing Development (EMD) and Transition To Production (TTP) shared consortium development efforts end in FY20. This is for US Sole Combat Systems integration testing including but not limited to: Aegis Baseline 10 integration, SSDS integration, and other potential (future Frigate) platform integration testing as required. This includes support with appropriate ESSM Blk 2 Missile Simulator Unit (MSU) with Raytheon Missile System operator support.

3. NATO SEASPARROW Technical Direction Agent (TDA): The MK 57 NATO SEASPARROW Surface Missile Systems (NSSMS) provides a rapid response, integrated, self-defense missile capability. The TDA is tasked with providing systems engineering and technical support for the MK 9 Tracker Illuminator System (TIS), and MK 29 Guided Missile Launching System (GMLS). The Combat System (CS) TDA is tasked with providing an Analysis of Alternatives (AoA), in the form of studies, analysis, and evaluations of hardware and software improvements. This task encompasses requirements development, and assessment, artifact and document reviews, technical meetings, and test requirement development, participation in test and system integration events, and post test analysis. RDT&E funding is necessary to complete AoA activities and develop recommendations, based on data, for improvements to the MK 9 TIS and MK 29 GMLS. Budget for FY2020 will be allocated for study, analysis, and evaluation completion. Budget for FY 2021 will be allocated to finalize improvement recommendation(s), and assist with development of strategic plans or technology insertion points.

4. Improved Stalker (I-Stalker) provides incremental improvements to the currently fielded Stalker Long Range Electro-Optic Sensor System (SLREOSS) in response to a 2016 United States Fleet Forces Command (USFFC) Operational Needs Statement (ONS). SLREOSS was developed as a modular, portable, form/fit replacement for the NATO Sea Sparrow Missile System (NSSMS) MK 6 Low Light Level Television (LLLTV) in response to the 2010 Naval Forces Central Command (NAVCENT) Counter Swarm Urgent Operational Need (UON) to combat Fast Attack Craft/Fast Inshore Attack Craft (FAC/FIAC). It is currently being fielded in either the NSSMS MK6 MOD 3 LLLTV Director Mount configuration or NSSMS MK6 MOD 4 LLLTV Independent Mount configuration depending on platform specifications. I-Stalker

will provide required upgrades to the SLREOSS Independent Mount configuration with the enhanced capabilities provided by the Navy owned Situational Awareness System (SAwS) to deliver an integrated radar and electro-optic/Infrared control and display suite. I-Stalker includes two (2) NSSMS MK6 MOD 4 LLLTV Independent Mount systems and one (1) SAwS which are nomenclatured and installed as an AN/SAY-3.

5. ESSM Blk 2 Risk Reduction/ESSM Blk 2 Engineering and Manufacturing Development (E&MD): ESSM Blk 2 upgrade is a cooperative effort between U.S Navy and NATO SEASPARROW Consortium Nations. ESSM Blk 2 upgrade replaces the largely obsolete guidance section with a dual mode Active/Semi-Active X-Band seeker capable of defeating future threat capabilities within the existing envelope, including; smaller signatures, increased raid sizes, and adverse environments including countermeasures. Threat types include: advanced Anti-Ship Cruise Missiles (ASCMs), Anti-Ship Ballistic Missiles, surface and asymmetrical. The consortium nations provided the majority of their funding early in the program (FY15-17) with the US providing the bulk of its funding later in EMD (FY18-20). The remaining budget is required to complete ESSM Blk 2 EMD.

6. Transition to Production (TTP): Transition to Production execution ensures the design (Hardware, Software, Test Equipment, Production Tooling, etc.), defined during the Engineering & Manufacturing Development (E&MD) Phase is successfully transitioned out of the engineering environment into a stable and capable production/ manufacturing environment. During the early phase of Blk 1 production the program experienced a series of 'process control failures' and 'production stoppages' leading to a "Blue Team" assessment and findings. One of the key underlying conditions identified as contributing to the discrepancies above was "incomplete transition to production activities and inadequate systems engineering." The Blk 2 TTP phase of program execution exists to address the shortfalls identified in the "Blue Team" report and to ensure the requisite resources are in place to support the program as design activities end and Low Rate Initial Production(LRIP) begins to deliver missiles at a rate commensurate with the requirements of LRIP and Full Rate Production (FRP).

7. ESSM Technology Roadmap & Studies: The ESSM Blk 2 Missile completes development in 2020, achieves Initial Operational Capability (IOC) in 2020 and transitions to in-service. In order to pace the threat and remain a viable weapon, the missile and its' supporting combat system components will require improvements. This effort will perform studies to identify technology candidates, find new manufacturing techniques, and determine applicability to the ESSM System for future improvements. RDT&E funding represented will develop and maintain an ESSM System roadmap to support missile performance and manufacturing efficiency improvements. Computer simulation updates will be needed as well to support the performance studies for future improvements. Areas of interest shall include, but are not limited to kinematic, tracking, and fuzing performance improvements as well as manufacturing and production improvements.

8. Other Development (Blk 2 Obsolescence and Redesign): Test Bed is the end-to-end integration of Combat System (CS) element models using Higher Level Architecture (HLA) to help assess a ship's ability to defend itself. Test Bed is maximizing the use of tactical code-based models in conjunction with physics-based environmental models to represent at-sea performance of ships and their combat systems. The goal is to develop a system of systems modeling for multiple use cases including System Development, System Integration, Developmental Test (DT) or Operational Test (OT) for a variety of ships and weapon systems. This effort is to integrate ESSM Tactical Simulation (ETS) model into the Combat Systems Testbed, and Enterprise Testbed. This effort also includes improvements needed to made in ETS based on the Studies
Explore missile launcher and MK 9 Tracker-Illuminator System (TIS) redesign in order to respond to obsolescence issues affecting ESSM systems on all CVN, LHA, and LHD class ships.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

9. ESSM Blk 2 Software Upgrades: This effort will provide the performance updates and fixes to the ESSM Blk 2 missile software. Software updates will be identified from performance improvements studies, identified software issues, Flight test results and new hardware and combat system changes.

10. C-Band Telemetry Upgrade: Department of Test and Evaluation (DOT&E) operational testing in Aegis Capability Baseline (ACB)-20 requires 12 active missiles in flight simultaneously to assess stream raids by threat systems. Current ESSM Telemeters operate in the S-band where Radio Frequency (RF) bandwidths are limited for Telemetry (TM) collection on the range. The current spectrum allocation and range infrastructure only supports TM collections for 3 active missiles in flight on the range at one time. The new requirement is due to the large number of missiles to support planned testing. The weapons and range are required to move telemetry into the C band where bandwidth exists to support required TM collections. Engineering has already certified this is achievable.

11. Common Munitions Built In Test (BIT) and Reprogramming Equipment (CMBRE) Adaptor: Maintenance Built in Test (MBIT) and Reprogramming development efforts associated with the CMBRE Adapter will allow the USN to perform reprogramming of the ESSM Blk 2 missile in the field. Specifically at forward deployed locations, either shore based or on the ships when deployed. Previously, reprogramming required the return of the missiles to the Seal Beach, CA Intermediate Level Maintenance Facility (ILMF). Further, the CMBRE Adapter (once developed) will allow the completion of the ESSM Blk 2 MBIT. Conduct of the MBIT shipboard will allow the extension of the missiles certification period.

12. MK9 Continuous Wave Tracking Illuminator (CWTI) (Transmitter) Replacement: The MK 57 NSSMS supports the SPARROW missile family with Semi-Active illumination support in the form of Continuous Wave Tracking Illuminator (CWTI). The CWTI enables the MK 9 Tracker-Illuminator System (TIS) to continue supporting self-defense mission requirements and pace emerging threats. The MK 9 TIS CWTI replacement eliminates obsolescence issues and increases the Radio Frequency (RF) power output to provide improved tracking, with uplink, performance, and higher ESSM probability of guidance on low RADAR Cross Section (RCS) threats. Additionally, a replacement of 1960's United States Air Force (USAF) Radar Test Set (RTS) adapted for the USN will be required to enhance additional frequency selections and ensure post-launch RF missile support for noise and uplink requirements.

13. Next Generation Tracker-Illuminator System (TIS): An upgrade is required to existing ship's infrastructure to provide Semi-Active (SAX) illumination source that improves ESSM Blk 2 probability of guidance (PG) when using Transition Section Guidance (TSG) Mode 0, 3 (current), or 5 (future). Additionally, an upgraded MK 9 TIS will improve Combat System probability of raid annihilation (PRA) for TSG Modes 0 and 5 (future). The receiver and tracking elements (1960s technology) have reached the limits of their ability to support system requirements and deficiencies have been noted in recent FOT&E out-briefs. This effort will develop (as required), qualify, test, and integrate modernized technology (equipment/components) as part of the MK 9 TIS (e.g., Transmitter Group, Antenna, and Signal Processor).

14. Next Generation Launching System: Develop, qualify, test, and integrate an upgrade, or define a replacement for the MK 132 Launcher that addresses key deficiencies with the in-service design. This upgrade improves environmental protection for Guided Missile Assemblies (GMA) (reducing corrosion), Grade A Near Miss Shock (NMS) compliance, reduces manning requirements for loading/unloading operations, mitigates long term supportability issues, addresses obsolescence, reduces the life cycle cost for operating and maintaining the MK 132 Launcher, and reduces the cost and time for ESSM in-service refurbishment, or re-certification This upgrade contains design margin to allow for growth, where the MK 132 Guided Missile Launcher is maximized today precluding ESSM Blk 2 deployment.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Evolved Sea Sparrow Missile (ESSM) Blk 1 Testing	9.558	9.214	11.246	0.000	11.246
Articles:	-	-	-	-	-
FY 2020 Plans: Continue supporting Aegis ACB 16 live fire testing and CVN 78 and DDG 1000 live fire events on the Self Defense Test Ship (SDTS) and on lead ship. Plans also include conducting live fire, supporting CSSQTs on LHD 6 and LHA 7 and supporting PMS 377 with Low Velocity Air Target (LVAT) flight test on LHA 7. Testing for SSDS Fire Control Loop Improvement Program (FCLIP) phase 2 on SDTS is also planned. ***FY 2021 Base Plans:*** Plans for FY 2021 include: 1.) supporting CSSQTs on DDG 1000, CVN 78, LHD 4 and CVN 70, 2.) supporting Aegis DT/OT and OT live fire events, and 3.) supporting 78 OT events on lead ship. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to additional Waterfront Integration Testing/Verifications and CSSQTs, and also additional operational firings required for lead ship for both DDG 1000 and CVN 78.					
Title: BLK 2 Follow-on Test & Evaluation (FOT&E)	0.000	5.909	8.080	0.000	8.080
Articles:	-	-	-	-	-
FY 2020 Plans: Finish OT live fire events before IOC. Conduct FOT&E on Aegis ACB 16 combat system. Support Aegis ACB 16 DT and OT live fire testing. Start integration efforts in support of SSDS functional compatibility and Min/Mod launcher upgrade. Start integration with new FFG(X) combat system. Start integration on Aegis ACB 20 on land based test sites. ***FY 2021 Base Plans:*** Support Aegis ACB 16 DT/OT and OT live fire events. Continue FOT&E events. Continue integration with SSDS functional compatibility. Start ESSM Block 2 integration with SSDS ACB 20 combat system. Continue integration on Aegis ACB 20 on land based test sites. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Increase in funding from FY 2020 to FY 2021 due to an increase of ESSM Blk 2 SSDS integration efforts.					
Title: NATO Sea Sparrow Combat System Integraton Technical Direction Agent (TDA)	0.323	2.107	2.245	0.000	2.245
Articles:	-	-	-	-	-
FY 2020 Plans: Performance assessment of ESSM Block 2 with semi-active illumination support, and begin an examination of fielded Launching Systems and Radars to reduce in-service costs, and exploration into MK 9 TIS tracking performance (e.g., antenna, receiver, output power, signal processing). The CS TDA will develop inputs to the GMLS roadmap and perform directed Launching System studies, analyses, and evaluations that build upon and leverage prior MK 41 VLS and MK 29 GMLS to quantify performance effects of a vertical launch versus a trainable launch. Efforts will consider ship compatibility constraints inclusive of size, weight and power (SWaP), flight safety (including VLS impacts to flight operations), and gas management. Additionally, evaluation of parameters such as potential range, firepower, safety, life cycle cost consolidation, environmental protection, and other launcher improvements will be deliberated as the AoA matures. The CS TDA will perform directed, forward looking, RADAR studies, analyses, and a comprehensive evaluation of RADAR tracking and illumination trade space to inform an Analysis of Alternatives (AoA). Requirements definition will take into consideration output power, architecture (e.g. phased array versus slewing monopulse), mission analysis (e.g. uplink/downlink, illumination without tracking), and performance. In accordance with PEO IWS mission objectives, the CS TDA will consider IWS 2 initiatives, best value for USN, and fielding plans to include both back fit and non-back fit options to help define and defend a RADAR roadmap that is informed via analysis. The CS TDA will also continue to provide analysis and recommendations for emergent issues and engineering changes for deployed systems.					
FY 2021 Base Plans: The CS TDA will finalize separate Launching System and RADAR requirements recommendation(s), and assist with development of strategic plans or technology insertion points. Continuing the FY 20 efforts, the CS TDA will develop a comprehensive long term plan that considers future missile development and use cases with interoperability considerations that span across the PEO IWS investment portfolio for best value for the USN. As required, the CS TDA will support acquisition planning for notional future programs. The CS TDA will also continue to provide analysis and recommendations for emergent issues and engineering changes for deployed systems.					
FY 2021 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 to finish the functional configuration audit. This increase is also to ensure AoA activities are complete to inform PEO IWS 12.0 during a requirements down-selection process for the Next Generation TIS (e.g. phased array versus slewing monopulse), mission analysis (e.g. frequency band(s), uplink/downlink, illumination without tracking), and performance). This increase is maintained through completion of the AoA and roadmap recommendations through CS TDA leadership and participation in resulting programs of record.					
Title: I-Stalker ***Articles:*** ***FY 2020 Plans:*** NA ***FY 2021 Base Plans:*** NA ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** NA	7.326 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Evolved Sea Sparrow Missile (ESSM) Blk 2 EMD ***Articles:*** ***FY 2020 Plans:*** Conduct IOT&E deployment aboard a DDG-51 Class Guided Missile Destroyer: Waterfront Integration Testing (WIT), Pre-deployment crew training, shipment of test rounds to Naval Weapons Station Seal Beach, California, Point Mugu Sea Range support, target preparation and expenditure, Telemetry data collection and analysis, photographic data collection, and post flight reconstruction and reporting. Conduct Modeling and Simulation runs for record in support of system performance characterization and operational evaluation required for establishing the Initial Operational Capability (IOC). ***FY 2021 Base Plans:***	54.133 -	23.460 -	0.000 -	0.000 -	0.000 -

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
NA ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding from FY 2020 to FY 2021 represents the completion of the ESSM Blk 2 Cooperative EMD Memorandum of Understanding (MOU). In FY 2020 the US has fulfilled their 40% of the total EMD cost obligation.					
Title: Transition to Production (TTP) ***Articles:*** ***FY 2020 Plans:*** Preparation for production will continue into FY 2020. Equipment procured in 2019 to support LRIP will be installed, proved-in, and integrated at RMS facilities. Upgrades to support FRP, including TE required for All Up Round testing and further capacity upgrades to section level production lines will occur. Additionally, lead-in activities will begin to support the execution of the FRP PRR. ESSM BLK2 is a Consortium funded Program; this fulfills the United States' obligation to transition to LRIP and FRP under the Memorandums of Understanding. ***FY 2021 Base Plans:*** NA ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding from FY 2020 to FY 2021 due to TTP effort completion in FY 2020.	12.637 -	23.126 -	0.000 -	0.000 -	0.000 -
Title: ESSM Blk 2 Technology Roadmap and Studies ***Articles:*** ***FY 2020 Plans:*** Perform systems engineering studies, missile performance studies, system performance studies, system and subsystem trade studies, conceptual design studies, functional design studies, preliminary design studies, detailed design studies, and other analyses focused on improving overall missile performance. ***FY 2021 Base Plans:*** Develop the roadmap and continue to perform necessary studies.	0.000 -	1.015 -	2.246 -	0.000 -	2.246 -

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Studies include, but are not limited to: systems engineering studies, missile performance studies, system performance studies, system and subsystem trade studies, conceptual design studies, functional design studies, preliminary design studies, detailed design studies, and other analyses focused on improving overall missile performance. Roadmap development/updates include, but are not limited to: technology assessment with respect to maturity and risk, specific production impacts, impacts to ship integration, and continuous monitoring of the evolution of the threat. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to the to addition of Consortium Technology Roadmap studies. Studies will start including possible improvements to the missile and it's supporting combat system components. Studies will identify technology candidates, find new manufacturing techniques, and determine applicability to the ESSM System for future improvements.					
Title: Other Development ***Articles:***	0.000 -	0.000 -	6.500 -	0.000 -	6.500 -
FY 2020 Plans: NA ***FY 2021 Base Plans:*** Evaluate the System requirement for the Combat System Test Bed (CSTB) and Enterprise Testbed. Develop a Run Time Interface (RTI) that is able to execute the ETS, a 6 Degrees of Freedom (6-DOF) and tactical missile code simulation. Integrate ETS into CSTB and Enterprise Testbed as per the Testbed schedules. This effort also includes to develop the ETS model based on the outcomes of studies. The effort will ensure ESSM stays current with modeling and simulations efforts associated with the Combat Systems. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Increase in funding from FY 2020 to FY 2021 due to the initiation of Other Development efforts, including: evaluating system requirements for Combat Systems and Enterprise Testbed.					
Title: ESSM Blk 2 Software Upgrades ***Articles:*** ***FY 2020 Plans:*** NA ***FY 2021 Base Plans:*** This is a level loaded effort for annual support from the ESSM Block 2 Prime Contractor to implement software updates resulting from the Initial Operational Test and Evaluation (IOT&E) phase, during Runs for the Record (RfR) that will be completed in support of IOC, results from identified required fixes, flight test analysis, the missile performance studies, system performance studies, or other analyses focused on improving overall missile performance as directed by the Government. These efforts may include, Interface Control Documentation studies and updates to ensure compatibility with existing consortium hardware and combat systems. As part of the development and testing of software updates the Contractor may also need to perform computer simulation updates, verification and validation. Computer simulations will be needed for the software performance verification, performance predictions, for the software improvements. Areas of interest will include, but are not limited to, cost effective functional software performance improvements, fixes, and hardware and combat system changes. The Prime Contractor will support meetings, create POA&Ms, develop algorithms, build proof of concepts and estimates for the capability improvements, and deliver study reports, test plans/ procedures, and test inspection reports as necessary. These software changes will form the first opportunity to improve the baseline ESSM Block 2 missile. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to the initiation of Software Upgrades in FY 2021. Development efforts will be completed in FY 2020 and this will be the first opportunity to improve ESSM Blk 2 Missile.	0.000 -	0.000 -	6.051 -	0.000 -	6.051 -
Title: C-Band Telemetry Upgrades ***Articles:*** ***FY 2020 Plans:***	0.000 -	0.000 -	6.234 -	0.000 -	6.234 -

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
NA ***FY 2021 Base Plans:*** Effort will begin in FY 2021. Requirements will include: designing and developing the C-Band telemeter, conducting the Systems Requirements Review (SRR), modifying the Telemetric Data Transmitting Set (TDTS) transmitter harness, and modifying TDTS antenna for C-Band Operation. The Primary Design Review (PDR) is planned to be conducted in Q3 FY 2021, and the Critical Design Review (CDR) is planned to be conducted in Q4 FY 2021. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to the initiation of the C-Band Telemetry Upgrades effort in FY 2021.					
Title: CMBRE Adaptor Development	0.000	2.500	1.500	0.000	1.500
Articles:	-	-	-	-	-
FY 2020 Plans: Provide funding for the development of the CMBRE Adapter. The CMBRE adapter is necessary in order to conduct Blk 2 Missile Built in Tests (MBIT) and reprogramming events when ESSM Blk 2 is installed in the MK25 Launch Canister. ***FY 2021 Base Plans:*** Complete development of the CMBRE Adapter. The CMBRE adapter is necessary in order to conduct Blk 2 Missile Built in Tests (MBIT) and reprogramming events when ESSM Blk 2 is installed in the MK25 Launch Canister. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding from FY 2020 to FY 2021 due to the US development efforts for the CMBRE adaptor ramping down.					
Title: MK9 CWTI (Transmitter) Replacement	0.000	5.042	10.300	0.000	10.300
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2020 Plans: The MK 57 NSSMS supports the SPARROW missile family with Semi-Active illumination support in the form of Continuous Wave Tracking Illuminator (CWTI). This development effort is being carried out to replace the MK73 transmitters on the following ships: CVN 79, CVN 80, CVN 81, and LHA 9. The MK73 transmitter is no longer able to be procured. The CWTI enables the MK 9 Tracker-Illuminator System (TIS) to continue supporting self-defense mission requirements and pace emerging threats. The MK 9 TIS CWTI replacement eliminates obsolescence issues and increases the RF power output to provide improved tracking, with uplink, performance, and higher ESSM probability of guidance on low RADAR Cross Section (RCS) threats. Additionally, a replacement of 1960's USAF Radar Test Set (RTS) adapted for the USN will be required to enhance additional frequency selections and ensure post-launch RF missile support for noise and uplink requirements. ***FY 2021 Base Plans:*** Continue development efforts for the MK9 CWTI Replacement, including the sub-assembly manufacturer/ supplier interface for the MK 9 TIS to ensure long-lead items are accounted for. Additionally, the Government will commence the establishment of a land-based test site (LBTS) at Yorktown, Naval Munitions Command (NMC). ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to majority of replacement efforts for the MK8 CWTI occurring in FY 2021.					
Title: Next Generation Tracker- Illuminator System (TIS)	0.000	0.000	18.055	0.000	18.055
Articles:	-	-	-	-	-
FY 2020 Plans: NA ***FY 2021 Base Plans:*** An upgrade is required to existing ship's infrastructure to provide Semi-Active (SAX) illumination source that improves ESSM Blk 2 probability of guidance (PG) when using Transition Section Guidance (TSG) Mode 0, 3 (current), or 5 (future). Additionally, an upgraded MK 9 TIS will improve Combat System probability of raid annihilation (PRA) for TSG Modes 0 and 5 (future). The receiver and tracking elements (1960s technology) have reached the limits of their ability to support system requirements and deficiencies have been noted in					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
recent FOT&E out-briefs. This effort will develop (as required), qualify, test, and integrate modernized technology (equipment/components) as part of the MK 9 TIS (e.g., Transmitter Group, Antenna, and Signal Processor). Funding is necessary to meet requirements for the development and installation of a Tracker-Illuminator System on new ship construction (SCN) in order to continue rapid deployment of ESSM Block 2 with an optimized Weapons System/Combat System. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to the implementation of the Next Generation Tracker-Illuminator System (TIS) development effort in FY 2021.					
Title: Next Generation Launching System ***Articles:*** ***FY 2020 Plans:*** NA ***FY 2021 Base Plans:*** Develop, qualify, test, and integrate an upgrade, or define a replacement for the MK 132 Launcher that addresses key deficiencies with the in-service design. This upgrade improves environmental protection for Guided Missile Assemblies (GMA) (reducing corrosion), Grade A Near Miss Shock (NMS) compliance, reduces manning requirements for loading/unloading operations, mitigates long term supportability issues, addresses obsolescence, reduces the life cycle cost for operating and maintaining the MK 132 Launcher, and reduces the cost and time for ESSM in-service refurbishment, or re-certification This upgrade contains design margin to allow for growth, where the MK 132 Guided Missile Launcher is maximized today precluding ESSM Blk 2 deployment. ***FY 2021 OCO Plans:*** NA ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to the implementation of the Next Generation Launching System development efforts.	0.000 -	0.000 -	16.760 -	0.000 -	16.760 -
Accomplishments/Planned Programs Subtotals	83.977	72.373	89.217	0.000	89.217

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• WPN 2307: *ESSM*	97.727	102.601	215.375	-	215.375	276.604	494.486	507.555	532.997	Continuing	Continuing
• OPN 5231: *Ship Missile Defense*	36.335	38.885	38.336	-	38.336	44.036	32.033	32.461	33.087	Continuing	Continuing
• OMN 1D4D: *NATO Seasparrow*	37.176	22.832	23.485	-	23.485	24.758	21.288	21.714	22.137	0.000	173.390

Remarks

OPN for Stalker is included in above LI 5231 - Ship Missile Defense in FY 2019- FY 2025
OMN funding is for ESSM Blk 1, NSSMS, & RIM-7; ESSM Blk 2 In-Service Support begins in FY 2021- funding is not reflected (has not been added) in OMN control.

D. Acquisition Strategy

ESSM Blk 2 EMD is a directed sole source contract to Raytheon Missile Systems Company.

I-Stalker: NSWC Crane to initiate and complete final design of hardware/software for integration of SAwS w/Stalker in preparation for sole source procurement (OPN) of Stalker Kits from the current design agent (Ball Aerospace) and SAwS Kits from NSWC Crane to meet CVN and LHD/LHA fleet deployment schedules.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Systems Engineering/Firing Spt	WR	Corona : CA	11.102	0.486	Nov 2018	0.802	Dec 2019	0.901	Dec 2020	-		0.901	0.000	13.291	-
ESSM Systems Engineering/Firing Spt Blk 2	WR	Corona : CA	0.000	0.000		0.900	Dec 2019	1.120	Dec 2020	-		1.120	0.000	2.020	-
NATO OC System Engineering	C/ FFPLOE	Raytheon : RI	1.955	0.000		0.000		0.000		-		0.000	0.000	1.955	-
NATO OC - Software	C/ FFPLOE	Raytheon : RI	8.054	0.000		0.000		0.000		-		0.000	0.000	8.054	-
Stalker System Engineering	WR	NSWC Crane : IN	4.782	0.000		0.000		0.000		-		0.000	0.000	4.782	-
Stalker Hardware Engineering	WR	NSWC Crane : IN	14.350	0.000		0.000		0.000		-		0.000	0.000	14.350	-
Stalker Software Engineering	WR	NSWC Crane : IN	2.725	0.000		0.000		0.000		-		0.000	0.000	2.725	-
ESSM Primary Hardware Development	C/CPAF	Raytheon : Tuscon	193.941	0.000		0.000		0.000		-		0.000	0.000	193.941	-
ESSM Ancillary Hardware	Various	Various : Various	71.324	0.000		0.000		0.000		-		0.000	0.000	71.324	-
ESSM Blk 2 EMD	C/CPIF	Raytheon : Tuscon	253.425	40.936	Nov 2018	23.460	Nov 2019	0.000		-		0.000	0.000	317.821	-
I-Stalker Systems Engineering	WR	NSWC Crane : Crane, IN	1.288	3.402	Dec 2018	0.000		0.000		-		0.000	0.000	4.690	-
TTP	SS/FFP	Raytheon : Tuscon	14.217	12.637	Dec 2018	23.126	Dec 2019	0.000		-		0.000	0.000	49.980	-
ESSM Blk 2 Risk reduction	SS/ FFPLOE	Raytheon : Tuscon	44.150	0.000		0.000		0.000		-		0.000	0.000	44.150	-
NATO OC Systems Engineering SPT	WR	NSWC PHD : CA	0.700	0.000		0.000		0.000		-		0.000	0.000	0.700	-
Dual Band Tranceiver	SS/FFP	Raytheon : Tuscon	6.155	0.000		0.000		0.000		-		0.000	0.000	6.155	-
Studies/Technology Roadmap	TBD	Raytheon : Tuscon	0.000	0.000		1.051	Mar 2020	2.246	Oct 2020	-		2.246	0.000	3.297	-
Other Development	TBD	Raytheon : Tucson	0.000	0.000		0.000		6.500	Oct 2020	-		6.500	0.000	6.500	-
Software Upgrades	TBD	Raytheon : Tucson	0.000	0.000		0.000		6.051	Oct 2020	-		6.051	0.000	6.051	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C-Band Telemetry upgrade	TBD	TBD : TBD	0.000	0.000		0.000		6.234	Oct 2020	-		6.234	0.000	6.234	-
CMBRE Adaptor	TBD	NG : NA	0.000	0.000		2.500	Dec 2019	1.500	Oct 2020	-		1.500	0.000	4.000	-
MK9 CWTI Replacment	TBD	TBD : TBD	0.000	0.000		5.042	Jul 2020	10.300	Oct 2020	-		10.300	0.000	15.342	-
Illuminator System	TBD	TBD : TBD	0.000	0.000		0.000		18.055	Oct 2020	-		18.055	0.000	18.055	-
Launching System	TBD	TBD : TBD	0.000	0.000		0.000		16.760	Oct 2020	-		16.760	0.000	16.760	-
I-Stalker Systems Engineering	WR	NRL : TBD	0.000	0.800	Aug 2019	0.000		0.000		-		0.000	0.000	0.800	-
I-Stalker Systems Engineering	WR	APL : TBD	0.000	0.525	Aug 2019	0.000		0.000		-		0.000	0.000	0.525	-
		Subtotal	628.168	58.786		56.881		69.667		-		69.667	0.000	813.502	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NATO System TDA	SS/FP	APL : MD	3.102	0.323	Jan 2019	2.107	Jan 2020	2.245	Jan 2021	-		2.245	Continuing	Continuing	Continuing
Stalker -ISEA/TDA/RM&A	SS/FFP	various : various	0.750	0.000		0.000		0.000		-		0.000	0.000	0.750	-
ILS/Engineering Support	Various	Various : Various	15.543	0.000		0.000		0.000		-		0.000	0.000	15.543	-
ESSM Blk 2 EMD	WR	APL : MD	16.169	4.285	Oct 2018	0.000		0.000		-		0.000	0.000	20.454	-
ESSM Blk 2 EMD	WR	NAWC CL : CA	21.118	6.197	Nov 2018	0.000		0.000		-		0.000	0.000	27.315	-
ESSM Blk 2 EMD	Various	Various : Various	8.866	2.715	Nov 2018	0.000		0.000		-		0.000	0.000	11.581	-
I-Stalker Platform Integration	WR	Norfolk Naval Shipyard (NNSY) : Norfolk, VA	0.100	0.300	Dec 2018	0.000		0.000		-		0.000	0.000	0.400	-
I-Stalker Platform Integration	C/BA	NSWC Dahlgren : Dahlgren, VA	0.232	0.615	Dec 2018	0.000		0.000		-		0.000	0.000	0.847	-
I-Stalker Platform Integration	C/BA	NSWC Crane : Crane, IN	0.415	0.709	Nov 2018	0.000		0.000		-		0.000	0.000	1.124	-
I-Stalker Platform Integration	WR	PSNSY : Puget Sound, WA	0.100	0.400	Dec 2018	0.000		0.000		-		0.000	0.000	0.500	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0173 / *NATO Sea Sparrow*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NATO OC Support	WR	Dahlgren : VA	2.174	0.000		0.000		0.000		-		0.000	0.000	2.174	-
Dual Band Transceiver	WR	APL : MD	0.800	0.000		0.000		0.000		-		0.000	0.000	0.800	-
Dual Band Tranceiver	WR	NAWC CL : CA	1.600	0.000		0.000		0.000		-		0.000	0.000	1.600	-
		Subtotal	70.969	15.544		2.107		2.245		-		2.245	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Developmental Test & Evaluation	WR	NAWC CL : CA	22.251	0.851	Oct 2018	0.862	Dec 2019	0.917	Dec 2020	-		0.917	Continuing	Continuing	Continuing
ESSM Developmental Test & Evaluation Blk 2	WR	NAWC CL : CA	0.000	0.000		1.100	Dec 2019	1.350	Dec 2020	-		1.350	0.000	2.450	-
ESSM OPEVAL/ TECHEVAL/Test Firings	WR	Corona, IHD, Dahlgren, SNSWC, PHD) : Various	18.688	1.500	Nov 2018	1.512	Dec 2019	1.654	Dec 2020	-		1.654	0.000	23.354	-
ESSM OPEVAL/ TECHEVAL/Test Firings Blk 2	WR	Corona, IHD, Dahlgren, SNSWC, PHD) : Various	0.000	0.000		0.500	Dec 2019	1.597	Dec 2020	-		1.597	0.000	2.097	-
ESSM Developmental Test & Evaluation	SS/FFP	APL : MD	5.982	0.500	Oct 2018	0.518	Nov 2019	0.617	Nov 2020	-		0.617	Continuing	Continuing	Continuing
ESSM Test & Evaluation	C/CPAF	Raytheon : Tuscon	23.035	3.363	Nov 2018	4.584	Nov 2019	6.122	Nov 2020	-		6.122	Continuing	Continuing	Continuing
ESSM Test & Evaluation Blk 2	C/CPAF	Raytheon : Tuscon	0.000	0.000		2.536	Nov 2019	3.095	Nov 2020	-		3.095	0.000	5.631	-
ESSM Test & Evaluation	WR	Dahlgren/PHD : VA/ CA	3.086	1.098	Nov 2018	0.100	Nov 2019	0.036	Nov 2020	-		0.036	0.000	4.320	-
Developmental Test & Evaluation	WR	Dahlgren : VA	0.418	0.000		0.000		0.000		-		0.000	0.000	0.418	-
I-Stalker Development Test and Evaluation	WR	NSWC Crane : IN	0.264	0.300	Nov 2018	0.000		0.000		-		0.000	0.000	0.564	-
		Subtotal	73.724	7.612		11.712		15.388		-		15.388	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM-Support and Performing Activity	Allot	PHD/NAWC CL/ APL : CA/MD	15.111	1.660	Oct 2018	0.700	Nov 2019	0.899	Nov 2020	-		0.899	Continuing	Continuing	Continuing
ESSM-Travel	Allot	Program Office : VA	3.527	0.100	Oct 2018	0.100	Oct 2019	0.100	Oct 2020	-		0.100	Continuing	Continuing	Continuing
ESSM-Misc	Various	various : various	2.149	0.000		0.000		0.000		-		0.000	0.000	2.149	2.065
NATO Travel/Misc	Various	Program Office : various	2.111	0.000		0.000		0.000		-		0.000	0.000	2.111	-
ESSM-Support and Performing Activity Blk 2	Allot	PHD/NAWC CL/ APL : CA/MD	0.000	0.000		0.873	Nov 2019	0.918	Nov 2020	-		0.918	0.000	1.791	-
Engineering Support	Various	Various : Various	5.458	0.000		0.000		0.000		-		0.000	0.000	5.458	-
I-Stalker Engineering Support	Various	TMB : Various	0.000	0.275	Sep 2019	0.000		0.000		-		0.000	0.000	0.275	-
		Subtotal	28.356	2.035		1.673		1.917		-		1.917	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	801.217	83.977		72.373		89.217		-		89.217	Continuing	Continuing	N/A

Remarks

Various used for multiple vendors and location under threshold.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

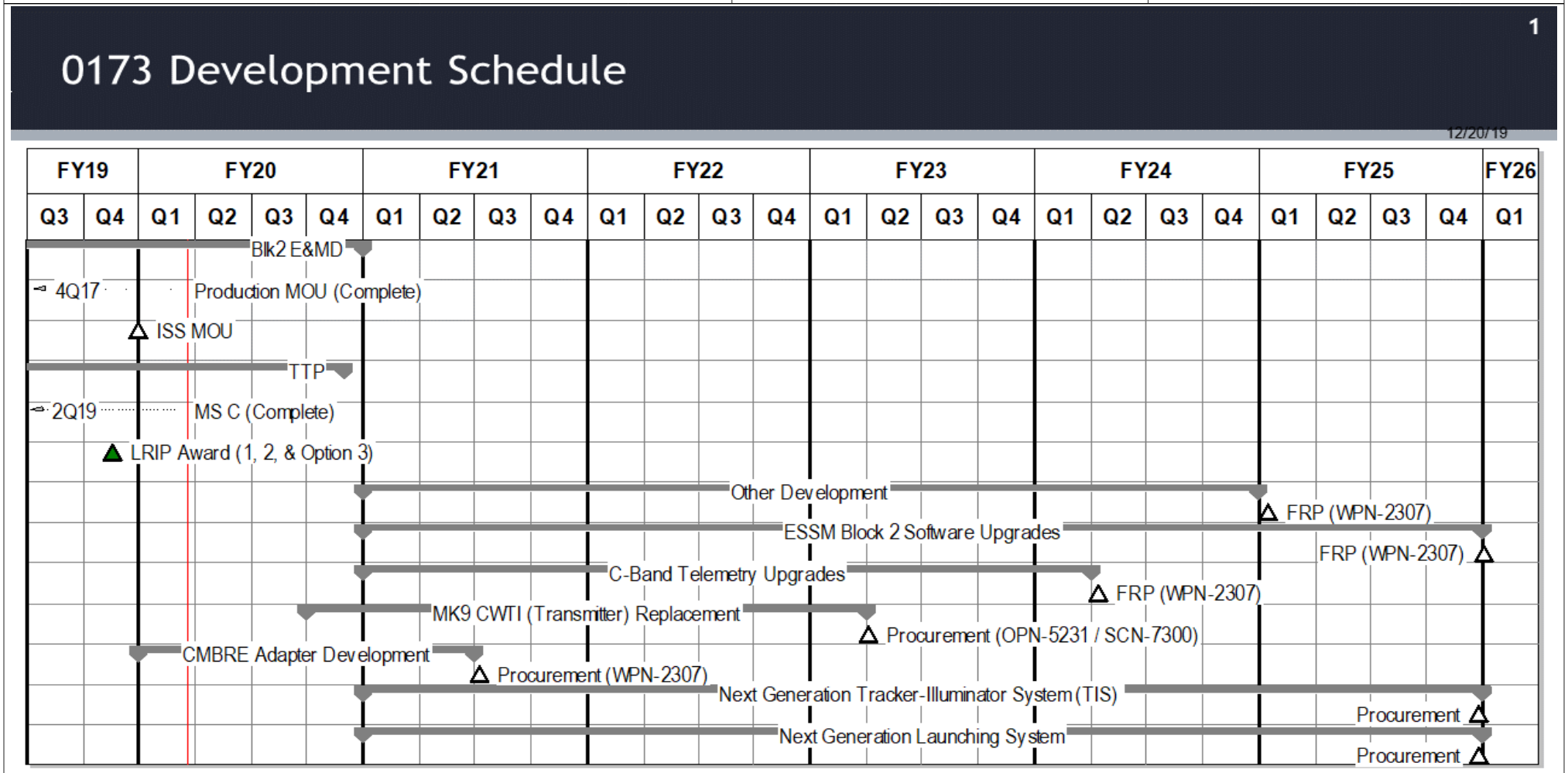

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0173				
ESSM BLOCK 2: Engineering and Manufacturing Development	1	2019	4	2020
ESSM BLOCK 2: Production MOU Negotiation/Signature	1	2019	4	2019
ESSM BLOCK 2: In Service Support MOU Negotiation/Signature	1	2019	1	2020
ESSM BLOCK 2: Transition to Production	1	2019	4	2020
ESSM BLOCK 2: Production Decision LRIP (Milestone C)	2	2019	2	2019
ESSM BLOCK 2: LRIP 1 Award	4	2019	4	2021
ESSM BLOCK 2: LRIP 2 Award	4	2019	4	2021
ESSM BLOCK 2: LRIP 3 Award	1	2020	4	2021
I-STALKER Transition to Production: Transition to Production	3	2019	4	2019
I-STALKER Final Design, Engineering, & Manufacturing Development: Final Design, Engineering, & Manufacturing Development	1	2019	4	2019
I-STALKER Development Testing: Development Testing	1	2019	4	2019
I-STALKER EDM Delivery: EDM Delivery	1	2019	1	2019
ESSM DEVELOPMENT: Other Development	1	2021	4	2024
ESSM DEVELOPMENT: ESSM Blk 2 Software Upgrades	1	2021	4	2025
ESSM DEVELOPMENT: C-Band Telemetry Upgrades	1	2021	1	2024
ESSM DEVELOPMENT: MK9 CWTI (Transmitter) Replacement	4	2020	1	2023
ESSM DEVELOPMENT: CMBRE Adaptor Development	1	2020	2	2021
ESSM DEVELOPMENT: Next Generation Tracker-Illuminator System (TIS)	1	2021	4	2025
ESSM DEVELOPMENT: Next Generation Launching System	1	2021	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0243 / *ALaMO*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
0243: *ALaMO*	40.635	23.792	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	64.427
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 57mm MK 332 HE-4G Projectile significantly increases MK 110 Gun Mount lethality and effectiveness against Fast Attack Craft and Fast In-Shore Attack Craft (FAC/FIAC). The 57mm ALaMO concluded development as part of a classified program and transitioned to qualification for Navy use in FY 2017. ALaMO will transition to production at the conclusion of the program.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Systems Engineering and Testing	23.792	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2020 Plans: N/A					
FY 2021 Base Plans: N/A					
FY 2021 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	23.792	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• PANMC/0266: *INTERMEDIATE CALIBER GUN AMMO HE-4G*	27.236	27.090	20.306	-	20.306	28.151	21.126	29.289	21.980	0.000	175.178

Remarks

Profile only reflects procurement of CART 57MM ALaMO (HE-4G).

D. Acquisition Strategy

MK 332 HE-4G will have completed qualifications and transition into LRIP.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Produce Design Verification hardware, DT Hardware	MIPR	DOTC : PICATINNY ARSENAL, NJ	36.408	19.589	Dec 2018	0.000		0.000		-		0.000	0.000	55.997	49.300
		Subtotal	36.408	19.589		0.000		0.000		-		0.000	0.000	55.997	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Services	WR	NSWC, DD : Dahlgren, VA	3.720	3.858	Nov 2018	0.000		0.000		-		0.000	0.000	7.578	-
Government Engineering Services	WR	NSWC, IHEODTD : Indian Head, MD	0.507	0.345	Jun 2019	0.000		0.000		-		0.000	0.000	0.852	-
		Subtotal	4.227	4.203		0.000		0.000		-		0.000	0.000	8.430	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	40.635	23.792		0.000		0.000		-		0.000	0.000	64.427	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

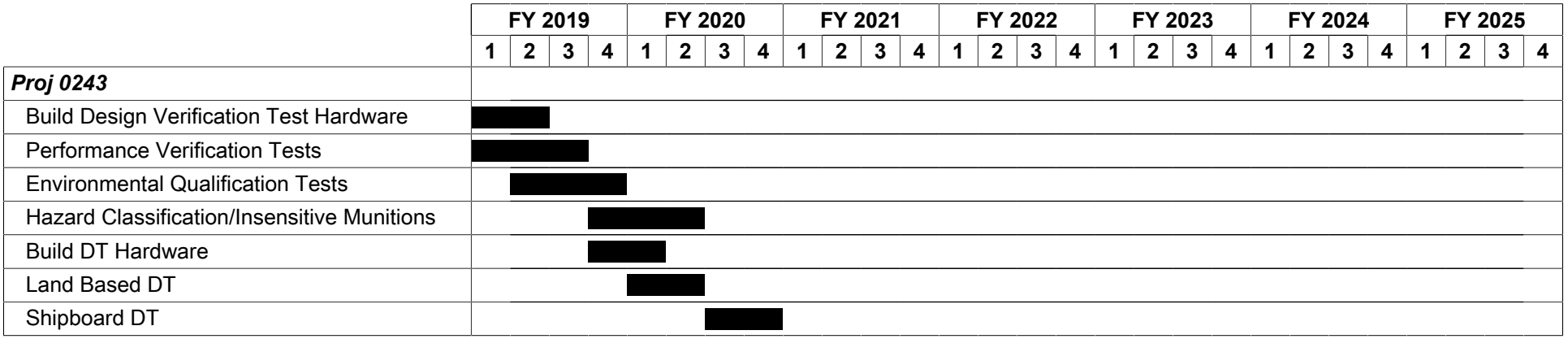

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0243				
Build Design Verification Test Hardware	1	2019	2	2019
Performance Verification Tests	1	2019	3	2019
Environmental Qualification Tests	2	2019	4	2019
Hazard Classification/Insensitive Munitions	4	2019	2	2020
Build DT Hardware	4	2019	1	2020
Land Based DT	1	2020	2	2020
Shipboard DT	3	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 2070 / *OTH Missile*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2070: *OTH Missile*	0.000	19.307	12.401	26.374	-	26.374	11.182	8.256	0.000	0.000	0.000	77.520
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Over-The-Horizon (OTH) Missile funds competitive acquisition, testing, and fielding of a modern, technologically mature Over-the-Horizon Weapon System (OTH-WS) surface to surface missile capability to be installed onto commissioned and in-production Littoral Combat Ship /Frigate(LCS/FFG(X)) beginning in FY 2021.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: OTH-WS Test and Evaluation and Systems Engineering	19.307	12.401	26.374	0.000	26.374
Articles:	-	-	-	-	-
FY 2020 Plans: -Continue Over-the-Horizon Weapon System (OTH-WS) ship engineering activities to include integration and design on LCS variants and FFG(X) platforms. -Procure test articles (,inert operational missiles, warheads, boosters, and components) required to conduct Operational Test, Live Fire Test and Evaluation, safety tests and Insensitive Munitions tests in accordance with the OTH-WS Test and Evaluation Master Plan (TEMP) and as required by Explosive Ordnance Disposal (EOD), Department of Transportation (DOT) and WSESRB (Weapon System Explosive Safety Review Board). - Conduct initial Operational Tests events to support the TEMP. - Conduct initial Live Fire Test and Evaluation events. - Develop integrated Modeling and Simulation tools to support Operational Test and Flight Test predictions. - Conduct Hazards of Electromagnetic Radiation to Ordnance (HERO) safety tests. - Conduct Explosive Ordnance Disposal (EOD) tests as mandated by DoD EOD. - Conduct Insensitive Munitions (IM) testing in accordance with the OTH-WS IM test plan. IM testing includes fast/slow energetics cook offs, bullet / fragment impact testing, sympathetic reaction testing, and missile drop tests. - Continue to design and develop all OTH-WS logistics equipment in accordance with maintenance / inventory management plans. - Provide OTH-WS missile and fire control subject matter expertise to support the program office with program execution. - Develop organic Navy OTH-WS training capability in accordance with the Naval Training System Plan (NTSP).					
FY 2021 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
- Continue Over-the-Horizon Weapon System (OTH-WS) ship engineering activities to include integration planning and design on LCS variants and FFG(X) platforms. - Procure test articles (missiles, components inert operational missiles, warheads, boosters) required to conduct Operational Test, Live Fire Test and Evaluation, safety tests and Insensitive Munitions tests in accordance with the OTH-WS Test and Evaluation Master Plan (TEMP) and as required by EOD, DOT and WSESRB. - Continue to conduct Operational Tests events to support the TEMP. - Continue to conduct Live Fire Test and Evaluation events - Validate integrated Modeling and Simulation tools to support Operational Test and Flight Test predictions. - Conduct Electro-Magnetic Environmental Effects (E3) testing to include Electro-Magnetic Interference (EMI), Electro-Magnetic Compatibility (EMC), Electro-Magnetic Vulnerability (EMV), and Electro-Static Discharge (ESD). -Complete Explosive Ordnance Disposal (EOD) tests as mandated by DoD EOD and continued Insensitive Munitions (IM) testing will be executed in accordance with the OTH-WS IM test plan. IM testing includes fast/ slow energetics cook offs, bullet / fragment impact testing, sympathetic reaction testing, and missile drop tests. - Execute required full environmental testing to include shock / vibration testing, low/high/cycling temperature testing, humidly testing, rain/salt/fog/sand & dust testing. - Execute required performance testing to include Seeker Discrimination Testing, restrained firing, warhead lethality testing, survivability (Radar Cross Section (RCS) measurement testing, flight termination testing etc.) testing, and initiator train testing. - Provide OTH-WS missile and fire control subject matter expertise to support the program office with program execution. - Implement organic Navy OTH-WS training capability in accordance with the Naval Training System Plan (NTSP). ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 due to EOD, Safety and IM test assets being procured in FY 2021.					
Accomplishments/Planned Programs Subtotals	19.307	12.401	26.374	0.000	26.374

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*	

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0603599/3086: *Frigate / OTH Missile System*	1.232	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.059
• OPN /5231: *Ship Missile Support Equipment/OTH Missile*	2.874	1.800	5.017	-	5.017	7.698	12.922	14.711	18.870	Continuing	Continuing
• WPN 2292: *LCS OTH Missile*	19.698	38.137	32.910	-	32.910	60.120	74.299	80.770	79.777	Continuing	Continuing

Remarks

OPN 5231 - Funding only represents OTH's cost elements.

D. Acquisition Strategy

The OTH-WS is an Acquisition Category (ACAT) II level weapon system production and sustainment program to provide the current Littoral Combat Ship (LCS) variants and Frigate (FFG(X)) ships with an Over-the-Horizon Surface-To-Surface Missile (SSM) capability. The Navy awarded a competitive contract on May 31, 2018.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OTH All Up Round (AUR) Technical Design Agent	WR	NAWC/WD : China Lake, CA	0.000	1.366	Oct 2018	2.259	Oct 2019	3.126	Oct 2020	-		3.126	0.000	6.751	-
OTH Simulation and Analysis	WR	NSWC/COR : Corona, CA	0.000	0.290	Oct 2018	0.290	Oct 2019	0.273	Oct 2020	-		0.273	0.000	0.853	-
OTH Weapon System Design Agent	WR	NSWC/DD : Dahlgren, VA	0.000	0.525	Oct 2018	0.800	Oct 2019	0.753	Oct 2020	-		0.753	0.000	2.078	-
OTH Test & Evaluation / ILS	WR	NSWC/PHD : Port Hueneme, CA	0.000	0.750	Oct 2018	1.832	Oct 2019	1.724	Oct 2020	-		1.724	0.000	4.306	-
OTH Weapon System Safety	WR	NSWC/DD : Dahlgren, VA	0.000	0.220	Oct 2018	0.500	Oct 2019	0.471	Oct 2020	-		0.471	0.000	1.191	-
Weapons Systems Engineering Planning	FFRDC	JHU/APL : Laurel, MD	0.000	0.462	Dec 2018	0.600	Dec 2019	0.565	Dec 2020	-		0.565	0.000	1.627	-
OEM Engineering Support	C/CPFF	Raytheon : Tucson, AZ	0.000	3.200	Nov 2018	1.000	Nov 2019	0.941	Nov 2020	-		0.941	0.000	5.141	-
Test & Evaluation Assets	C/FFP	Raytheon : Tucson, AZ	0.000	11.339	Nov 2018	0.000		0.000		-		0.000	0.000	11.339	-
Range & Target	Various	Various : Various	0.000	0.000		4.100	Oct 2019	5.100	Oct 2020	-		5.100	0.000	9.200	-
Test Asset Procurement	C/FFP	Raytheon : Tucson, AZ	0.000	0.000		0.000		12.457	Nov 2020	-		12.457	0.000	12.457	-
		Subtotal	0.000	18.152		11.381		25.410		-		25.410	0.000	54.943	N/A

Remarks

Required procurement of EOD, Safety and Insensitive Munition Test Assets that support continued deployment.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OTH Contractor Acquisiton Mgt Suppt	C/CPIF	CACI : Arlington, VA	0.000	0.320	Dec 2018	0.320	Dec 2019	0.301	Dec 2020	-		0.301	0.000	0.941	-
OTH Program Management Support	C/CPIF	Strategic Insight : Arlington, VA	0.000	0.100	Dec 2018	0.100	Dec 2019	0.094	Dec 2020	-		0.094	0.000	0.294	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OTH Program Management Support	WR	PEO IWS : Arlington, VA	0.000	0.100	Oct 2018	0.100	Oct 2019	0.094	Oct 2020	-		0.094	0.000	0.294	-
OTH Contractor Engineering Support	C/CPIF	Alion/ECS/GDIT : Arlington, VA	0.000	0.635	Dec 2018	0.500	Dec 2019	0.475	Dec 2020	-		0.475	0.000	1.610	-
		Subtotal	0.000	1.155		1.020		0.964		-		0.964	0.000	3.139	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	19.307		12.401		26.374		-		26.374	0.000	58.082	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*

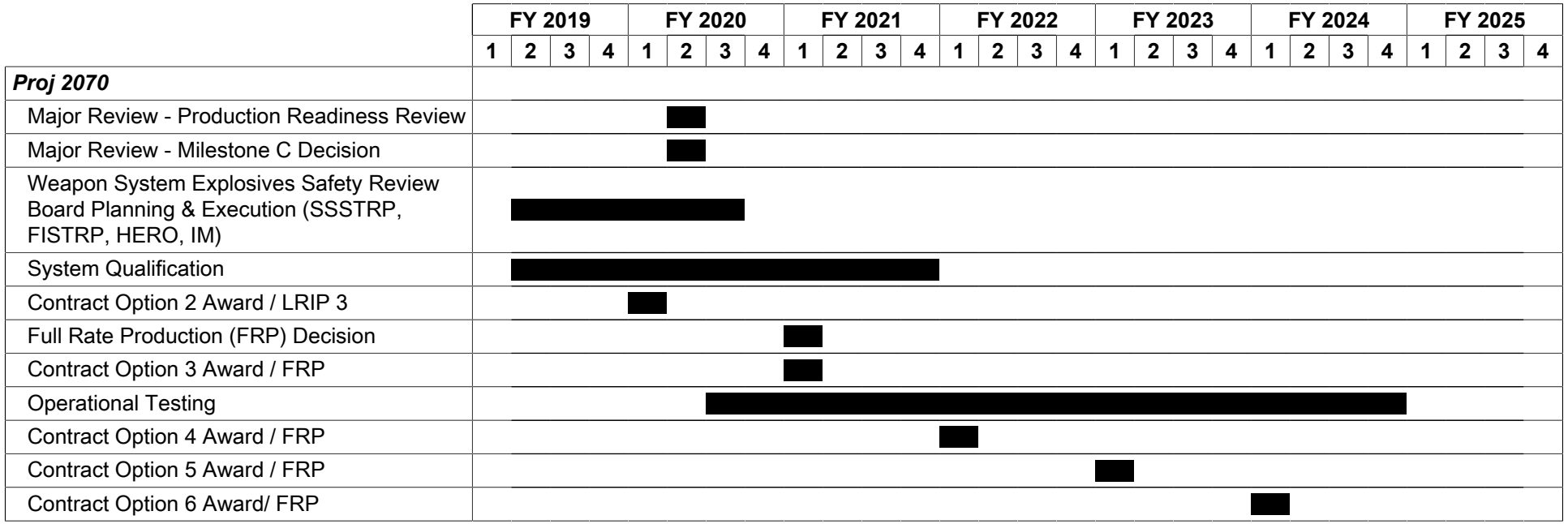

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2070				
Major Review - Production Readiness Review	2	2020	2	2020
Major Review - Milestone C Decision	2	2020	2	2020
Weapon System Explosives Safety Review Board Planning & Execution (SSSTRP, FISTRP, HERO, IM)	2	2019	3	2020
System Qualification	2	2019	4	2021
Contract Option 2 Award / LRIP 3	1	2020	1	2020
Full Rate Production (FRP) Decision	1	2021	1	2021
Contract Option 3 Award / FRP	1	2021	1	2021
Operational Testing	3	2020	4	2024
Contract Option 4 Award / FRP	1	2022	1	2022
Contract Option 5 Award / FRP	1	2023	1	2023
Contract Option 6 Award/ FRP	1	2024	1	2024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 9081 / *Phalanx CIWS SEARAM*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
9081: *Phalanx CIWS SEARAM*	17.577	9.495	8.400	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	35.472
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The MK-15 Close-In Weapons System (CIWS) is a fast reaction, rapid fire, computer controlled radar system utilizing either a 20mm gun (Phalanx) or a SeaRAM weapon system (SEARAM) to meet its primary mission of providing Anti-Ship Missile (ASM) defense. CIWS fleet population exceeds 220 systems onboard nearly every USN surface combatant. In addition, CIWS continues to be installed on new construction surface ships with life expectancies of 25+ years. Limited technology refresh development efforts started in FY2018 for the Electric Gun Drive System (EGDS) with completion of development in FY19 and FY20. EGDS will replace the current pneumatic gun drive system that is difficult and costly to maintain with an all-electric drive system. EGDS will reduce maintenance/troubleshooting requirements, reduce support costs and provide capability increases such as variable firing rates and reduced ammunition expenditures.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: CIWS Tech Refresh	9.495	8.400	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2020 Plans: Complete development of mission computer and electric gun software. Complete integration and testing of Proof of manufacture hardware. Conduct test readiness review and complete qualification. Complete ECP.					
FY 2021 Base Plans: N//A					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: There is no FY21 RDTEN funding as Electric Gun Drive development completes in FY20.					
Accomplishments/Planned Programs Subtotals	9.495	8.400	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

D. Acquisition Strategy

The MK 15 Close-In Weapons System (CIWS) is a fast reaction, rapid fire, computer controlled radar system utilizing either a 20mm gun (Phalanx) or a SeaRAM weapon system (SeaRAM) to meet its primary mission of providing Anti-Ship Missile (ASM) defense. Funding provides support for efforts related to EGDS Technology Refresh. This work will be completed via sole source contracts to the CIWS Design Agent (Raytheon Missile Systems). EGDS Tech Refresh improvements will be fielded as Engineering Change Proposals (ECPs) and will be installed during CIWS overhauls or pierside.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CIWS Tech Refresh	SS/CPFF	Raytheon Missile Systems : Tucson, AZ	13.835	8.548	Mar 2019	7.770	Dec 2019	0.000		-		0.000	0.000	30.153	4.435
SeaRAM CIWS on DDG Class	SS/CPFF	Raytheon Missile Systems: : Various	2.309	0.000		0.000		0.000		-		0.000	0.000	2.309	-
CIWS Tech Refresh	Various	Various : Various	0.400	0.217	Sep 2019	0.000		0.000		-		0.000	0.000	0.617	-
CIWS Tech Refresh	WR	NAWC CL : CA	0.085	0.120	Mar 2019	0.180	Dec 2019	0.000		-		0.000	0.000	0.385	-
CIWS Tech Refresh	WR	NSWC DD : VA	0.050	0.040	Mar 2019	0.040	Dec 2019	0.000		-		0.000	0.000	0.130	-
CIWS Tech Refresh	WR	NSWC IHD : MD	0.450	0.250	Mar 2019	0.150	Dec 2019	0.000		-		0.000	0.000	0.850	-
CIWS Tech Refresh	C/BA	APL : MD	0.125	0.060	May 2019	0.000		0.000		-		0.000	0.000	0.185	-
CIWS Tech Refresh	WR	TECH REP : CA	0.085	0.100	Mar 2019	0.100	Dec 2019	0.000		-		0.000	0.000	0.285	-
CIWS Tech Refresh	SS/CPFF	TSC : VA	0.000	0.150	May 2019	0.150	Dec 2019	0.000		-		0.000	0.000	0.300	-
CIWS Tech Refresh	WR	NSWC CCD : Not Specified	0.012	0.000		0.000		0.000		-		0.000	0.000	0.012	-
CIWS Tech Refresh	SS/CPFF	ALION : VA	0.221	0.000		0.000		0.000		-		0.000	0.000	0.221	-
Various	Various	Various : Various	0.005	0.010	Sep 2019	0.010	Sep 2020	0.000		-		0.000	0.000	0.025	-
		Subtotal	17.577	9.495		8.400		0.000		-		0.000	0.000	35.472	N/A

Remarks

CIWS Tech Refresh modernization activities are focused on redesign of key subsystems, some of which date to the 1970s with obsolete and largely unsupportable electronics systems. Replacing these subsystems with modular "refreshed" components will reduce total ownership costs and maintenance requirements for the overall sustainment of the Phalanx system.

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	17.577	9.495		8.400		0.000		-		0.000	0.000	35.472	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Proj 9081																												
Tech Refresh: CIWS Research, Development, and Test for Tech Refresh	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9081				
Tech Refresh: CIWS Research, Development, and Test for Tech Refresh	1	2019	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	24.118	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.118
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Three Congressional adds are funded. C468 for Condition Based Maintenance to support forecasting and scheduling of maintenance; C469 for Next Generation PHALANX for MK 15 CIWS; and C470 ALaMO Munition System: The 57mm MK 332 HE-4G Projectile significantly increases MK 110 Gun Mount lethality and effectiveness against Fast Attack Craft and Fast In-Shore Attack Craft (FAC/FIAC). The 57mm ALaMO concluded development as part of a classified program and transitioned to qualification for Navy use in FY 2017. ALaMO will transition to production at the conclusion of the program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Condition Based Maintenance ***FY 2019 Accomplishments:*** Project C468: Condition Based Maintenance program, originally developed for the LCS program, leverages work already done for LCS and AEGIS. It aides in forecasting and scheduling planned maintenance. Increase support for combat systems Condition Based Maintenance (CBM+) in the Evolved Sea Sparrow Missile System (ESSM), thereby enhancing three ship classes simultaneously - CVN, LHA and LHD. ***FY 2020 Plans:*** N/A	7.718	0.000
Congressional Add: Next Generation Phalanx ***FY 2019 Accomplishments:*** Project C469: Contract modification award to restore and convert an existing PHALANX mount to an engineering SEARAM mount. ***FY 2020 Plans:*** NA	6.753	0.000
Congressional Add: Alamo Munition Systems ***FY 2019 Accomplishments:*** Project C470 -Complete transition to production activities. -Procure hardware for Counter Unmanned Aerial Systems (CUAS) evaluation. -Conduct gun fired CUAS demonstration. ***FY 2020 Plans:*** N/A	9.647	0.000
Congressional Adds Subtotals	24.118	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

C470 ALaMO Munition System: MK 332 HE-4G will have initiated hardware procurement for Counter-Unmanned Aerial Systems (C-UAS)capabilities demonstration.

C469 Next Generation Phalanx: Work contracted with Raytheon Missile Systems (RMS) and performed at RMS Louisville.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9999 / *Congressional Adds*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C470- Production transition	MIPR	DOTC : Picatinny Arsenal, NJ	0.000	4.649	Feb 2019	0.000		0.000		-		0.000	0.000	4.649	-
C470- Produce test hardware	MIPR	DOTC : Picatinny Arsenal, NJ	0.000	4.396	Aug 2019	0.000		0.000		-		0.000	0.000	4.396	-
		Subtotal	0.000	9.045		0.000		0.000		-		0.000	0.000	9.045	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C470-Government Engineering Support Services	WR	NSWC DD : NSWC Dahlgren, VA	0.000	0.602	Jun 2019	0.000		0.000		-		0.000	0.000	0.602	-
C468- Condition Based Maintenance	C/FFP	MIkros Systems : NA	0.000	7.718	Jun 2019	0.000		0.000		-		0.000	0.000	7.718	-
C469-CIWS Improvements	SS/CPFF	Raytheon : Various	0.000	6.753	Sep 2019	0.000		0.000		-		0.000	0.000	6.753	-
		Subtotal	0.000	15.073		0.000		0.000		-		0.000	0.000	15.073	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	24.118		0.000		0.000		-		0.000	0.000	24.118	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9999 / *Congressional Adds*

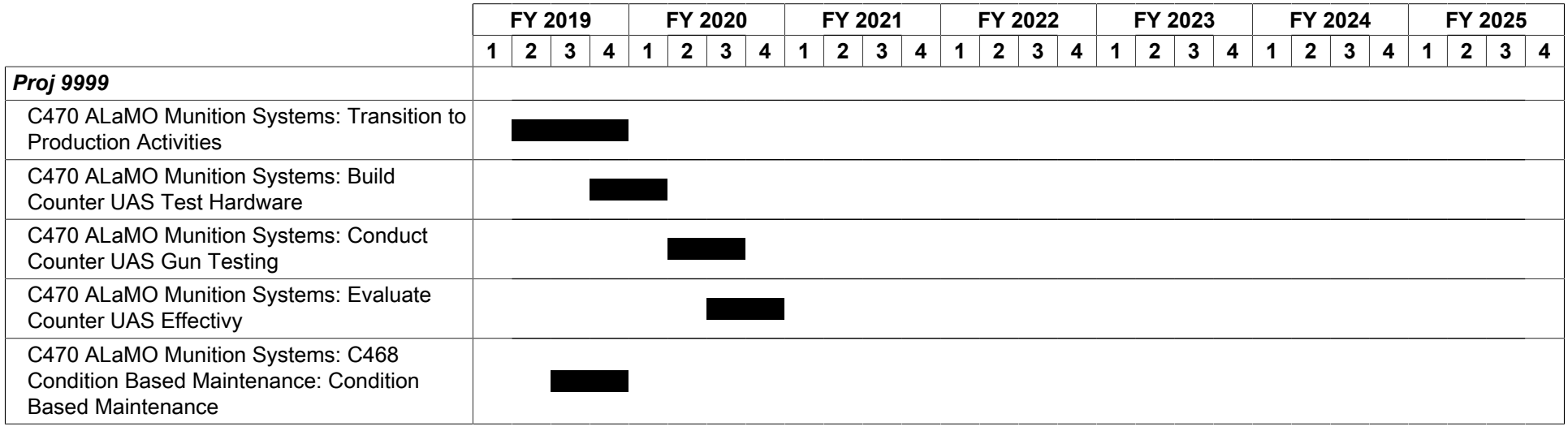

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
C470 ALaMO Munition Systems: Transition to Production Activities	2	2019	4	2019
C470 ALaMO Munition Systems: Build Counter UAS Test Hardware	4	2019	1	2020
C470 ALaMO Munition Systems: Conduct Counter UAS Gun Testing	2	2020	3	2020
C470 ALaMO Munition Systems: Evaluate Counter UAS Effectivy	3	2020	4	2020
C470 ALaMO Munition Systems: C468 Condition Based Maintenance: Condition Based Maintenance	3	2019	4	2019