Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603925N *I Directed Energy and Electric Weapon System*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	14.379	92.856	142.814	118.169	-	118.169	80.903	70.639	38.359	34.472	Continuing	Continuing
2731: *High Energy Laser Counter ASCM Project (HELCAP)*	0.000	0.000	0.000	9.000	-	9.000	19.000	17.000	3.000	0.000	0.000	48.000
3402: *Surface Navy Laser Weapon System (SNLWS)*	0.000	47.441	83.807	89.234	-	89.234	56.282	47.250	29.451	30.032	Continuing	Continuing
9823: *Lasers for Navy applicat*	14.379	39.625	33.107	19.935	-	19.935	5.621	6.389	5.908	4.440	Continuing	Continuing
9999: *Congressional Adds*	0.000	5.790	25.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	31.690

A. Mission Description and Budget Item Justification

This program element will transition Directed Energy and Electric Weapon Systems (DE&EWS) technology from Science and Technology (S&T) research to the Technology Maturation and Risk Reduction phase, ultimately leading to acquisition initiation for the Surface/Subsurface Navy.

DE&EWS consist of multiple breakthrough technologies including: laser weapons that provide for speed-of-light engagements at tactically significant ranges resulting in savings realized by minimizing the use of defensive missiles and projectiles; electromagnetic launch of projectiles that will significantly increase firing ranges imposing greater cost to adversaries of ballistic and air defense missile engagements; enhance the land attack mission; and fielding of high power radio frequency systems for non-kinetic electronic attack and active denial technology, allowing for non-lethal determination of threat intent beyond small arms fire ranges.

Development of DE&EWS includes: Weapons Grade High Energy Lasers, Electromagnetic Railgun (EMRG) Weapon Systems, High Power Radio Frequency Weapon/ Sensor Systems, and other systems/capabilities.

Project 2731 - High Energy Laser Counter ASCM Project (HELCAP): Defeating Anti-Ship Cruise Missiles (ASCMs) with a laser weapon system presents several technical challenges (e.g. high atmospheric turbulence, target acquisition and identification, target tracking, aim point maintenance, automatic aim point placement, jitter control). The High Energy Laser Counter ASCM Project (HELCAP) will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation (e.g. laser sources, mission analysis, lethality, advanced beam control with atmospheric mitigation, target and tracking sensors, control systems) required to defeat ASCMs in a crossing engagement.

FY 2020 funding will provide for automated laser weapon control activities and initiate planning and establish test assets and test site preparations to enable FY 2022-2023 counter ASCM detect to defeat demonstrations.

Project 3402 - The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY16 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging

mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. SNLWS leverages mature technology to deliver a proven laser weapon capability to the Fleet integrated with the Combat System. SNLWS development leverages the Office of Naval Research (ONR) efforts on the Solid State Laser (SSL) Quick Reaction Capability (QRC) and Solid State Laser (SSL) Technology Maturation (TM) efforts.

The FY 2020 funding supports completion of the system build, review and delivery of the Technical Data Package, preparation for conduct of Factory Qualification Testing (FQT), and Packaging, Handling, Storage and Transportation (PHS&T) of one system.

Project 9823 - Lasers for Navy Applications: Low Power Module (LPM) development will provide near-term, directed energy, shipboard Counter-Intelligence, Surveillance, and Reconnaissance (C-ISR) capabilities to dazzle Unmanned Aerial Systems (UASs) and other platforms that will address urgent operational needs of the Fleet. FY 2018 was the first year of funding and supported the design, development and procurement of eight standalone units over the FYDP, for deployment on DDG 51 surface combatants. The program supports the non-recurring engineering, development, procurement of long lead material, assembly and checkout, system certification, and platform integration/installation for these eight standalone units.

The FY 2020 funding supports assembly and checkout of the final increment of ODIN systems to be installed shipboard in FY 2021, as well as sustainment of installed Units 1 and 2 is initiated in FY 2020.

Project 9999 (PU C407) - Congressional Add - High Energy Storage Modules: Advanced energy storage systems are the foundation of the electric weapons kill chain, and their applications and demands are increasing in defense and naval applications. These applications require innovative battery technologies that provide high power and energy density, and provide increased rates of discharge, while ensuring safety and optimal thermal management. High Energy Storage Modules research will involve development, assembly and initial Naval certification testing of a 1000 volt high-rate, high-power-density Lithium-ion battery pack in order to increase Naval operational capabilities. The 1000-volt battery pack will combine newly developed and patented battery cooling technologies with an established Lithium-ion battery chemistry, produced by a domestic manufacturer. High Energy Storage Modules with higher discharge rates will decrease the amount of batteries needed to meet peak shipboard power loads. This effort will substantially progress the state of the art for high-rate water-cooled battery packs, to help bolster Naval operational capabilities.

Project 9999 (PU C453) - Congressional Add - Surface Navy Laser Weapon System (SNLWS) Program Re-phasing: Congress added funding in FY 2019 for re-phasing of the SNLWS development and fielding effort. This funding supports procurement of HELIOS long lead materials in FY 2019 related to early award of the contract to Lockheed Martin Aculight.

Project 9999 (PU C440) - Congressional Add - Electromagnetic Railgun Program: Congress added funding in FY 2019 for ship-based program/technical development and ship integration related risk reduction. Electromagnetic railgun provides increased capability for the following mission sets: Naval Surface Fire Support (NSFS), Integrated Air and Missile Defense (IAMD), Fast Attack Craft and Fast Inshore Attack Craft (FAC/FIAC), and future potential for Anti-Surface Warfare (ASuW). This

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603925N *I Directed Energy and Electric Weapon System*

funding supports the testing and refinement of pulse current transfer, mount, and hypervelocity projectile component development. In addition, this project supports the continuing effort to define and evolve requirements related to mount and platform interface management and maturations of specifications for tactical railgun weapon system.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	107.310	223.344	107.886	-	107.886
Current President's Budget	92.856	142.814	118.169	-	118.169
Total Adjustments	-14.454	-80.530	10.283	-	10.283
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-106.430			
• Congressional Rescissions	-	-			
• Congressional Adds	-	25.900			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.960	0.000			
• Program Adjustments	0.000	0.000	11.338	-	11.338
• Rate/Misc Adjustments	-0.001	0.000	-1.055	-	-1.055
• Congressional Directed Reductions Adjustments	-19.493	-	-	-	-
• Congressional Add Adjustments	6.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *High Energy Storage Modules*	5.790	0.000
Congressional Add: *Electromagnetic Railgun*	0.000	10.000
Congressional Add: *SNLWS Program Rephasing*	0.000	15.900
Congressional Add Subtotals for Project: 9999	5.790	25.900
Congressional Add Totals for all Projects	5.790	25.900

Change Summary Explanation

The FY 2019 net funding decrease in the amount of $80.530 million consists of the following: A $106.430 million decrease to the SNLWS Program PU 3402; a $15.9 million Congressional add for the SNLWS rephrasing and a $10 million Congressional add for the Electromagnetic Railgun Program.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603925N *I Directed Energy and Electric Weapon System*

The funding increase from PB19 to PB20 for FY 2020 includes $2.3 million to support Optical Dazzling Interdictor, Navy (ODIN) Sustainment; and $9.0 million for the High Energy Laser Counter ASCM Project (HELCAP) to address laser technology for ACSM threats.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2731: *High Energy Laser Counter ASCM Project (HELCAP)*	0.000	0.000	0.000	9.000	-	9.000	19.000	17.000	3.000	0.000	0.000	48.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project is not a new start in FY20 as efforts associated with RHEL PH II now titled HELCAP were ongoing in PE 0603801N. Due to technology maturation, a portion of HELCAP program efforts now fall into BA04.

A. Mission Description and Budget Item Justification

The High Energy Laser Counter ASCM Project (HELCAP) will expedite the development, experimentation, integration and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM) by addressing the remaining technical challenges, e.g.: atmospheric turbulence, automatic target identification and aim point selection, precision target tracking with low jitter in high clutter conditions, advanced beam control, and higher power HEL development. HELCAP will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation required to defeat ASCMs in a crossing engagement.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: High Energy Laser Counter ASCM Project (HELCAP)	0.000	0.000	9.000	0.000	9.000
Articles:	-	-	-	-	-
Description: The High Energy Laser Counter ASCM Project (HELCAP) will expedite the development, experimentation, integration and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM) by addressing the remaining technical challenges, e.g.: atmospheric turbulence, automatic target identification and aim point selection, precision target tracking with low jitter in high clutter conditions, advanced beam control, and higher power HEL development. HELCAP will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation required to defeat ASCMs in a crossing engagement. HELCAP will leverage the knowledge gained in the Navy Laser Family of Systems (NLFoS) efforts: - Alternative Laser Sources for higher powers, also known as the Ruggedized High Energy Laser (RHEL) activities;					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Solid State Laser Tech Maturation activities that provides initial key enabling technical solutions in high power lasers and beam control, and will provide opportunities for single ship operational and sustainment learning; - Surface Navy Laser Weapon System Increment 1 (SNLWS Inc. 1) project that provides the initial combat system integration and installation knowledge for Aegis platforms, and multi-ship battle force operations knowledge; - Optical Dazzling Interdictor Navy (ODIN) that provides Counter-ISR technical and fleet operational knowledge. This leveraged knowledge and new HELCAP technical solutions to the C-ASCM problem will enable a fully informed decision to rapidly field an integrated, fleet ready, HEL Weapon. HELCAP activities include assessment, development, and experimentation associated with lethality, advanced beam control, and laser sources being conducted with advanced technology development (BA 03) funds under PE 0603801N Innovative Naval Prototypes (INP) Advanced Technology Development, as well as technology integration to support automated laser weapon control in "integrated detect to defeat demonstrations" conducted within this program element (PE). ***FY 2019 Plans:*** N/A. ***FY 2020 Base Plans:*** The FY 2020 funding supports automated laser weapon control activities, as well as the initiation of planning and establishment of test assets and test site preparations to enable FY 2022-2023 counter ASCM detect to defeat demonstrations. FY 2020 tasks include: - Perform Systems Engineering activities to ensure that the advanced technology development (BA 03) HELCAP products being produced under PE 0603801N appropriately interface with automated laser weapon control and planned counter ASCM detect to defeat demonstrations. - Perform additional mission analysis to ensure counter ASCM detect to defeat demos are representative of future concepts of operations. - Perform automated laser weapon control system design and fabricate tasks including laser weapon control, laser weapon console, and target acquisition handover. Activities may include requirements flow-down, design reviews, interface documents, and identification of long lead procurements,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Initiate planning to enable FY 2022-2023 counter ASCM detect to defeat demonstrations. This may include requirements development, draft integrated test plans, confirm test site selection and initial approvals, and identification of long lead test articles. - Initiate establishment of test asset procurements and site preparation to enable FY 2022-2023 counter ASCM detect to defeat demonstrations. ***FY 2020 OCO Plans:*** N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase from FY 2019 to FY 2020 reflects the initial year of Advanced Component Development & Prototypes (BA 04) investment for HELCAP.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	9.000	0.000	9.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The HELCAP is an initiative that provides for an industry-developed testbed for government test and evaluation and demonstration of a high energy laser system capable of defeating an anti-ship cruise missile. Competition was utilized to select the industry provider of the beam control testbed. The testbed is being designed to accept technology insertion from other industry providers. These activities are being performed under PE 0603801N. The government is then integrating additional auxiliary systems and performing FY 2022-2023 counter ASCM detect to defeat demonstrations at government test sites.

E. Performance Metrics

- Conduct Laser Weapon Control Design Reviews
- Procure Laser Weapon Control Hardware
- Conduct Test and Evaluation of Laser Weapon Control
- Document HELCAP ASCM Mission Analysis
- Conduct ASCM detect to defeat experimentation
- Procure ASCM detect to defeat test hardware
- Conduct ASCM detect to defeat test site preparations
- ASCM detect to defeat demonstration test execution
- ASCM detect to defeat demonstration post-test documentation

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Laser Weapon Control Design and Fabricate	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		2.500	Oct 2019	-		2.500	0.000	2.500	-
Laser Weapon Control Design and Fabricate	C/CPFF	TBD : Not Specified	0.000	0.000		0.000		1.750	Dec 2019	-		1.750	0.000	1.750	-
HELCAP Mission Analysis	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		1.000	Oct 2019	-		1.000	0.000	1.000	-
		Subtotal	0.000	0.000		0.000		5.250		-		5.250	0.000	5.250	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HELCAP Systems Engineering, Program Management	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		1.250	Oct 2019	-		1.250	0.000	1.250	-
		Subtotal	0.000	0.000		0.000		1.250		-		1.250	0.000	1.250	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ASCM detect to defeat demonstration planning	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		0.750	Oct 2019	-		0.750	0.000	0.750	-
ASCM detect to defeat demonstration test site long lead assets and preparations	C/CPFF	NSWC Port Hueneme : Hueneme, CA	0.000	0.000		0.000		1.500	Oct 2019	-		1.500	0.000	1.500	-
		Subtotal	0.000	0.000		0.000		2.250		-		2.250	0.000	2.250	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HELCAP Program Management /Engineering Support	C/CPFF	TBD : TBD	0.000	0.000		0.000		0.250	Oct 2019	-		0.250	0.000	0.250	-
		Subtotal	0.000	0.000		0.000		0.250		-		0.250	0.000	0.250	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		9.000		-		9.000	0.000	9.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

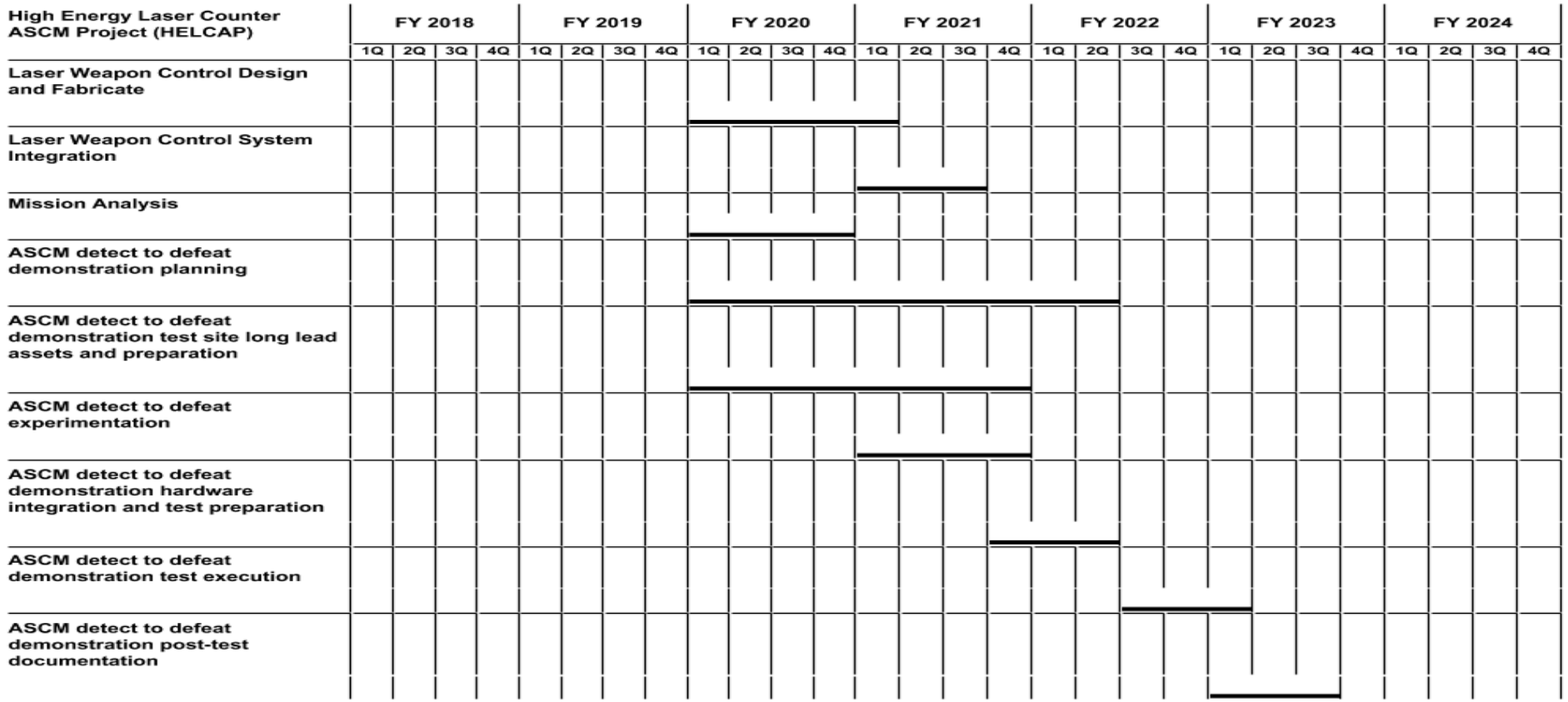

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
High Energy Laser Counter ASCM Project (HELCAP)				
Laser Weapon Control Design and Fabricate: HELCAP: Laser Weapon Control Design and Fabricate	1	2020	1	2021
Laser Weapon Control System Integration: HELCAP: Laser Weapon Control System Integration	1	2021	3	2021
Mission Analysis: HELCAP: Mission Analysis	1	2020	4	2020
ASCM detect to defeat demonstration planning: HELCAP: ASCM detect to defeat demonstration planning	1	2020	2	2022
ASCM detect to defeat demonstration test site long lead assets and preparation: HELCAP: ASCM detect to defeat demonstration test site	1	2020	4	2021
ASCM detect to defeat experimentation: HELCAP: ASCM detect to defeat experimentation	1	2021	4	2021
ASCM detect to defeat demonstration hardware integration and test preparation: HELCAP: ASCM detect to defeat demonstration hardware integration and test	4	2021	2	2022
ASCM detect to defeat demonstration test execution: HELCAP: ASCM detect to defeat demonstration test execution	3	2022	1	2023
ASCM detect to defeat demonstration post-test documentation: HELCAP: ASCM detect to defeat demonstration post-test documentation	1	2023	3	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 3402 / *Surface Navy Laser Weapon System (SNLWS)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3402: *Surface Navy Laser Weapon System (SNLWS)*	0.000	47.441	83.807	89.234	-	89.234	56.282	47.250	29.451	30.032	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 3402 - The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY16 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. SNLWS leverages mature technology to deliver a proven laser weapon capability to the Fleet integrated with the Combat System. SNLWS development leverages the Office of Naval Research (ONR) efforts on the Solid State Laser (SSL) Quick Reaction Capability (QRC) and Solid State Laser (SSL) Technology Maturation (TM) efforts.

The FY20 funding supports completion of the system build, review and delivery of the Technical Data Package, preparation for conduct of Factory Qualification Testing (FQT), and Packaging, Handling, Storage and Transportation (PHS&T) of one system.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: SNLWS Development	32.000	55.410	57.199	0.000	57.199
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue SNLWS development. This includes creating an A-Specification which meets the requirements in the System Scope Document (SSD); conducting systems engineering efforts for laser, mount, beam transport, power and cooling, and systems/ship integration; continuing system design that meets the A-Specification and Government furnished external (Mechanical, Electrical, and Logical) interface requirements and ship integration study requirements; initiating functional decomposition of the system level documentation into sub-system level requirements for the laser, weapon mount, beams control architecture and transport system, power and cooling sub system and ship interface requirements. - Develop Interface Functional Descriptions (IFDs) for the combat system baseline. - Develop system level control and combat system interface software.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue development of Preliminary Design/Technical Data Package consisting of: design documentation; non-recurring system/sub-system/component engineering and management; and component/sub-system procurement, assembly, and testing. - Conduct SNLWS Technical Interchange Meetings (TIMs) with PEO IWS and designated field activities. - Provide programmatic and engineering support to SNLWS Integrated Product Teams (IPTs) and Working Groups (WGs). - Conduct Preliminary Design Review (PDR) to provide a technical assessment of the system architecture and preliminary system design and establish the allocated baseline. - Continue procurement of materials to include: Mount, Computer Systems, Cables/Connectors, Cameras/ Illuminators, Laser Structure/Foundation, Power/Cooling Mod Kits, and Platform Mod Kits. - Receive and integrate government furnished Laser Weapon Control System (LWCS), Weapons Domain Laser Controller (WDLC) and Deconfliction Safety Software (DSS) GFE into final system design. - Prepare for conduct of system Factory Qualification Test (FQT) by verifying test procedures are complete and are in compliance with approved test plans. - Continue fabrication of first system consisting of a High Energy Laser Weapon System combined with a C-ISR capability for countering UAS-mounted sensors. - Develop and deliver required contract deliverables/documentation.					
FY 2020 Base Plans: - Conduct Critical Design Review (CDR) to assess the system detailed design prior to fabrication of hardware and coding of software. - Complete integration of sub-systems to include High Energy Laser Weapon System combined with a C-ISR capability for countering UAS-mounted sensors. - Preparation for and initiation of test events associated with contractor testing and verification of system for delivery. - Develop and deliver required contract deliverables/documentation, including life cycle support and training documentation. - Conduct SNLWS Technical Interchange Meetings (TIMs) with PEO IWS and designated field activities. - Provide programmatic and engineering support to SNLWS Integrated Product Teams (IPTs) and Working Groups (WGs).					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A.					
FY 2019 to FY 2020 Increase/Decrease Statement: The funding increase for LM/Aculight from FY 2019 to FY 2020 is required to support the SNLWS development efforts, such as the Critical Design Review (CDR), as a result of the re-phasing.					
Title: SNLWS Government and Support Engineering Services	15.441	28.397	32.035	0.000	32.035
Articles:	-	-	-	-	-
FY 2019 Plans: - Support all management/technical efforts required in support of Preliminary Design Review (PDR) efforts leading up to and conducting the formal PDR. - Support all management/technical efforts required in support of Critical Design Review (CDR) efforts leading up to conduct of the formal CDR in FY 2020. - Continue review of all contractor provided engineering, design, production readiness, and test documentation. - Conduct Technical Interchange Meetings (TIMs) with contractor and government personnel. - Provide programmatic and engineering support to government-led Integrated Product Teams (IPTs) and Working Groups (WGs). - Complete hardware/software build of Laser Weapon Control System (LWCS), Weapons Domain Laser Controller (WLDC) and Deconfliction Safety Software (DSS) and provide to contractor as GFE. - Continue AEGIS Combat System software engineering, development, and integration; conduct Levels 1-5 integration and testing. - Continue DDG 51 Flight IIA Ship Integration and Installation engineering ship data package development, review, and approval. - Finalize test plans, procedures, and schedules that ensure traceability to system requirements as part of required contractor testing. - Review/comment/approve deliverables provided by the contractor. - Develop and deliver programmatic and technical documentation to support all requisite cost, schedule, and performance reporting requirements.					
FY 2020 Base Plans: - Continue review of all contractor provided engineering, design, production readiness, and test documentation. - Conduct Technical Interchange Meetings (TIMs) with contractor and government personnel. - Provide programmatic and engineering support to government-led Integrated Product Teams (IPTs) and Working Groups (WGs).					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue AEGIS Combat System software engineering, development, and integration; conduct Levels 1-5 integration and testing. - Execute DDG 51 Flight IIA Ship Integration and Installation in FY 2021. - Execute planned test events and conduct analysis of test results. - Support efforts leading up to the Factory Qualification Test (FQT)in FY 2021 for contractor developed components/ subsystems/systems. - Review/comment/approve deliverables provided by the contractor. - Update and implement programmatic and technical documentation developed to support all requisite cost, schedule, and performance reporting requirements. - Prepare drawings, support ship checks and preparation for system Shipboard Installation. ***FY 2020 OCO Plans:*** N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase for SNLWS Government and Engineering Services from FY 2019 to FY 2020 supports the increased government requirements for preparation for and initiation of shipboard integration, checkout and testing.					
Accomplishments/Planned Programs Subtotals	47.441	83.807	89.234	0.000	89.234

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY 2016 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. The acquisition strategy permits accelerated fielding of laser weapon systems in the Fleet. The acquisition strategy consists of a baseline development and production of a single test unit followed by options for fixed price production units.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

E. Performance Metrics

- Conduct SNLWS Source Selection.
- Award SNLWS contract.
- Conduct System Requirements Review.
- Conduct System Functional Review.
- Develop/deliver Laser Weapon Control System (LWCS) as GFE.
- Conduct Preliminary Design Review.
- Conduct Final Design Review.
- Develop/deliver Deconflication Safety Software (DSS) as GFE.
- Develop/deliver Weapons Domain Laser Controller (WDLC) as GFE.
- Conduct Factory Qualification Test (FQT).
- Conduct T&E review for Contractor Test.
- Deliver Test System.
- Install, Develop, Test & Operate delivered system.
- Sustain delivered system.
- Initiate Combat System Integration & DDG 51 Flight IIA Integration/Installation Engineering.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 3402 / *Surface Navy Laser Weapon System (SNLWS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Development	C/CPIF	Lockheed Martin Aculight : Bothell, WA	0.000	32.000	Jan 2018	55.410	Oct 2018	57.199	Oct 2019	-		57.199	Continuing	Continuing	Continuing
		Subtotal	0.000	32.000		55.410		57.199		-		57.199	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Systems Engineering, Program Management, GFE/GFI	WR	NSWC Dahlgren : Dahlgren, VA	0.000	9.066	Nov 2017	13.323	Nov 2018	18.121	Nov 2019	-		18.121	Continuing	Continuing	Continuing
SNLWS Ship Installation, Integration & Documentation	C/CPAF	BIW : Bath, ME	0.000	0.103	Feb 2018	2.974	Jan 2019	4.850	Jan 2020	-		4.850	Continuing	Continuing	Continuing
SNLWS Combat System Integration/Licenses	C/CPFF	Lockheed Martin : Moorestown, NJ	0.000	1.433	Oct 2017	6.067	Jan 2019	2.500	Jan 2020	-		2.500	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	NSWC Crane : Crane, IN	0.000	0.270	Nov 2017	0.162	Nov 2018	0.162	Nov 2019	-		0.162	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	NSWC PHD : Port Hueneme, CA	0.000	0.477	Nov 2017	0.280	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	SSC PAC : San Diego, CA	0.000	0.146	Nov 2017	0.199	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	NPS : Monterey, CA	0.000	0.150	Nov 2017	0.100	Dec 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
SNLWS Systems Engineering	MIPR	MIT LL : Lexington, MA	0.000	0.005	Jan 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
SNLWS Systems Engineering	C/CPFF	PSU EOC : Freeport, PA	0.000	0.500	Feb 2018	0.300	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing
SNLWS Technical Director	WR	NSWC Crane : Crane, IN	0.000	0.280	Nov 2017	0.324	Nov 2018	0.325	Nov 2019	-		0.325	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 3402 / *Surface Navy Laser Weapon System (SNLWS)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Product Support	WR	NSWC PHD : Port Hueneme, CA	0.000	0.182	Nov 2017	0.902	Nov 2018	0.600	Nov 2019	-		0.600	Continuing	Continuing	Continuing
Installation APM	WR	NSWC Dam Neck : Dam Neck, VA	0.000	0.168	Nov 2018	0.150	Nov 2019	0.150	Sep 2020	-		0.150	Continuing	Continuing	Continuing
		Subtotal	0.000	12.780		24.781		27.608		-		27.608	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Test & Evaluation	WR	SSC PAC : San Diego, CA	0.000	0.122	Nov 2017	0.000		0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
SNLWS Test & Evaluation	WR	NSWC PHD : Port Hueneme, CA	0.000	0.133	Nov 2017	0.818	Nov 2018	1.200	Nov 2019	-		1.200	Continuing	Continuing	Continuing
SNLWS Test & Evaluation	WR	NSWC Crane : Crane, IN	0.000	0.000		0.250	Nov 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
SNLWS Test & Evaluation	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.707	Nov 2017	0.573	Nov 2018	0.900	Nov 2019	-		0.900	Continuing	Continuing	Continuing
		Subtotal	0.000	0.962		1.641		2.450		-		2.450	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Program Management/Engineering Support	C/CPFF	GRYPHON Technologies : Washington, D.C.	0.000	0.265	Jun 2018	0.500	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
SNLWS Program Management/Engineering Support	C/CPIF	SPA : Washington, D.C.	0.000	0.950	Feb 2018	1.011	Dec 2018	1.012	Dec 2019	-		1.012	Continuing	Continuing	Continuing
SNLWS Travel	Various	NAVSEA : Washington, D.C.	0.000	0.125	Feb 2018	0.150	Feb 2019	0.150	Feb 2020	-		0.150	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Program Management	C/CPFF	TMB : Washington, D.C.	0.000	0.162	Jun 2018	0.170	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
SNLWS Program Management	TBD	TBD : TBD	0.000	0.000		0.000		0.670	Dec 2019	-		0.670	Continuing	Continuing	Continuing
SNLWS Program Management	C/CPFF	Strategic Insight : Washington, D.C.	0.000	0.197	Jun 2018	0.144	Dec 2018	0.145	Dec 2019	-		0.145	Continuing	Continuing	Continuing
		Subtotal	0.000	1.699		1.975		1.977		-		1.977	Continuing	Continuing	N/A

Remarks

SNLWS Program Management award is TBD due to the planned competitive award of follow-on contract.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	47.441		83.807		89.234		-		89.234	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

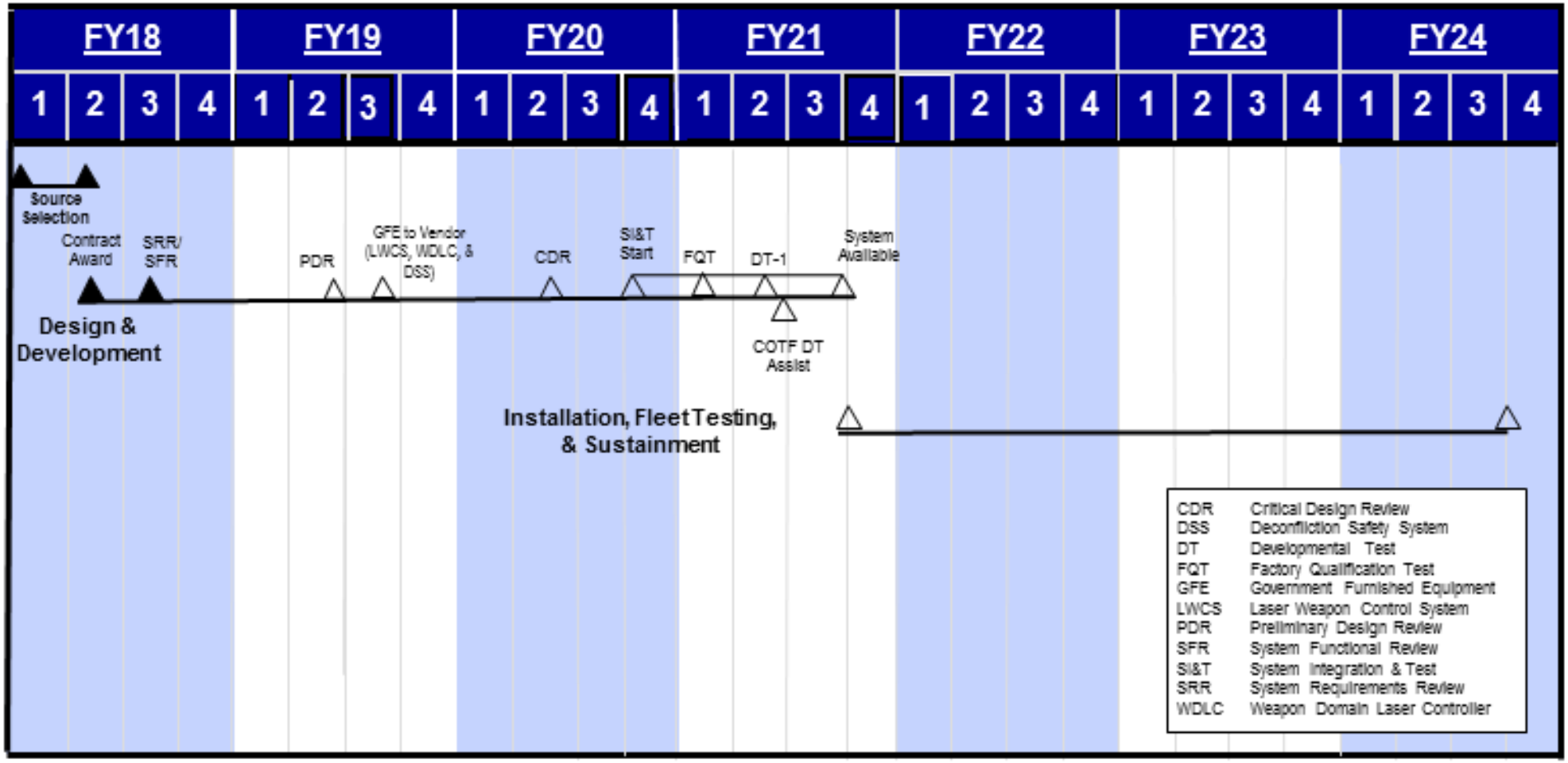

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3402				
SNLWS: Conduct SNLWS Source Selection	1	2018	2	2018
SNLWS: Contract Award	2	2018	2	2018
SNLWS: Conduct System Requirements Review/System Functional Review	3	2018	3	2018
SNLWS: Initial Baseline Review (IBR)	2	2019	2	2019
SNLWS: Preliminary Design Review	2	2019	2	2019
SNLWS: Laser Weapon Control System (LWCS) GFE to Vendor	3	2019	3	2019
SNLWS: Deconflication Safety Software (DSS) GFE to Vendor	3	2019	3	2019
SNLWS: Weapons Domain Laser Controller (WDLC) GFE to Vendor	3	2019	3	2019
SNLWS: Critical Design Review	2	2020	2	2020
SNLWS: Factory Qualification Test (FQT)	1	2021	1	2021
SNLWS: Deliver to Pier	4	2021	4	2021
SNLWS: Installation, Fleet Testing and Sustainment	4	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9823 / *Lasers for Navy applicat*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9823: *Lasers for Navy applicat*	14.379	39.625	33.107	19.935	-	19.935	5.621	6.389	5.908	4.440	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 9823 - Lasers for Navy Applications: Low Power Module (LPM) development will provide near-term, directed energy, shipboard Counter-Intelligence, Surveillance, and Reconnaissance (C-ISR) capabilities to dazzle Unmanned Aerial Systems (UASs) and other platforms that will address urgent operational needs of the Fleet. FY 2018 was the first year of funding and supported the design, development and procurement of eight standalone units over the FYDP, for deployment on DDG 51 surface combatants. The program supports the non-recurring engineering, development, procurement of long lead material, assembly and checkout, system certification, and platform integration/installation and sustainment for these eight standalone units.

The FY 2020 funding supports assembly and checkout of the final increment of ODIN systems to be installed shipboard in FY 2021. Additionally, sustainment of installed Units 1 and 2 begins in FY 2020 as well as installation of units 3, 4, and 5 onboard designated DDG 51 class ships.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Low Power Module (LPM) Development	39.625	33.107	19.935	0.000	19.935
Articles:	-	-	-	-	-
Description: Beginning in FY 2018, Low Power Module (LPM) development efforts are being renamed Optical Dazzling Interdictor, Navy (ODIN).					
FY 2019 Plans: - Complete system integration, test and certifications, including electromagnetic interference, system operability, and safety. - Complete shipboard documentation development - deliver to ship, and conduct training for ship's crew. - Deliver Units 1 and 2 onboard designated DDG 51 class ships, conduct system turnover, and support shipboard operations. - Complete procurement and build of Units 3, 4, and 5. - Perform Assembly and Checkout, and integration of Units 3, 4, and 5. Each unit consists of: Beam Director (Telescope, Optics, Fast Steering Mirrors); Lower Power Lasers (2); Sensors (Coarse Track, Fine Track, ISR Imaging); Computer Rack, Network Switches; and an Operator Laptop. - Procure and initiate build of Units 6, 7, and 8.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Install Units 3, 4, and 5 onboard designated DDG 51 class ships and initiate shipboard test and checkout. - Conduct system integration, test and certifications, including electromagnetic interference, system operability, and safety for Units 6, 7, and 8. - Initiate shipboard documentation and training development for Units 6, 7, and 8. - Complete shipboard test and checkout, conduct system turnover, and support shipboard operations of units 3, 4, and 5. - Complete procurement and build of Units 6, 7, and 8. - Perform Assembly and Checkout, and integration of Units 6, 7, and 8. Each unit consists of: Beam Director (Telescope, Optics, Fast Steering Mirrors); Lower Power Lasers (2); Sensors (Coarse Track, Fine Track, ISR Imaging); Computer Rack, Network Switches; and an Operator Laptop. - Initiate sustainment of Units 1 and 2. ***FY 2020 OCO Plans:*** N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding decreased in FY 2020 by $13.172M as the majority of the engineering development, integration, and test/certification for building the final systems will be accomplished in FY 2019. The FY 2020 funding will address final assembly and checkout of the final increment of ODIN systems to be installed shipboard in FY21, Additionally, sustainment of installed Units 1 and 2 begins in FY 2020.					
Accomplishments/Planned Programs Subtotals	39.625	33.107	19.935	0.000	19.935

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The LPM is a government designed, developed, and produced system that will provide eight units for use on DDG 51 class ships. This effort will transition the developed LPM capabilities to the Fleet, while informing the development of future prototyping capabilities and program of record efforts.

E. Performance Metrics

- Conduct Technical Design Reviews (TDRs)
- Procure hardware for units 1 and 2
- Perform assembly, integration, and checkout of units 1 and 2

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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- Conduct Test & Evaluation of units 1 and 2
- Perform installation of units 1 and 2
- Procure hardware for units 3, 4 and 5
- Perform assembly, integration, and checkout of units 3, 4 and 5
- Conduct Test & Evaluation of units 3, 4 and 5
- Perform installation of units 3, 4 and 5
- Procure hardware for units 6, 7 and 8
- Perform assembly, integration and checkout of units 6, 7 and 8
- Conduct Test & Evaluation of units 6, 7 and 8
- Perform installation of units 6, 7 and 8
- Provide sustainment of units 1 - 8

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware & Software - Material Buys	C/FFP	NSWC DD : Dahlgren, VA	0.000	16.842	Dec 2017	10.242	Dec 2018	2.000	Dec 2019	-		2.000	Continuing	Continuing	Continuing
Engineering/Development	WR	NSWC DD : Dahlgren, VA	3.022	7.037	Nov 2017	6.086	Nov 2018	3.200	Nov 2019	-		3.200	Continuing	Continuing	Continuing
Software Development	WR	NSWC DD : Dahlgren, VA	0.000	4.294	Nov 2017	2.445	Nov 2018	1.750	Nov 2019	-		1.750	Continuing	Continuing	Continuing
Engineering Development	C/CPFF	PSU EOC : Freeport, PA	0.000	2.420	Feb 2018	1.760	Dec 2018	1.500	Dec 2019	-		1.500	Continuing	Continuing	Continuing
Engineering/Development	WR	NSWC PHD : Port Hueneme, CA	0.155	0.330	Nov 2017	0.539	Nov 2018	0.200	Nov 2019	-		0.200	Continuing	Continuing	Continuing
Engineering/Development	WR	NSWC Crane : Crane, IN	0.000	0.300	Nov 2017	0.020	Nov 2018	0.050	Nov 2019	-		0.050	Continuing	Continuing	Continuing
Engineering/Development	WR	NRL : Washington, D.C.	0.000	0.260	Nov 2017	0.060	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	3.177	31.483		21.152		8.700		-		8.700	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platform Integration/ ILS/ Installation	C/CPFF	CACI : Washington, D.C.	0.000	0.101	Sep 2018	0.194	Dec 2018	0.050	Dec 2019	-		0.050	Continuing	Continuing	Continuing
Spares	WR	NSWC DD : Dahlgren, VA	0.000	0.711	Nov 2017	0.000		0.750	Nov 2019	-		0.750	Continuing	Continuing	Continuing
Platform Integration/ILS/ Installation	WR	NSWC DD : Dahlgren, VA	2.014	2.328	Nov 2017	2.733	Nov 2018	2.579	Nov 2019	-		2.579	Continuing	Continuing	Continuing
Platform Integration	C/CPAF	BIW : Bath, ME	0.030	0.214	Feb 2018	0.060	Jan 2019	0.207	Jan 2020	-		0.207	Continuing	Continuing	Continuing
Platform Integration	C/CPFF	Lockheed Martin : Moorestown, NJ	0.000	0.265	Feb 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	SSC PAC : San Diego, CA	0.140	0.770	Nov 2017	0.290	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Safety, Product Support, Security & Operations	WR	NSWC Dahlgren : Dahlgren, VA	3.612	1.511	Nov 2017	1.253	Nov 2018	0.900	Nov 2019	-		0.900	Continuing	Continuing	Continuing
Platform Integration	WR	NSWC Crane : Crane, IN	0.000	0.156	Nov 2017	0.000		0.050	Nov 2019	-		0.050	Continuing	Continuing	Continuing
Platform Integration/ILS/ Installation	WR	NSWC PHD : Port Hueneme, CA	0.000	0.840	Nov 2017	2.200	Nov 2018	3.574	Nov 2019	-		3.574	Continuing	Continuing	Continuing
Packaging, Handling, Storage & Transportation, De-Install, Refurbishment	WR	NSWC DD : Dahlgren, VA	1.155	0.088	Nov 2017	0.091	Nov 2018	0.093	Nov 2019	-		0.093	Continuing	Continuing	Continuing
		Subtotal	6.951	6.984		6.821		8.453		-		8.453	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Planning & Execution	WR	PHD NSWC : Port Hueneme, CA	0.605	0.275	Nov 2017	0.700	Nov 2018	0.700	Nov 2019	-		0.700	Continuing	Continuing	Continuing
Test Planning & Execution	WR	NSWC DD : Dahlgren, VA	2.097	0.370	Nov 2017	3.187	Nov 2018	1.000	Nov 2019	-		1.000	Continuing	Continuing	Continuing
Test Planning & Execution	WR	NSWC Crane : Crane, IN	0.622	0.000		0.230	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
Test Planning & Execution	WR	SSC PAC : San Diego, CA	0.000	0.000		0.434	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
		Subtotal	3.324	0.645		4.551		2.200		-		2.200	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Mgmt/Support	TBD	TBD : TBD	0.000	0.000		0.000		0.275	Dec 2019	-		0.275	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Mgmt/Supportt	C/BA	Strategic Insight : Washington, D.C.	0.000	0.000		0.076	Dec 2018	0.075	Dec 2019	-		0.075	Continuing	Continuing	Continuing
Program Mgmt/Support	C/CPFF	TMB : Washington, D.C.	0.000	0.000		0.025	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Program Mgmt/Support	C/CPFF	GRYPHON Technologies : Washington, D.C.	0.498	0.250	Jun 2018	0.250	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Travel	Various	NAVSEA : Washington, D.C.	0.074	0.052	Feb 2018	0.052	Feb 2019	0.052	Feb 2020	-		0.052	Continuing	Continuing	Continuing
Program Mgmt/Support	C/CPIF	SPA : Washington, D.C.	0.355	0.211	Jun 2018	0.180	Dec 2018	0.180	Dec 2019	-		0.180	Continuing	Continuing	Continuing
		Subtotal	0.927	0.513		0.583		0.582		-		0.582	Continuing	Continuing	N/A

Remarks

LPM Program Management award is TBD due to planned competitive award of follow-on contract.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.379	39.625		33.107		19.935		-		19.935	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

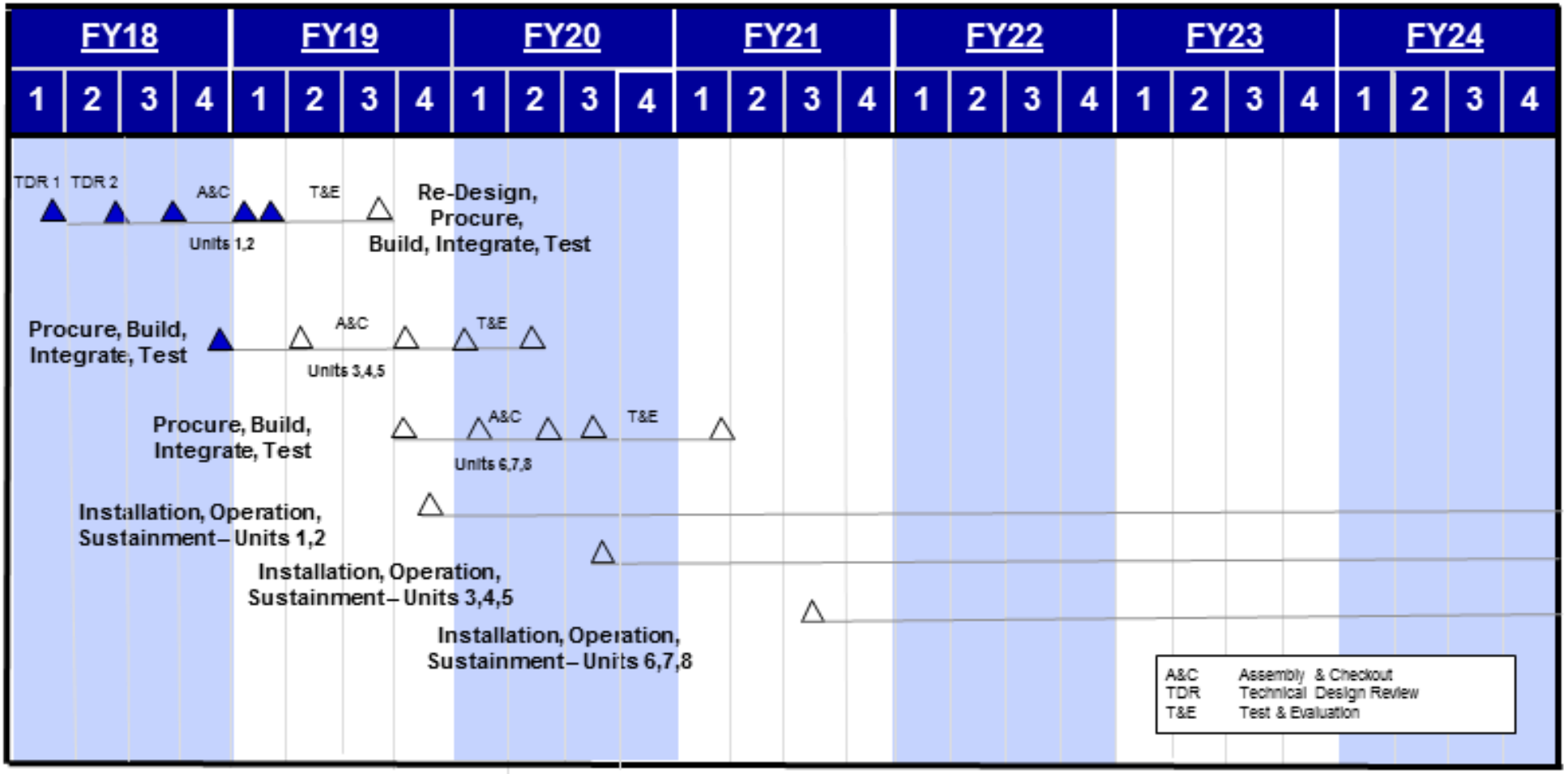

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9823				
Design/Develop Operational System	1	2018	3	2018
Technical Design Reviews (TDR) 1 and 2	1	2018	2	2018
Component Procurement Units 1 and 2	1	2018	4	2018
Assembly & Checkout Units 1 and 2	4	2018	1	2019
Component Procurement Units 3, 4 and 5	4	2018	2	2019
Integration Units 1 and 2	1	2019	1	2019
Test and Evaluation Units 1 and 2	1	2019	3	2019
Assembly & Checkout Unit's 3, 4 and 5	2	2019	4	2019
Integration Units 3, 4 and 5	3	2019	3	2019
Installation, Operation and Sustainment Units 1 and 2	4	2019	4	2024
Component Procurement Units 6, 7 and 8	4	2019	1	2020
Test & Evaluation Unit's 3, 4 and 5	1	2020	2	2020
Assembly & Checkout Unit's 6, 7 and 8	1	2020	2	2020
Integration Units 6, 7 and 8	2	2020	3	2020
Test and Evaluation Units 6, 7 and 8	3	2020	1	2021
Installation, Operation and Sustainment Units 3, 4 and 5	3	2020	4	2024
Installation, Operation and Sustainment Units 6, 7 and 8	3	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	5.790	25.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	31.690
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 9999 (PU C407) - Advanced energy storage systems are the foundation of the electric weapons kill chain, and their applications and demands are increasing in defense and naval applications. These applications require innovative battery technologies that provide high power and energy density, and provide increased rates of discharge, while ensuring safety and optimal thermal management. High Energy Storage Modules research will involve development, assembly and initial Naval certification testing of a 1,000 volt high-rate, high-power-density Lithium-ion battery pack in order to increase Naval operational capabilities. The 1,000-volt battery pack will combine newly developed and patented battery cooling technologies with an established Lithium-ion battery chemistry, produced by a domestic manufacturer. High Energy Storage Modules with higher discharge rates will decrease the amount of batteries needed to meet peak shipboard power loads. This effort will substantially progress the state of the art for high-rate water-cooled battery packs, to help bolster Naval operational capabilities.

Project 9999 (PU C453) - Surface Navy Laser Weapon System (SNLWS) Program Re-phasing: Congress added funding in FY19 for re-phasing of the SNLWS development and fielding effort. This funding supports procurement of HELIOS long lead materials related to early award of the contract to Lockheed Martin Aculight.

Project 9999 (PU C440) - Congressional Add - Electromagnetic Railgun Program: Congress added funding in FY19 for ship-based program/technical development and ship integration related risk reduction. Electromagnetic railgun provides increased capability for the following mission sets: Naval Surface Fire Support (NSFS), Integrated Air and Missile Defense (IAMD), Fast Attack Craft and Fast Inshore Attack Craft (FAC/FIAC), and future potential for Anti-Surface Warfare (ASuW). This funding supports the testing and refinement of pulse current transfer, mount, and hypervelocity projectile component development. In addition, this project supports the continuing effort to define and evolve requirements related to mount and platform interface management and maturations of specifications for tactical railgun weapon system.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: High Energy Storage Modules	5.790	0.000
FY 2018 Accomplishments: - Initiated prototype development based on systems and design engineering efforts. - Resourced Navy technical agents and SMEs to work with OEM to define interface requirements, operational requirements, integration considerations and safety test plan. - Initiated modeling and simulation demonstrations in order to support FY19 operational, thermal and safety development and FY19 T&E.		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
- Initiated contracting for FY19 SBIR Phase III to execute scale-up and produce cells and battery packs to support initial test and evaluation. - Developed basis for 1000VDC battery system employment. - Develop prototype and conduct modeling and simulation demonstrations in order to support operational, thermal and safety development and A19 T&E. - Execute SBIR Phase III for scale-up and produce cells and battery packs to support initial test and evaluation. -Perform cycle and safety Test & Evaluation at the cell and module level in accordance with NAVSEAINST 9310. ***FY 2019 Plans:*** N/A		
Congressional Add: Electromagnetic Railgun ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** - Conduct Pulse Current Transfer Development/Testing to upgrade Electric Weapon Systems Integration Lab (EWSIL) with hardware/software necessary to support testing and conduct test events. - Complete design and fabrication work necessary to add cooling and elevation evaluation capabilities to EWSIL. - Conduct design and fabrication work necessary for prototyping of low-loss coaxial buswork. - Conduct Mount Component Development to builds and refine prototype design for blowback mitigation system for use with railgun. - Conduct Topside Integration/Platform and System Trade studies. - Continue Mount/Platform Interface Development. - Continue railgun system materials testing and analysis. - Initiate Projectile Interface Development.	0.000	10.000
Congressional Add: SNLWS Program Rephasing ***FY 2018 Accomplishments:*** N/A. ***FY 2019 Plans:*** - Procure the following long lead materials: Beam Director subsystem and Beam Control subsystem.	0.000	15.900
Congressional Adds Subtotals	5.790	25.900

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

D. Acquisition Strategy

Project 9999 (PU C407)- Leverage Naval Surface Warfare Center resources and competencies to support technical direction, contracting methodologies (utilizing SBIR Phase III technology transfer) and safety certification capabilities.

The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY16 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. The acquisition strategy permits accelerated fielding of laser weapon systems in the Fleet. The acquisition strategy consists of a baseline development and production of a single test unit followed by options for fixed price production units.

Project 9999 (PU C440) - Leverage Naval Surface Warfare Center and University Affiliated Research Centers (UARC) resources and competencies to support electromagnetic railgun system engineering activities to mature technologies in support of transition to a Program of Record. These study and prototype activities provide influence on prototype design and test to optimize readiness and capability for transition to a Navy tactical application.

E. Performance Metrics

Project 9999 (PU C407):
-Produce Interface Control Documents to define electrical, thermal, and controls approaches to maximize applicability of 1000V batteries
-Produce test plans for cell, module, and system level abusive testing in accordance with Navy requirements
-Perform Cell-level Safety Testing
-Perform Safety and Performance Testing at the Module Level
-Establish mature design and perform scale up of microfibrous media-phase change materials (MFM-PCM) battery packs to support 1,000VDC battery builds

Project 9999 (PU C453):
Supports conduct of SNLWS Preliminary Design Review

Project 9999 (PU C440):
-Install and conduct test events: design and fabricate necessary hardware, update test plans for testing, conduct Test Event Readiness Reviews, generate respective test reports.
-Produce design, fabricate, and test prototype coaxial buswork.
-Refine and build prototype design for blowback mitigation system.
-Produce updated Systems Engineering Plan (SEP), Configuration Management (CM) Plan, and the Technical Risk Assessment Planning (TRAP) and maturation of specifications for tactical RGWS.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

-Produce design, fabricate, and test armatures for Railgun launch packages.
-Conduct testing, mitigation designs and testing.
-Produce test reports from railgun materials testing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C407-High Energy Storage Modules	C/CPFF	Intramicron : Auburn, AL	0.000	4.836	Jan 2019	0.000		0.000		-		0.000	0.000	4.836	-
C453- SNLWS Development	C/CPIF	Lock Martin Aculight : Bothell, WA	0.000	0.000		14.990	Nov 2018	0.000		-		0.000	0.000	14.990	-
C440- APCT Hardware Fabrication	MIPR	DOTC : Picatinny Arsenal, NJ	0.000	0.000		0.860	Jun 2019	0.000		-		0.000	0.000	0.860	-
C440- PCT/Breech Interface and Blowback Mitigation Fabrication	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.200	Feb 2019	0.000		-		0.000	0.000	0.200	-
		Subtotal	0.000	4.836		16.050		0.000		-		0.000	0.000	20.886	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C407-Power & Energy IPT	WR	NSWC Philadelphia : Philadelphia, PA	0.000	0.575	Jul 2018	0.000		0.000		-		0.000	0.000	0.575	-
C407-Support to Power & Energy IPT	WR	NSWC Crane : Crane, IN	0.000	0.379	Jul 2018	0.000		0.000		-		0.000	0.000	0.379	-
C453- Support SNLWS Development	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.910	Feb 2019	0.000		-		0.000	0.000	0.910	-
C440-APCT Development Support and Oversight	WR	NSWC Dahlgren, : Dahlgren, VA	0.000	0.000		2.019	Feb 2019	0.000		-		0.000	0.000	2.019	-
C440-Mount Component Development, SE Support, and Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.819	Feb 2019	0.000		-		0.000	0.000	0.819	-
C440-Blowback Mitigation	FFRDC	APL : Laurel, MD	0.000	0.000		0.200	Feb 2019	0.000		-		0.000	0.000	0.200	-
C440-Mount Platform Interface Development, Requirements and Specification Management	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.570	Feb 2019	0.000		-		0.000	0.000	0.570	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9999 / *Congressional Adds*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C440-Topside Integration / Platform Studies, SE Support, and Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.250	Feb 2019	0.000		-		0.000	0.000	0.250	-
C440- System Trade Studies	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.250	Feb 2019	0.000		-		0.000	0.000	0.250	-
C440- Munition Interface Development and Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.706	Feb 2019	0.000		-		0.000	0.000	0.706	-
C440- Program Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.500	Feb 2019	0.000		-		0.000	0.000	0.500	-
		Subtotal	0.000	0.954		6.224		0.000		-		0.000	0.000	7.178	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C440- APCT Test Execution	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		2.020	Feb 2019	0.000		-		0.000	0.000	2.020	-
C440- Risk Reduction and Railgun Testing	WR	NSWC Dahlgren : Dahglren, VA	0.000	0.000		0.706	Feb 2019	0.000		-		0.000	0.000	0.706	-
C440- Railgun Materials Testing	WR	Naval Post Graduate School : San Diego, CA	0.000	0.000		0.900	Oct 2019	0.000		-		0.000	0.000	0.900	-
		Subtotal	0.000	0.000		3.626		0.000		-		0.000	0.000	3.626	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	5.790		25.900		0.000		-		0.000	0.000	31.690	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

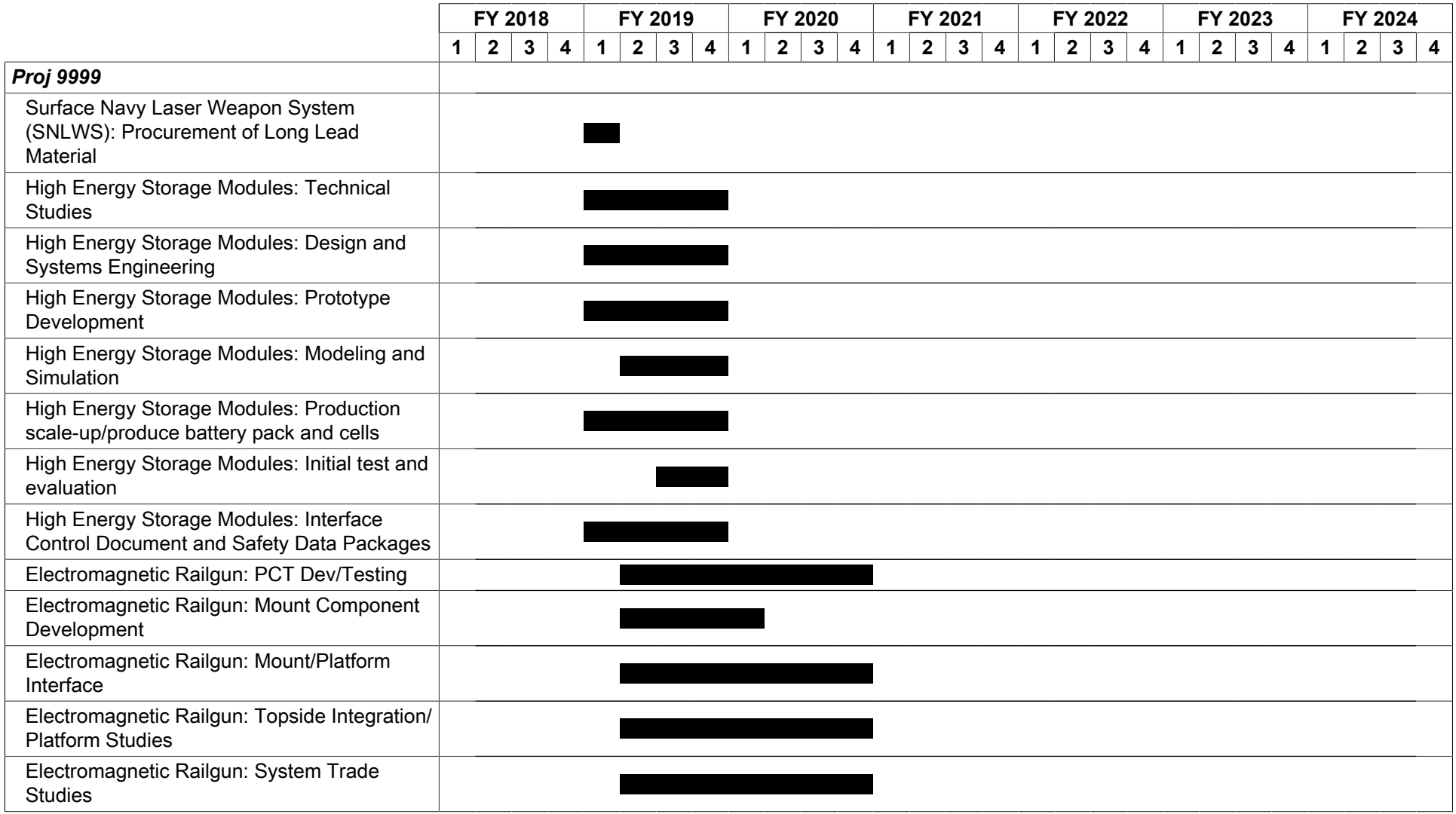

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Electromagnetic Railgun: Projectile/RGS Interface Development						[redacted]																						

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Surface Navy Laser Weapon System (SNLWS): Procurement of Long Lead Material	1	2019	1	2019
High Energy Storage Modules: Technical Studies	1	2019	4	2019
High Energy Storage Modules: Design and Systems Engineering	1	2019	4	2019
High Energy Storage Modules: Prototype Development	1	2019	4	2019
High Energy Storage Modules: Modeling and Simulation	2	2019	4	2019
High Energy Storage Modules: Production scale-up/produce battery pack and cells	1	2019	4	2019
High Energy Storage Modules: Initial test and evaluation	3	2019	4	2019
High Energy Storage Modules: Interface Control Document and Safety Data Packages	1	2019	4	2019
Electromagnetic Railgun: PCT Dev/Testing	2	2019	4	2020
Electromagnetic Railgun: Mount Component Development	2	2019	1	2020
Electromagnetic Railgun: Mount/Platform Interface	2	2019	4	2020
Electromagnetic Railgun: Topside Integration/Platform Studies	2	2019	4	2020
Electromagnetic Railgun: System Trade Studies	2	2019	4	2020
Electromagnetic Railgun: Projectile/RGS Interface Development	2	2019	4	2020