Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy												Date: May 2021
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 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	1,256.104	118.609	94.420	87.862	-	87.862	-	-	-	-	-	-
0167: *5in Rolling Airframe Missile*	324.531	21.135	6.143	8.283	-	8.283	-	-	-	-	-	-
0173: *NATO Sea Sparrow*	885.194	69.538	62.020	68.583	-	68.583	-	-	-	-	-	-
0243: *ALaMO*	0.000	8.000	0.000	0.000	-	0.000	-	-	-	-	-	-
2070: *OTH Missile*	19.307	11.915	26.257	10.996	-	10.996	-	-	-	-	-	-
9081: *Phalanx CIWS SEARAM*	27.072	8.021	0.000	0.000	-	0.000	-	-	-	-	-	-

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 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**
Previous President's Budget	115.130	121.761	96.206	-	96.206
Current President's Budget	118.609	94.420	87.862	-	87.862
Total Adjustments	3.479	-27.341	-8.344	-	-8.344
• Congressional General Reductions	-	-0.541			
• Congressional Directed Reductions	-	-26.800			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	7.950	0.000			
• SBIR/STTR Transfer	-4.471	0.000			
• Program Adjustments	0.000	0.000	-6.141	-	-6.141
• Rate/Misc Adjustments	0.000	0.000	-2.203	-	-2.203

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy	Date: May 2021
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)*

Change Summary Explanation

FY2022 Program Adjustment decrease of -$6.141M is due to a decrease to Project 0173 of -$10.491M for prior year funds availability, offset by a $4.35M increase to Project 0167 for RAM Blk2 integration to the Ship Self-Defense System (SSDS) for carrier and amphib platforms.

FY2022 decrease of $-2.203M is for Rate / Misc Adjustments

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
0167: *5in Rolling Airframe Missile*	324.531	21.135	6.143	8.283	-	8.283	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Rolling Airframe Missile (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 consisting of both a missile launcher and dual mode, passive radio frequency/infrared seeker missiles. The baseline RAM Block 2 missile upgrade program is a cooperative requirement of the U.S. and Federal Republic of Germany and agreed to in a signed international Memorandum of Understanding(MOU). The RAM Block 2 missile defends against emerging, highly maneuverable Anti-Ship Cruise Missile (ASCM) threats utilizing advanced seekers while maintaining all the proven capabilities of previous RAM Block 0/1/1A's accurate terminal guidance, proven lethality, and no shipboard post launch dependence. The RAM Block 2 missile is being further upgraded, referred to as the RAM BLK 2A Fire Control Loop Improvement Project (FCLIP) ECP, via software only modifications to the missile and launcher to improve performance against raid attacks. The latest RAM Block 2 upgrade, referred to as RAM BLK 2B Raid ECP, is in development and will provide an upgraded infrared seeker and Missile-to-Missile Link (MML) capability to counter emerging complex raid attacks. Development and flight testing of the 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. FY22 through 26 efforts will focus on correcting issues found during RAM 2B development flight tests. In addition to supporting integration efforts with the new Combat Systems baselines for Carriers, and Amphibious platforms.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Rolling Airframe Missile Block 2 Development and Test	21.135	6.143	8.283	0.000	8.283
Articles:	-	-	-	-	-
FY 2021 Plans: Execute Guided Tests Vehicle (GTV) 1A and 1C development flights in Q2 FY21. Execute GTV2B development flight test in Q4 FY21					
FY 2022 Base Plans: Execute GTV 3 the final development flight test in Q2 FY22. Correct issues uncovered during the developmental flight tests to support fielding in the Fleet. Perform in-flight missile vulnerability/susceptibility to the electromagnetic environments of the Combat Systems. Establish the test plans and assemble the test equipment to confirm that all RAM variant(s) missile performance is not degraded in the new shipboard electromagnetic					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
environment i.e. Navy scheduled fielding of Enterprise Air Surveillance Radars and upgraded Electronic Warfare Suites. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase supports the fielding of RAM Blk 2B capability to the Fleet by ensuring all technical documentation, ILS and safety artifacts have been reviewed and accepted by Navy Subject Matter Experts. Increase also supports correction of RAM Blk 2B flight test deficiencies, and supports integration efforts with new Ship Self-Defense System (SSDS) Combat System baselines.					
Accomplishments/Planned Programs Subtotals	21.135	6.143	8.283	0.000	8.283

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• WPN 2242: *RAM*	106.765	90.533	94.280	-	94.280	-	-	-	-	-	-
• OPN 5231: *Ship Missile Support Equipment*	7.464	9.930	7.209	-	7.209	-	-	-	-	-	-

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 2022 Navy			Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-	-	-
Primary Hardware Dev/Blk 1	Various	Various : Various	10.081	0.000		0.000		0.000		-		0.000	-	-	-
FCLIP	WR	PHD : CA	0.777	0.000		0.000		0.000		-		0.000	-	-	-
FCLIP	SS/CPFF	AECOM : VA	0.982	0.244	Dec 2019	0.000		0.000		-		0.000	-	-	-
Raid ECP	SS/CPFF	Raytheon : Tucson/ Louisville	56.596	17.341	Dec 2019	3.655	Dec 2020	2.000	Dec 2021	-		2.000	-	-	-
FCLIP	SS/CPFF	Raytheon : Tucson/ Louisville	39.394	1.169	Dec 2019	0.000		0.000		-		0.000	-	-	-
Raid ECP	SS/CPFF	JHU/APL : MD	1.015	0.050	Dec 2019	0.050	Dec 2020	0.000		-		0.000	-	-	-
FCLIP	WR	China Lake : CA	8.277	0.458	Nov 2019	0.000		0.000		-		0.000	-	-	-
Raid ECP	WR	China Lake : CA	2.753	0.380	Nov 2019	1.173	Nov 2020	0.000		-		0.000	-	-	-
FCLIP	SS/CPFF	JHU/APL : MD	0.592	0.100	Dec 2019	0.000		0.000		-		0.000	-	-	-
Raid ECP	WR	PHD : CA	0.050	0.000		0.000		0.000		-		0.000	-	-	-
Raid ECP	SS/CPFF	AECOM : VA	1.204	0.378	Dec 2019	0.378	Dec 2020	0.000		-		0.000	-	-	-
FCLIP	WR	PT Mugu : CA	0.025	0.000		0.000		0.000		-		0.000	-	-	-
FCLIP	WR	NSWC DD : VA	0.698	0.146	May 2020	0.000		0.000		-		0.000	-	-	-
Various	Various	Various : Various	1.834	0.112	Sep 2020	0.087	Sep 2021	0.017	Nov 2021	-		0.017	-	-	-
2B Integration	SS/CPFF	Raytheon : Tucson/ Louisville	0.000	0.000		0.000		0.927	Nov 2021	-		0.927	-	-	-
2B Integration	WR	China Lake : CA	0.000	0.000		0.000		0.638	Oct 2021	-		0.638	-	-	-
2B Integration	C/CPFF	TBD : TBD	0.000	0.000		0.000		0.980	Dec 2021	-		0.980	-	-	-
2B P3I	SS/CPFF	Raytheon : Tucson/ Louisville	0.000	0.000		0.000		2.080	Mar 2022	-		2.080	-	-	-
2B Integration	WR	NSWC DD : VA	0.000	0.000		0.000		1.641	Oct 2021	-		1.641	-	-	-
		Subtotal	278.928	20.378		5.343		8.283		-		8.283	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies and Analysis	Various	Various : Various	1.610	0.200	May 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	1.610	0.200		0.000		0.000		-		0.000	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Support	C/CPFF	Raytheon : Tucson	18.187	0.300	Nov 2019	0.300	Nov 2020	0.000		-		0.000	-	-	-
Test Support	WR	China Lake/PHD : CA/CA	12.757	0.157	Oct 2019	0.500	Oct 2020	0.000		-		0.000	-	-	-
FOT&E	WR	China Lake : PHD, CA	4.701	0.000		0.000		0.000		-		0.000	-	-	-
Miscellaneous	Various	Various : Various	5.765	0.000		0.000		0.000		-		0.000	-	-	-
Test Support	SS/CPFF	JHU/APL : MD	0.717	0.100	Nov 2019	0.000		0.000		-		0.000	-	-	-
Integration	Various	Various : Various	1.719	0.000		0.000		0.000		-		0.000	-	-	-
		Subtotal	43.846	0.557		0.800		0.000		-		0.000	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-	-	-
		Subtotal	0.147	0.000		0.000		0.000		-		0.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	324.531	21.135		6.143		8.283		-		8.283	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
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*

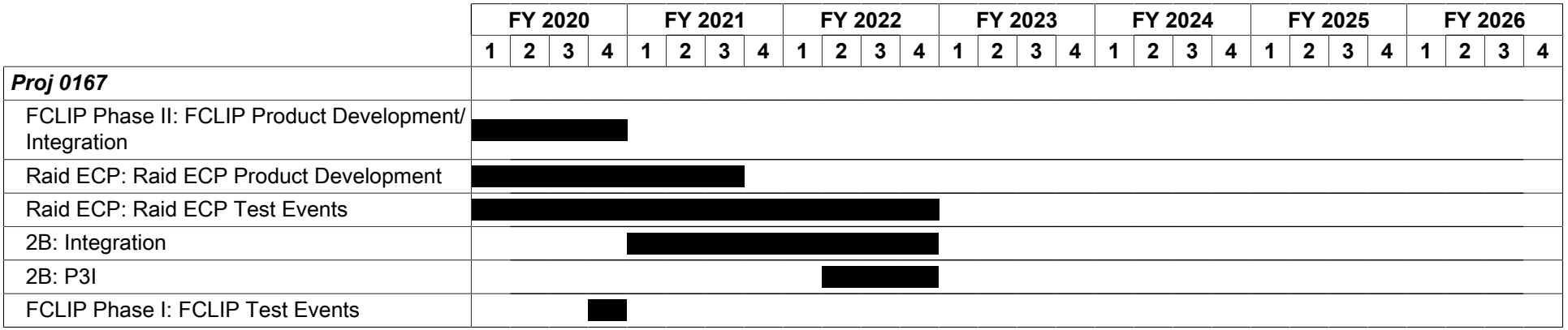

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0167				
FCLIP Phase II: FCLIP Product Development/Integration	1	2020	4	2020
Raid ECP: Raid ECP Product Development	1	2020	3	2021
Raid ECP: Raid ECP Test Events	1	2020	4	2022
2B: Integration	1	2021	4	2022
2B: P3I	2	2022	4	2022
FCLIP Phase I: FCLIP Test Events	4	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
0173: *NATO Sea Sparrow*	885.194	69.538	62.020	68.583	-	68.583	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project encompasses thirteen (13) primary efforts to enhance ship self-defense:

1. Evolved SEASPARROW Missile (ESSM) Blk 1 Testing: Evolved SEASPARROW Missile (ESSM) Blk 1 is a cooperative effort among nine (9) NATO SEASPARROW Nations and the U.S. to provide crucial battlespace defense 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 (Aircraft Carrier), LHD 1 (Multipurpose Amphibious Assault Ship), LHA 7 (Multipurpose Amphibious Assault Ship), CG 47 (Guided Missile Cruiser), and DDG 51 (Guided Missile Destroyer) class ships. ESSM Blk 1 integration efforts continue to bring the capability to CVN 78 and DDG 1000. Testing scheduled for FY21 includes ESSM Blk 1 firings from the lead ships 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 DDG 1000, CVN 78, LHD 4, and CVN 70.

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. There will be planning efforts to support 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.

4. 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 with the U.S. providing the bulk of its funding later in EMD. The remaining budget is required to complete ESSM Blk 2 EMD.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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*

5. 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).

6. ESSM Technology Roadmap & Studies: : The ESSM Blk 2 Missile completes development in 2021, achieves Initial Operational Capability (IOC) in 2021 and transitions to in-service. In order to achieve performance not realized during the execution of Engineering and Manufacturing Development (E&MD), pace the threat, and remain a viable weapon system, 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 NATO SEASPARROW Project Office (NSPO) managed Combat System Elements for future hardware or software improvements to either the Consortium's combat systems or the missile, or both. RDT&E funding represented will develop and maintain an ESSM System roadmap and support specific studies to determine candidate combat system and/or missile performance and manufacturing efficiency improvements. Computer simulation updates will be needed to support the performance studies for future improvements.

7. 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 Block 2 Tactical Simulation (ETS) model into the Combat Systems Testbed and Enterprise Testbed. This effort also includes improvements needing to be made in ETS based on the studies exploring 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.

8. Evolved SEASPARROW Missile (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.

9. 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 Evolved SEASPARROW Missile (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 that this is achievable.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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*

10. 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 United States Navy (USN) to perform reprogramming of the Evolved SEASPARROW Missile (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.

11. MK 9 Continuous Wave Tracking Illuminator (CWTI) (Transmitter) Replacement: The MK 57 NATO SEASPARROW Surface Missile System (NSSMS) supports the SPARROW missile family with Semi-Active illumination in the form of Continuous Wave Tracking Illuminator (CWTI). The CWTI enables the MK 9 Tracker-Illuminator System (TIS) to support self-defense mission requirements and paces 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 Evolved SEASPARROW Missile (ESSM) probability of guidance (PG) 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 United States Navy (USN) will be required to fulfill maintenance requirements and enhance additional frequency selections and ensure post-launch RF missile support for noise and uplink requirements.

12. Next Generation Tracker-Illuminator System (TIS): An upgrade is required to existing ship's infrastructure to provide Semi-Active (SAX) illumination source that improves Evolved SEASPARROW Missile (ESSM) Block 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 (1960's technology) have reached the limits of their ability to support system requirements and deficiencies have been noted in Follow-on Operational Test and Evaluation (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).

13. 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/replacement 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 Evolved SEASPARROW Missile (ESSM) in-service refurbishment, or re-certification. This upgrade/replacement contains design margin to allow for growth, where the MK 132 Guided Missile Launcher is maximized today precluding ESSM Block 2 deployment.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Evolved Sea Sparrow Missile (ESSM) Blk 1 Testing	6.379	7.176	6.094	0.000	6.094
Articles:	-	-	-	-	-
FY 2021 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Plans for FY 2021 include: 1.) supporting Combat System Ships Qualification Trials (CSSQT) on DDG 1000, CVN 78, LHD 4, LHA 7 and CVN 70, 2.) Supporting Aegis live fire events 3.) Supporting DDG 1000 and CVN 78 events on lead ship, and 4) executing Sea Skimming Guidance Live Fire events. ***FY 2022 Base Plans:*** Plans for FY 2022 include supporting CSSQTs on DDG 1001, LHD 7 and CVN 73 and supporting Aegis live fire events. ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding from FY 2021 to FY 2022 due to a reduction of ESSM Blk 1 Follow-On Test and Evaluation (FOT&E) requirements, as well as prior year funds availability and Total Force Manpower Savings. Efforts will begin to shift to ESSM Blk 2 FOT&E requirements.					
Title: BLK 2 Follow-on Test & Evaluation (FOT&E) ***Articles:*** ***FY 2021 Plans:*** Planning efforts for Follow On Test and Evaluation (FOT&E) events. Continue integration with Ship Self Defense System (SSDS) functional compatibility. Start ESSM Blk 2 integration with SSDS combat system. Continue integration on new Aegis combat systems on land based test sites. Conduct integration activities with Mk 29 Min/Mod (Minimum Modification). ***FY 2022 Base Plans:*** Conduct FOT&E in support of Aegis/optimized interfaces. Continue ESSM Blk 2 integration with SSDS and FFG combat systems. Conduct planning in support of Mk29 Min/Mod and SSDS integration. ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 due to Blk 2 FOT&E removed from FY 2020 & 2021 and moved to FY 2022. Funding will be needed for planning/integration support and DDG Flight 3/other combat systems that will be integrating ESSM Block 2 into their systems.	0.000 -	1.500 -	4.744 -	0.000 -	4.744 -
Title: NATO Sea Sparrow Combat System Integraton Technical Direction Agent (TDA)	2.107	2.245	1.965	0.000	1.965

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Articles:	-	-	-	-	-
FY 2021 Plans: The Combat Systems (CS) Technical Design Agent (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 2022 Base Plans:*** As road map studies conclude their initial iteration and programs of record are initiated based on that long term planning, the CS TDA will provide systems engineering analysis, trade studies, and peer review(s), inclusive of recommendations for Launching System and RADAR architecture, configuration, performance requirements (including platform integration and alignment). The CS TDA will continue to provide independent analysis and recommendations for emergent issues and engineering changes for deployed systems. ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding from FY 2021 to FY 2022 due to prior year funds availability and Total Force Manpower Savings.					
Title: Evolved Sea Sparrow Missile (ESSM) Blk 2 EMD	30.384	17.071	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: Program will continue to execute E&MD phase, and will complete the Initial Operational Test and Evaluation (IOT&E) events onboard U.S. SDTS and manned Aegis Ship Platforms. Program will complete the ground testing program and conclude all requirements verification activities, as well as complete the development of all baseline software capabilities. Program will conduct post-flight analysis of Operational Test (OT) phase, complete Simulation accreditation and runs for the record, and develop appropriate artifacts to support IOC					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
declaration. Program will finalize the Interface Control Documentation needed to support International Combat Systems integration activities. ***FY 2022 Base Plans:*** NA ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding from FY 2021 to FY 2022 represents the completion of the Engineering and Manufacturing Development (E&MD) requirements for the successful implementation of ESSM Blk 2.					
Title: Transition to Production (TTP) ***Articles:*** ***FY 2021 Plans:*** NA ***FY 2022 Base Plans:*** NA ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** NA	23.126 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: ESSM Blk 2 Technology Roadmap and Studies ***Articles:*** ***FY 2021 Plans:*** Develops the overarching Program Office Technology Roadmap and performs studies necessary to identify appropriate courses of action needed to achieve performance not realized during the execution of E&MD and pace the threat. Technology 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. 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	0.000 -	0.375 -	1.287 -	0.000 -	1.287 -

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
other analyses focused on improving overall missile or combat systems performance. Failure to fund this effort will inhibit United States Navy's (USN's) ability to provide the needed capability to resolve issues identified in flight tests, performance not achieved during the development phase, inhibit optimization of capabilities inherent to dual-mode active/semi-active missiles, and prevent ability to pace the ever evolving threats to U.S. Navy and 11 other International Navies of the Consortium. ***FY 2022 Base Plans:*** The ESSM Block 2 contractors and field activities will continue to perform necessary updates to the Technology Roadmap and conduct specific studies as directed by the Government, support meetings, create Plan Of Actions and Milestones (POA&Ms) for capability improvements, and deliver reports as necessary. Prospective updates will include, technology assessment with respect to maturity and risk; understanding the specifics of production impacts; assessing the impacts to ship integration impacts; and continuing to take into account the evolution of the threat. Maintenance of the Technology Roadmap must assess all these factors and provide an updated Roadmap periodically as appropriate. ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 to support desired steady state requirements for completing establishment of Technology Roadmap as well as completing technology assessments with respect to maturity and risk, maintaining the roadmap, and extracting strategic intelligence used to guide the Studies effort required to identify specific capability improvements.					
Title: Other Development	0.000	6.103	1.501	0.000	1.501
Articles:	-	-	-	-	-
FY 2021 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. ***FY 2022 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Integrate ETS into CSTB and Enterprise Testbed as per the Testbed schedules. This effort also includes to development updates to 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 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding from FY2021 to FY2022 reflects a portion of Combat System test bed support that is no longer required due to the ESSM Block 2 model reaching a level of maturity that no longer requires the same effort of support from the ESSM Block 1 Development Team. Sufficient funding remains to ensure ESSM stays current with modeling and simulation efforts associated with the Combat Systems.					
Title: ESSM Blk 2 Software Upgrades	0.000	1.500	4.719	0.000	4.719
Articles:	-	-	-	-	-
FY 2021 Plans: This is a level loaded effort for annual support from the ESSM Block 2 Prime Contractor, Raytheon, 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 Initial Operational Capability (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 and 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. This effort will require the Prime Contractor to support meetings, create Plan of Actions and Milestones (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. Failure to fund this effort will inhibit United States Navy's (USN's) ability to provide the needed capability to resolve issues identified in flight tests, performance not achieved during the development phase,					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
inhibit optimization of capabilities inherent to dual-mode active/semi-active missiles, and prevent ability to pace the ever evolving threats to U.S. Navy and 11 other International Navies of the Consortium. ***FY 2022 Base Plans:*** The ESSM Block 2 Prime Contractor will continue to perform necessary software updates that are resulting from performance improvements studies, from software issues resulting from Follow-On Test and Evaluation (FOT&E) flight test results and as a result of new hardware and combat system changes as prioritized and directed by the Government. The effort will require the Prime Contractor to support meetings, create POA&Ms, develop algorithms, build proof of concepts and estimates for the capability improvements, and deliver software reports, test plans/procedures, and test inspection reports as necessary. ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 to support software updates resulting from studies and testing events.					
Title: C-Band Telemetry Upgrades ***Articles:*** ***FY 2021 Plans:*** 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. Conduct the Primary Design Review (PDR) in Q4 FY 2021. Failure to fund this effort will inhibit United States Navy's (USN's) ability to assess the active missile engagement performance against stream raids in realistic environments in accordance with Title 10. There are multiple problems with active seekers that need to be assessed on the range. The data collected will support the Verification, Validation and Accreditation (VV&A) of Modeling and Simulation (M&S) used to assess missile and combat system performance against various threats. It will also be instrumental in addressing future fleet Tactics, Techniques, and Procedures (TTPs). ***FY 2022 Base Plans:*** ESSM Block 2 and C band telemeter design and fabrication efforts. Completes the Critical Design Review (CDR) in Q2 FY22. Complete the delta qualification test and TEMPEST testing in FY22. Failure to fund will inhibit USN's ability to assess the active missile engagement performance against stream raids in realistic	0.000 -	6.234 -	10.724 -	0.000 -	10.724 -

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
environments in accordance with Title 10. There are multiple problems with active seekers that need to be assessed on the range. The data collected will support the VV&A of M&S used to assess missile and combat system performance against various threats. It will also be instrumental in addressing future fleet TTPs. ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 due to an increase in significant design work (i.e. Critical Design Review, design & fabrication, complete delta qualification testing) being accomplished in FY 2022.					
Title: CMBRE Adaptor Development ***Articles:*** ***FY 2021 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 2022 Base Plans:*** NA ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding from FY 2021 to FY 2022 due to the completion of the CMBRE Adaptor Development requirement in FY 2021.	2.500 -	1.500 -	0.000 -	0.000 -	0.000 -
Title: MK9 CWTI (Transmitter) Replacement ***Articles:*** ***FY 2021 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	5.042 -	13.496 -	25.224 -	0.000 -	25.224 -

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
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 2022 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 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 is due to the majority of program efforts taking place in FY22. The work done in FY22 will be primarily to build to design, test, and qualify physical prototype hardware sets. This effort focuses on the next generation of the ESSM Launching Systems for CVN and LHD/LHA platforms and will include making the transmitter replacement whole with the Radar Test Set and the Signal Processing Receiver.					
Title: Next Generation Tracker- Illuminator System (TIS)	0.000	0.960	2.890	0.000	2.890
Articles:	-	-	-	-	-
FY 2021 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 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					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
on new ship construction (SCN) in order to continue rapid deployment of ESSM Block 2 with an optimized Weapons System/Combat System. ***FY 2022 Base Plans:*** Develop, qualify, test, and integrate modernized technology (equipment/components) as part of MK 9 TIS upgrades. (Transmitter Group, Signal Data processing algorithms, and Antenna/illuminator). Development of a First Article Unit (FAU). Additionally, the Government will commence the establishment of a land-based test site (LBTS) at Yorktown, Naval Munitions Command (NMC). ***FY 2022 OCO Plans:*** NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 specifically for the Engineering Development Model (EDM) acquisition.					
Title: Next Generation Launching System	0.000	3.860	9.435	0.000	9.435
Articles:	-	-	-	-	-
FY 2021 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 2022 Base Plans:*** Develop, qualify, test, and integrate modernized technology (equipment/components) as an upgrade or replacement to the MK 29 Guided Missile Launching System (GMLS). Development of a First Article Unit (FAU). Additionally, the Government will commence the establishment of a land-based test site (LBTS) at Yorktown, Naval Munitions Command (NMC). ***FY 2022 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
NA ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding from FY 2021 to FY 2022 due to the majority of the Next Generation Launching System development efforts occurring in FY 2022.					
Accomplishments/Planned Programs Subtotals	69.538	62.020	68.583	0.000	68.583

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• WPN 2307: *ESSM*	101.250	212.637	248.619	-	248.619	-	-	-	-	-	-
• OPN 5231: *Ship Missile Defense*	32.525	35.835	43.502	-	43.502	-	-	-	-	-	-
• OMN 1D4D: *NATO Seasparrow*	22.415	23.902	31.960	-	31.960	-	-	-	-	-	-

Remarks

OPN for Stalker is included in above LI 5231 - Ship Missile Defense in FY 2020- FY 2022 (FY20 $7.44M; FY21 $7.67M; FY22 $13.34)
OMN funding is for ESSM Blk 1, NSSMS, & RIM-7; ESSM Blk 2 In-Service Support begins in FY 2021. There is currently no additional OMN funding for ESSM Blk 2 ISS in FY21; half of the requirement was added in FY22; with the full requirement added in FY25 and beyond.

D. Acquisition Strategy

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

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Systems Engineering/Firing Spt	WR	Corona : CA	11.588	0.802	Dec 2019	0.901	Dec 2020	0.999	Dec 2021	-		0.999	-	-	-
ESSM Systems Engineering/Firing Spt Blk 2	WR	Corona : CA	0.000	0.000	Dec 2019	0.200	Dec 2020	0.202	Dec 2021	-		0.202	-	-	-
NATO OC System Engineering	C/ FFPLOE	Raytheon : RI	1.955	0.000		0.000		0.000		-		0.000	-	-	-
NATO OC - Software	C/ FFPLOE	Raytheon : RI	8.054	0.000		0.000		0.000		-		0.000	-	-	-
Stalker System Engineering	WR	NSWC Crane : IN	4.782	0.000		0.000		0.000		-		0.000	-	-	-
Stalker Hardware Engineering	WR	NSWC Crane : IN	14.350	0.000		0.000		0.000		-		0.000	-	-	-
Stalker Software Engineering	WR	NSWC Crane : IN	2.725	0.000		0.000		0.000		-		0.000	-	-	-
ESSM Primary Hardware Development	C/CPAF	Raytheon : Tuscon	193.941	0.000		0.000		0.000		-		0.000	-	-	-
ESSM Ancillary Hardware	Various	Various : Various	71.324	0.000		0.000		0.000		-		0.000	-	-	-
ESSM Blk 2 EMD	C/CPIF	Raytheon : Tuscon	294.361	30.384	Nov 2019	17.071	Nov 2020	0.000		-		0.000	-	-	-
I-Stalker Systems Engineering	WR	NSWC Crane : Crane, IN	4.690	0.000		0.000		0.000		-		0.000	-	-	-
TTP	SS/FFP	Raytheon : Tuscon	26.854	23.126	Dec 2019	0.000		0.000		-		0.000	-	-	-
ESSM Blk 2 Risk reduction	SS/ FFPLOE	Raytheon : Tuscon	44.150	0.000		0.000		0.000		-		0.000	-	-	-
NATO OC Systems Engineering SPT	WR	NSWC PHD : CA	0.700	0.000		0.000		0.000		-		0.000	-	-	-
Dual Band Tranceiver	SS/FFP	Raytheon : Tuscon	6.155	0.000		0.000		0.000		-		0.000	-	-	-
Studies/Technology Roadmap	TBD	Raytheon : Tuscon	0.000	0.000	Mar 2020	0.375	Oct 2020	1.287	Dec 2021	-		1.287	-	-	-
Other Development	TBD	Raytheon : Tucson	0.000	0.000		6.103	Oct 2020	1.501	Dec 2021	-		1.501	-	-	-
Software Upgrades	TBD	Raytheon : Tucson	0.000	0.000		1.500	Oct 2020	4.719	Dec 2021	-		4.719	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C-Band Telemetry upgrade	TBD	TBD : TBD	0.000	0.000		6.234	Dec 2020	10.724	Nov 2021	-		10.724	-	-	-
CMBRE Adaptor	TBD	NG : NA	0.000	2.500	Dec 2019	1.500	Oct 2020	0.000		-		0.000	-	-	-
MK9 CWTI Replacment	TBD	TBD : TBD	0.000	5.042	Sep 2020	13.496	Jan 2021	25.224	Nov 2021	-		25.224	-	-	-
Illuminator System	TBD	TBD : TBD	0.000	0.000		0.960	Jul 2021	2.890	Jan 2022	-		2.890	-	-	-
Launching System	TBD	TBD : TBD	0.000	0.000		3.860	Jul 2021	9.435	Feb 2022	-		9.435	-	-	-
I-Stalker Systems Engineering	WR	NRL : TBD	0.800	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Systems Engineering	WR	APL : TBD	0.525	0.000		0.000		0.000		-		0.000	-	-	-
		Subtotal	686.954	61.854		52.200		56.981		-		56.981	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NATO System TDA	SS/FP	APL : MD	3.425	2.107	Jan 2020	2.245	Jan 2021	1.965	Jan 2022	-		1.965	-	-	-
Stalker -ISEA/TDA/RM&A	SS/FFP	various : various	0.750	0.000		0.000		0.000		-		0.000	-	-	-
ILS/Engineering Support	Various	Various : Various	15.543	0.000		0.000		0.000		-		0.000	-	-	-
ESSM Blk 2 EMD	WR	APL : MD	20.454	0.000		0.000		0.000		-		0.000	-	-	-
ESSM Blk 2 EMD	WR	NAWC CL : CA	27.315	0.000		0.000		0.000		-		0.000	-	-	-
ESSM Blk 2 EMD	Various	Various : Various	11.581	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Platform Integration	WR	Norfolk Naval Shipyard (NNSY) : Norfolk, VA	0.400	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Platform Integration	C/BA	NSWC Dahlgren : Dahlgren, VA	0.847	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Platform Integration	C/BA	NSWC Crane : Crane, IN	1.124	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Platform Integration	WR	PSNSY : Puget Sound, WA	0.500	0.000		0.000		0.000		-		0.000	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-	-	-
Dual Band Transceiver	WR	APL : MD	0.800	0.000		0.000		0.000		-		0.000	-	-	-
Dual Band Tranceiver	WR	NAWC CL : CA	1.600	0.000		0.000		0.000		-		0.000	-	-	-
		Subtotal	86.513	2.107		2.245		1.965		-		1.965	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Developmental Test & Evaluation	WR	NAWC CL : CA	23.102	0.862	Dec 2019	0.917	Dec 2020	0.945	Dec 2021	-		0.945	-	-	-
ESSM Developmental Test & Evaluation Blk 2	WR	NAWC CL : CA	0.000	0.000	Dec 2019	0.250	Dec 2020	0.501	Dec 2021	-		0.501	-	-	-
ESSM OPEVAL/ TECHEVAL/Test Firings	WR	Corona, IHD, Dahlgren, SNSWC, PHD) : Various	20.188	1.512	Dec 2019	1.654	Dec 2020	1.125	Nov 2021	-		1.125	-	-	-
ESSM OPEVAL/ TECHEVAL/Test Firings Blk 2	WR	Corona, IHD, Dahlgren, SNSWC, PHD) : Various	0.000	0.000	Dec 2019	0.150	Dec 2020	0.302	Nov 2021	-		0.302	-	-	-
ESSM Developmental Test & Evaluation	SS/FFP	APL : MD	6.482	0.518	Nov 2019	0.617	Nov 2020	0.620	Nov 2021	-		0.620	-	-	-
ESSM Test & Evaluation	C/CPAF	Raytheon : Tuscon	26.398	1.749	Nov 2019	1.976	Nov 2020	1.501	Dec 2021	-		1.501	-	-	-
ESSM Test & Evaluation Blk 2	C/CPAF	Raytheon : Tuscon	0.000	0.000	Nov 2019	0.599	Nov 2020	2.911	Dec 2021	-		2.911	-	-	-
ESSM Test & Evaluation	WR	Dahlgren/PHD : VA/ CA	4.184	0.136	Nov 2019	0.112	Nov 2020	0.113	Nov 2021	-		0.113	-	-	-
Developmental Test & Evaluation	WR	Dahlgren : VA	0.418	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Development Test and Evaluation	WR	NSWC Crane : IN	0.564	0.000		0.000		0.000		-		0.000	-	-	-
		Subtotal	81.336	4.777		6.275		8.018		-		8.018	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM-Support and Performing Activity	Allot	PHD/NAWC CL/ APL : CA/MD	16.771	0.700	Nov 2019	0.899	Nov 2020	0.691	Nov 2021	-		0.691	-	-	-
ESSM-Travel	Allot	Program Office : VA	3.627	0.100	Oct 2019	0.100	Oct 2020	0.100	Oct 2021	-		0.100	-	-	-
ESSM-Misc	Various	various : various	2.149	0.000		0.000		0.000		-		0.000	-	-	-
NATO Travel/Misc	Various	Program Office : various	2.111	0.000		0.000		0.000		-		0.000	-	-	-
ESSM-Support and Performing Activity Blk 2	Allot	PHD/NAWC CL/ APL : CA/MD	0.000	0.000	Nov 2019	0.301	Nov 2020	0.828	Nov 2021	-		0.828	-	-	-
Engineering Support	Various	Various : Various	5.458	0.000		0.000		0.000		-		0.000	-	-	-
I-Stalker Engineering Support	Various	TMB : Various	0.275	0.000		0.000		0.000		-		0.000	-	-	-
		Subtotal	30.391	0.800		1.300		1.619		-		1.619	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	885.194	69.538		62.020		68.583		-		68.583	-	-	N/A

Remarks

Various used for multiple vendors and location under threshold.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
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*

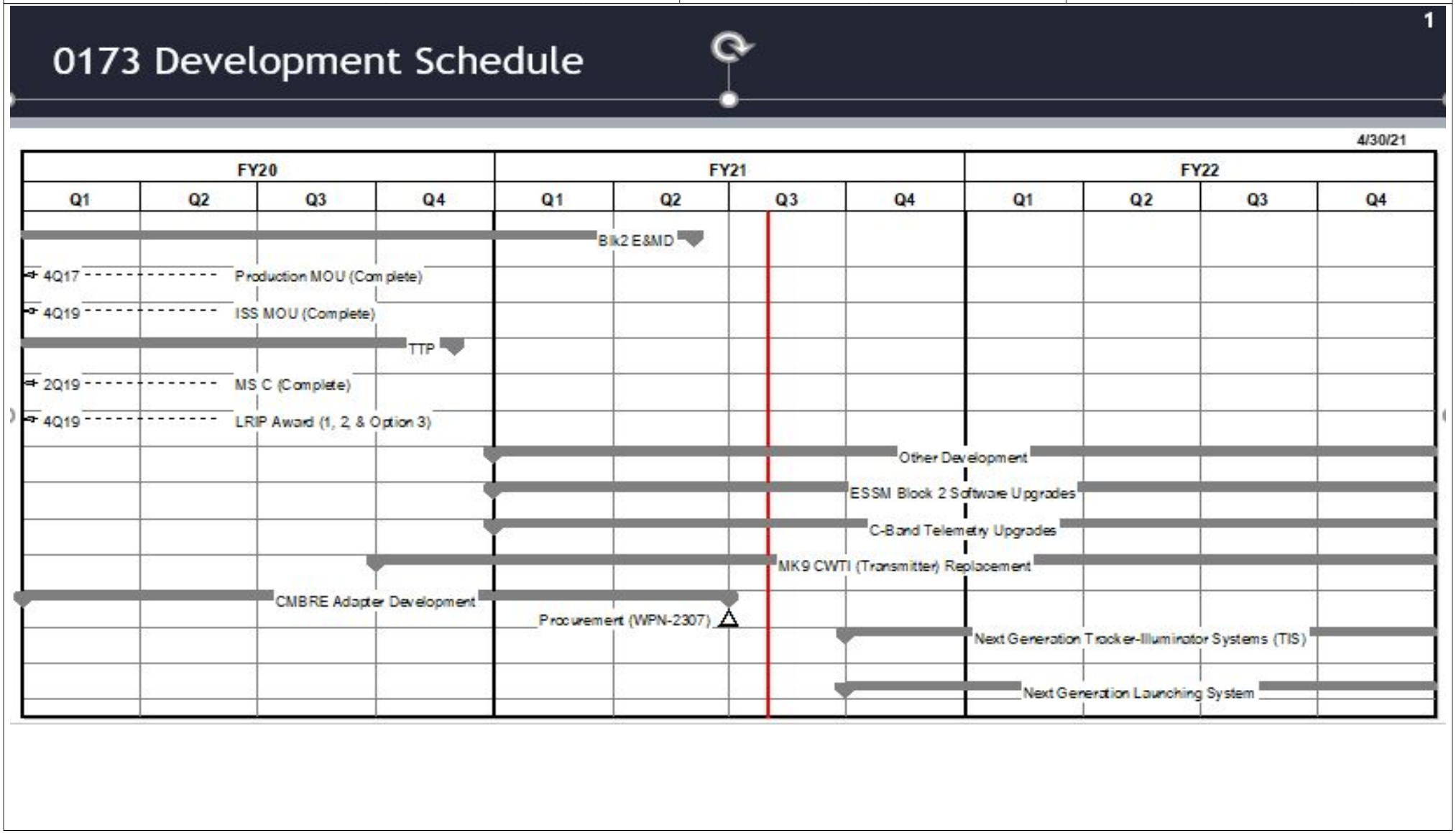

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0173				
ESSM BLOCK 2: Engineering and Manufacturing Development	1	2020	2	2021
ESSM BLOCK 2: In Service Support MOU Negotiation/Signature	1	2020	1	2020
ESSM BLOCK 2: Transition to Production	1	2020	4	2020
ESSM BLOCK 2: LRIP 3 Award	1	2020	1	2020
ESSM DEVELOPMENT: Other Development	1	2021	4	2022
ESSM DEVELOPMENT: ESSM Blk 2 Software Upgrades	1	2021	4	2022
ESSM DEVELOPMENT: C-Band Telemetry Upgrades	1	2021	4	2022
ESSM DEVELOPMENT: MK9 CWTI (Transmitter) Replacement	4	2020	4	2022
ESSM DEVELOPMENT: CMBRE Adaptor Development	1	2020	2	2021
ESSM DEVELOPMENT: Next Generation Tracker-Illuminator System (TIS)	4	2021	4	2022
ESSM DEVELOPMENT: Next Generation Launching System	4	2021	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
0243: *ALaMO*	0.000	8.000	0.000	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Systems Engineering and Testing	8.000	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: Conduct hazard classification and insensitive munitions qualification. Conduct remaining safety and suitability environmental qualification tests. Build DT test assets. Conduct land based and shipboard DT events. Conduct Weapons System Explosives Safety Review Board reviews for qualification closure. Conduct Weapons System Explosives Safety Review Board reviews for DT events.					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	8.000	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

MK 332 HE-4G will be completed qualifications and transition into LRIP FY2019.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Produce Design Verificaiton Hardware, DT Hardware	MIPR	DOTC : Picatinny Arsenal, NJ	0.000	3.076	Jan 2021	0.000	Sep 2021	0.000		-		0.000	-	-	-
		Subtotal	0.000	3.076		0.000		0.000		-		0.000	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Services	WR	NSWC DD : Dahlgren, VA	0.000	4.924	Jan 2021	0.000	Sep 2021	0.000		-		0.000	-	-	-
		Subtotal	0.000	4.924		0.000		0.000		-		0.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	8.000		0.000		0.000		-		0.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

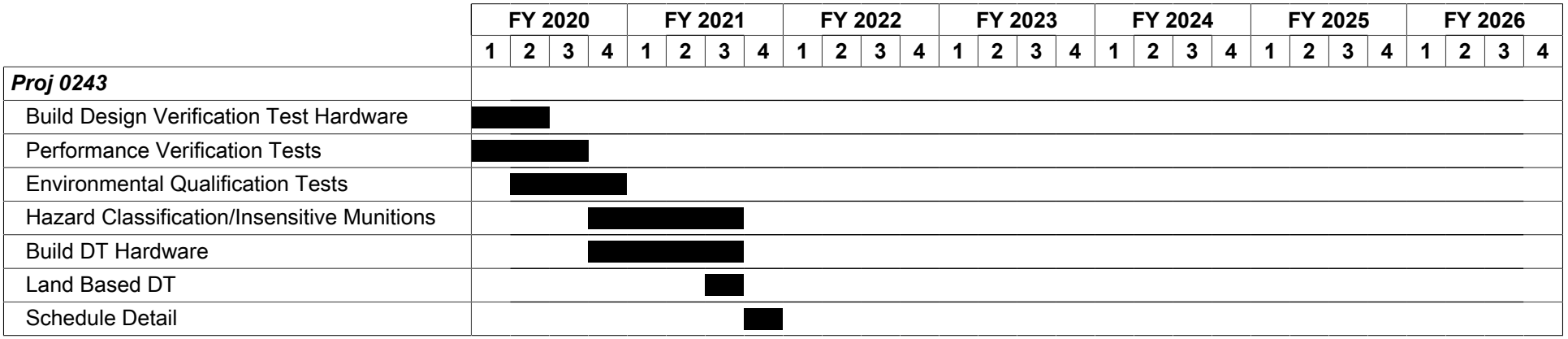

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0243				
Build Design Verification Test Hardware	1	2020	2	2020
Performance Verification Tests	1	2020	3	2020
Environmental Qualification Tests	2	2020	4	2020
Hazard Classification/Insensitive Munitions	4	2020	3	2021
Build DT Hardware	4	2020	3	2021
Land Based DT	3	2021	3	2021
Schedule Detail	4	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
2070: *OTH Missile*	19.307	11.915	26.257	10.996	-	10.996	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Over-The-Horizon (OTH) Missile funds competitive acquisition, testing, integrating and fielding of a modern, technologically mature Over-the-Horizon Missile Launch System (OTH-MLS) surface to surface missile capability will be installed onto commissioned and in-production Littoral Combat Ship Variants/Frigate/Landing Platform Dock (LCS/FFG/LPD) beginning FY 2019.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: OTH-MLS Test and Evaluation and Systems Engineering	11.915	26.257	10.996	0.000	10.996
Articles:	-	-	-	-	-

FY 2021 Plans:

- Continue Over-the-Horizon Weapon System (OTH-MLS) ship engineering activities to include integration planning and design on LCS variants, LCS Lethality and Survivability, FFG, and LPD platforms.
- Procure test articles (inert operational missiles, components inert operational missiles, warheads, boosters) required to conduct environmental qualification test, safety tests and Insensitive Munitions tests in accordance with the OTH-MLS Test and Evaluation Master Plan (TEMP) and as required by Explosive Ordnance Disposal (EOD), Development Operational Tests (DOT) and Weapon System Explosives Safety Review Board (WSESRB).
- Conduct Operational Tests events to support the TEMP.
- Conduct cyber testing to obtain Authority To Operate (ATO) for system deployment.
- Validate integrated Modeling and Simulation tools to support Operational Test and Flight Test predictions.
- Conduct Electro-Magnetic Environmental Effects (E3) testing.
- Execute required full environmental testing to include 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-MLS missile and fire control subject matter expertise to support the program office with program execution.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
- Implement organic Navy OTH-MLS training capability in accordance with the Naval Training System Plan (NTSP). - Prepare for OTH-MLS Full Rate Production (FRP) decision. - Continue operational testing of six OTH missiles at Pt. Mugu Test Range for system qualification. - Conduct and finalize Milestone C decision. ***FY 2022 Base Plans:*** - Continue to provide OTH-MLS missile and fire control subject matter expertise to support the program office with program execution. - Continue Electro-Static discharge (ESD) and Electro-magnetic vulnerability (EMV) testing to obtain safety certification. - Continue with system environmental testing. - Support Fleet and User evaluation. - Continue with OTH-MLS and Combat System integration growth. - Obtain OTH WS Full Rate Production (FRP) decision. - Complete EOD tests as mandated by DoD EOD and continued Insensitive Munitions (IM) testing will be executed in accordance with the OTH-MLS IM test plan. IM testing includes fast/slow energetics cook offs, bullet / fragment impact testing, sympathetic reaction testing, and missile drop tests. - Continue safety testing to support the WSESRB - Continue Live Fire Test and Evaluation (LFT&E) program. - Complete operation flight tests. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease due to development and integration efforts ramping down as program approaches Milestone C (FY 2021) and Full Rate Production decision in FY 2022.					
Accomplishments/Planned Programs Subtotals	11.915	26.257	10.996	0.000	10.996

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• OPN /5231: *Ship Missile Support Equipment/OTH Missile*	1.800	10.317	10.490	-	10.490	-	-	-	-	-	-
• WPN 2292: *LCS OTH Missile*	42.493	31.610	59.331	-	59.331	-	-	-	-	-	-

Remarks

OPN 5231 is a shared BLI - Funding only reflects OTH-MLS cost elements.

D. Acquisition Strategy

The OTH-MLS is an Acquisition Category (ACAT) II level weapon system production and sustainment program to provide the current Littoral Combat Ship (LCS) variants, Frigate (FFG) and Landing Platform/Dock (LPD) ships with an Over-the-Horizon Surface-To-Surface Missile (SSM) capability. The Navy awarded a seven-year competitive contract awarded to Raytheon May 31, 2018 that procures material, procures test assets, and provides installation support.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	1.366	3.445	Oct 2019	3.126	Oct 2020	1.625	Oct 2021	-		1.625	-	-	-
OTH Simulation and Analysis	WR	NSWC/COR : Corona, CA	0.290	0.773	Oct 2019	0.273	Oct 2020	0.150	Oct 2021	-		0.150	-	-	-
OTH Weapon System Design Agent	WR	NSWC/DD : Dahlgren, VA	0.525	1.127	Oct 2019	0.753	Oct 2020	0.310	Oct 2021	-		0.310	-	-	-
OTH Test & Evaluation / ILS	WR	NSWC/PHD : Port Hueneme, CA	0.750	0.655	Oct 2019	1.724	Oct 2020	1.300	Oct 2021	-		1.300	-	-	-
OTH Weapon System Safety	WR	NSWC/DD : Dahlgren, VA	0.220	0.139	Oct 2019	0.471	Oct 2020	0.550	Oct 2021	-		0.550	-	-	-
Weapons Systems Engineering Planning	FFRDC	JHU/APL : Laurel, MD	0.462	0.000	Dec 2019	0.565	Dec 2020	0.400	Dec 2021	-		0.400	-	-	-
OEM Engineering Support	C/CPFF	Raytheon : Tucson, AZ	3.200	4.139	Nov 2019	0.941	Nov 2020	0.610	Nov 2021	-		0.610	-	-	-
Test & Evaluation Assets	C/FFP	Raytheon : Tucson, AZ	11.339	0.000		0.000		0.000		-		0.000	-	-	-
Range & Target	Various	Various : Various	0.000	0.550	Oct 2019	5.100	Oct 2020	2.551	Oct 2021	-		2.551	-	-	-
Test Asset Procurement	C/FFP	Raytheon : Tucson, AZ	0.000	0.000		12.340	Nov 2020	2.000	Nov 2021	-		2.000	-	-	-
OTH WEAPON System safety	WR	NSWC/IHD : Indian Head, MD	0.000	0.030	May 2020	0.000		0.000		-		0.000	-	-	-
Test and Eval	WR	COTF : Norfolk, VA	0.000	0.030	May 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	18.152	10.888		25.293		9.496		-		9.496	-	-	N/A

Remarks

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

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OTH Contractor Acquisition Mgt Support	C/CPIF	CACI : Arlington, VA	0.320	0.301	Dec 2019	0.301	Dec 2020	0.450	Dec 2021	-		0.450	-	-	-
OTH Program Management Support	C/CPIF	Strategic Insight : Arlington, VA	0.100	0.000	Dec 2019	0.094	Dec 2020	0.280	Dec 2021	-		0.280	-	-	-
OTH Program Management Support	WR	PEO IWS : Arlington, VA	0.100	0.275	Oct 2019	0.094	Oct 2020	0.290	Oct 2021	-		0.290	-	-	-
OTH Contractor Engineering Support	C/CPIF	Alion/ECS/GDIT : Arlington, VA	0.635	0.451	Dec 2019	0.475	Dec 2020	0.480	Dec 2021	-		0.480	-	-	-
		Subtotal	1.155	1.027		0.964		1.500		-		1.500	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	19.307	11.915		26.257		10.996		-		10.996	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
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*

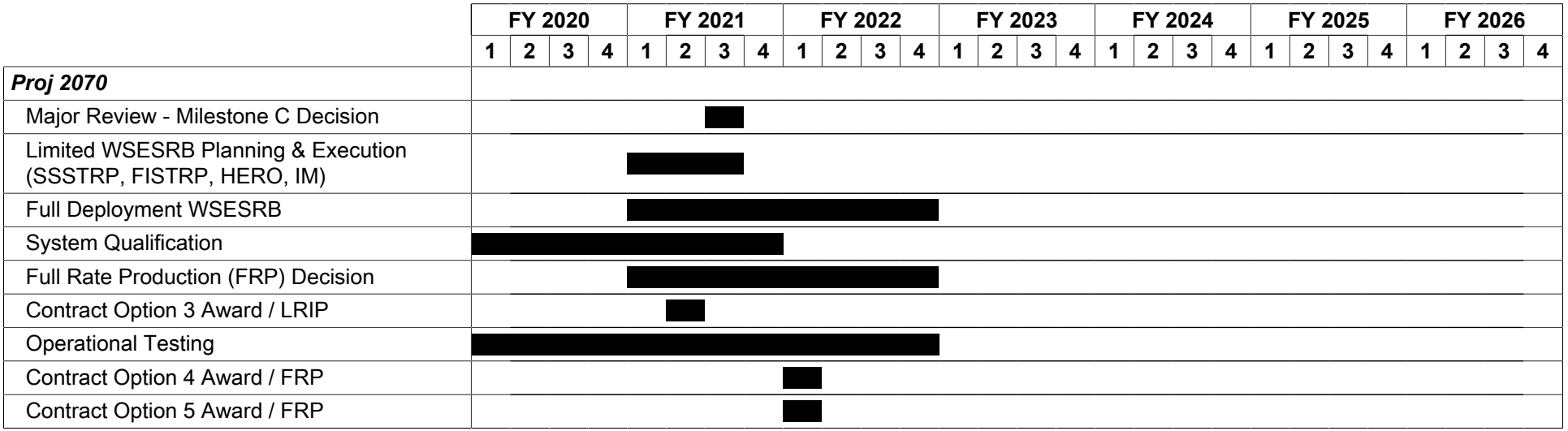

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 2070 / *OTH Missile*

Schedule Details

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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
9081: *Phalanx CIWS SEARAM*	27.072	8.021	0.000	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: CIWS Tech Refresh	8.021	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N//A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	8.021	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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*

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 2022 Navy		Date: May 2021
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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CIWS Tech Refresh	SS/CPFF	Raytheon Missile Systems : Tucson, AZ	22.383	7.441	Dec 2019	0.000		0.000		-		0.000	-	-	-
SeaRAM CIWS on DDG Class	SS/CPFF	Raytheon Missile Systems: : Various	2.309	0.000		0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	Various	Various : Various	0.617	0.000		0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	WR	NAWC CL : CA	0.205	0.130	Dec 2019	0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	WR	NSWC DD : VA	0.090	0.040	Dec 2019	0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	WR	NSWC IHD : MD	0.700	0.150	Dec 2019	0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	C/BA	APL : MD	0.185	0.000		0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	WR	TECH REP : CA	0.185	0.100	Dec 2019	0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	SS/CPFF	TSC : VA	0.150	0.150	Dec 2019	0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	WR	NSWC CCD : Not Specified	0.012	0.000		0.000		0.000		-		0.000	-	-	-
CIWS Tech Refresh	SS/CPFF	ALION : VA	0.221	0.000		0.000		0.000		-		0.000	-	-	-
Various	Various	Various : Various	0.015	0.010	Sep 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	27.072	8.021		0.000		0.000		-		0.000	-	-	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 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	27.072	8.021		0.000		0.000		-		0.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
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 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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 2022 Navy		Date: May 2021
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	2020	4	2020