Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy											Date: February 2020	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603178N *I Medium and Large Unmanned Surface Vehicles (USVs)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	0.000	464.042	-	464.042	530.035	380.379	320.427	260.535	Continuing	Continuing
3066: *Large Unmanned Surface Vessel (LUSV)*	0.000	0.000	0.000	238.617	-	238.617	377.200	144.549	198.720	134.948	Continuing	Continuing
3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	0.000	0.000	199.123	-	199.123	122.837	192.836	77.854	80.857	Continuing	Continuing
3428: *Medium Unmanned Surface Vehicle (MUSV)*	0.000	0.000	0.000	26.302	-	26.302	29.998	42.994	43.853	44.730	Continuing	Continuing

Note

FY 2020 and prior funding in Program Element (PE) 0603502N. Large Unmanned Surface Vessel (LUSV) (Project 3066), Unmanned Surface Vehicle (USV) Enabling Capabilities (Project 3067), and Medium Unmanned Surface Vehicle (MUSV) (Project 3428) projects realigned from PE 0603502N in FY 2021.

A. Mission Description and Budget Item Justification

Projects under this Program Element provide resources for the unmanned platforms in the Navy's Future Surface Combatant Force (FSCF), the Large Unmanned Surface Vessel (LUSV) and Medium Unmanned Surface Vehicle (MUSV), along with relevant supporting enabling technologies.

Medium Unmanned Surface Vehicle (MUSV) is defined as having a reconfigurable mission capability which is accomplished via modular payloads with an initial capability to support Battlespace Awareness through supporting Intelligence, Surveillance and Reconnaissance (ISR) and Information Operations (IO) mission areas. The Large Unmanned Surface Vessel (LUSV) will be delivered and fielded initially as research and development prototype vessels (Overlord prototypes and one prototype LUSV) intended to demonstrate successful integration of government furnished Command, Control, Communications, Computers and Intelligence (C4I) and combat systems and the reliability of automated hull, mechanical, and electrical (HM&E) systems. The prototype LUSVs will incorporate reservations in the design for future combat capabilities with the desired goal of transitioning to procuring and delivering a LUSV with an integrated combat system and organic payloads supporting Anti-Surface Warfare (ASuW) and Strike mission areas.

MUSVs and LUSVs provide affordable, high endurance, reconfigurable ships able to accommodate various payloads for unmanned missions and augment the Navy's manned surface force. MUSVs and LUSVs will be capable of semi-autonomous operation, with operators in-the-loop or on-the-loop. USV Command and Control (C2) will be maintained via an afloat
element (i.e., embarked on a United States Navy (USN) combatant/other assigned afloat asset) or via an ashore element (C2 station ashore). While MUSV and LUSV will logically share common Government Furnished Equipment (GFE) C2 systems to support fleet integration and operations and may share other autonomy and mechanical technologies (depending on acquisition approaches), they will be primarily differentiated by size and cost as driven by payload capabilities, and capacities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603178N *I Medium and Large Unmanned Surface Vehicles (USVs)*

Other potential future LUSV capabilities are being informed by the Navy's FSCF Analysis of Alternatives (AoA) and will be refined as future payloads and Concepts of Operation (CONOPS) are developed. MUSV and LUSV are key enablers of the Navy's Distributed Maritime Operations (DMO) concept, which includes being able to forward deploy and team with individual manned combatants or augment battle groups. Fielding of MUSV and LUSV will provide the Navy increased capability and necessary capacity at lower procurement and sustainment costs, reduced risk to sailors and increased readiness by offloading missions from manned combatants.

While unmanned surface vehicles are new additions to fleet units, MUSV and LUSV are intended to combine robust and proven commercial vessel specifications with existing military payloads to rapidly and affordably expand the capacity and capability of the surface fleet. Both programs benefit from years of investment and full scale demonstration efforts in autonomy, endurance, command and control, payloads and testing from the Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/ Sea Hunter (FY 2017 to FY 2021) and Office of the Secretary of Defense Strategic Capabilities Office (OSD SCO) Ghost Fleet Overlord Large USV experimentation effort (FY 2018 to FY 2021). The combination of fleet-ready C2 solutions developed by the Ghost Fleet Overlord program and initial man-in-the-loop or man-on-the-loop control will reduce the risk of fleet integration of unmanned surface vehicles and allow autonomy and payload technologies to develop in parallel with fielding vehicles with standardized interfaces.

These efforts are broken out into three (3) Project Units (PUs): Medium Unmanned Surface Vehicle (MUSV) (Project 3428), Large Unmanned Surface Vessel (LUSV) (Project 3066) and Unmanned Surface Vehicle Enabling Capabilities (Project 3067).

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	464.042	-	464.042
Total Adjustments	0.000	0.000	464.042	-	464.042
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	464.417	-	464.417
• Rate/Misc Adjustments	0.000	0.000	-0.375	-	-0.375

Change Summary Explanation

Program Changes: +$464,042K transfer from PE 0603502N
Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	Project (Number/Name) 3066 / *Large Unmanned Surface Vessel (LUSV)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3066: *Large Unmanned Surface Vessel (LUSV)*	0.000	0.000	0.000	238.617	-	238.617	377.200	144.549	198.720	134.948	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2020 and prior funding in Program Element (PE) 0603502N. Project 3066 realigned from PE 0603502N starting in FY 2021.

A. Mission Description and Budget Item Justification

The Large Unmanned Surface Vessel (LUSV) project was a new start effort in FY 2020 that leveraged efforts under PE 0604250D8Z through the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) Ghost Fleet Overlord project.

LUSVs will provide affordable, high endurance, ships able to accommodate various payloads augmenting the Navy's manned surface force in supporting the Future Surface Combatant Force (FSCF) program and Distributed Maritime Operations (DMO) concept. The platforms will be capable of weeks-long deployments and trans-oceanic transits and operate aggregated with Carrier Strike Groups (CSGs), Amphibious Ready Groups (ARGs), Surface Action Groups (SAGs), and individual manned combatants.

Major changes from FY 2020 President's Budget request to FY 2021 President's Budget request:

(1) The program will award Conceptual Design (CD) contracts to multiple vendors in FY20. The CD effort will support refinement of a LUSV Performance Specification that does not include the Vertical Launch System (VLS). The final Performance Specification will define a LUSV with reservations in the design to support integration of a variety of capabilities and payloads. This effort, which was originally planned to award in Q2 FY 2020 will be delayed until early Q4 FY 2020 in order to support amendment of the CD Request for Proposals (RFP), Performance Specification, and associated artifacts.

(2) The delay in award of the LUSV CD effort will delay follow-on activities (RFP, source selection) leading up to the award of the LUSV Detail Design and Construction (DD&C) contract. DD&C award will be delayed one year, from FY 2021 to FY 2022. The DD&C award will deliver a non-VLS LUSV prototype based on the Performance Specification developed during the CD effort.

(3) In lieu of the FY 2020 President's Budget request plan of awarding the LUSV DD&C contract in FY21, the Navy is planning to procure up to two additional Overlord prototypes, building on the lessons learned through the Ghost Fleet program and advances in C4I and combat system prototyping efforts.

(4) The Navy plans to transition LUSV to a program of record in FY 2023 and align procurement funding to the Shipbuilding and Conversion, Navy (SCN) account.

Program prototyping and development strategy by year:

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

The LUSV program has developed a vessel prototyping strategy to develop and deliver incremental capability increases and demonstrate key autonomy and automation enablers. The strategy supports research and development prototype vessels intended to demonstrate successful integration of government furnished Command, Control, Communications, Computers and Intelligence (C4I) and combat systems and the reliability of automated hull, mechanical, and electrical (HM&E) systems, eventually leading to a LUSV with the Integrated Combat System (ICS) and organic payloads. Early prototype vessels will enable the Navy to accrue operational hours to gather data on autonomy, automation, and systems reliability; increase confidence in the man-machine team; and develop and refine unmanned concepts of operation (CONOPs) and tactics, techniques, and procedures (TTPs).

(1) FY 2019: Ghost Fleet Overlord prototypes - quantity 2, (RDTE under PE 0604250D8Z). OSD SCO-funded vessels currently executing a two-phase experimentation plan that will conclude end of FY 2021 after which they will be turned over to the Navy. These vessels are designed to employ modular payloads and combat systems.

(2) FY 2020: Overlord prototypes - quantity 2 (RDTEN). These vessels will be executed as options on the Washington Headquarters Services (WHS) contract on which the Ghost Fleet Overlord prototypes were procured. These vessels will advance the lessons learned through the Overlord project and will integrate Navy C4I systems in addition to having the capability to employ modular payloads.

(3) FY 2021: Overlord prototypes - quantity up to 2 (RDTEN). Up to two additional prototype vessels are included in the FY 2021 President's Budget request which will deliver updated HM&E and integrated C4I systems and will be the first vessels to integrate a developmental version of the ICS. These vessels will also provide the Navy the opportunity to explore other potential missions (e.g. logistics support, USMC warfighting requirements) for unmanned platforms.

(4) FY 2022: Prototype LUSV - quantity 1 (RDTEN). The prototype LUSV will serve as the DD&C step towards delivering a LUSV with the Integrated Combat System and VLS. The prototype will be designed and delivered based on the Performance Specification developed during the FY 2020 CD effort to include reservations in the design to incorporate a variety of capabilities and payloads. The LUSV prototype will remain at the Surface Developmental Squadron as an R&D and test asset for continued technology development and payload integration efforts.

(5) FY 2023+: LUSV- quantity 7 planned in the FY 2021 President's Budget request Future Years Defense Plan (SCN). The LUSV will be delivered with fully integrated ICS and VLS and will be Fleet assets supporting Anti-Surface Warfare (ASuW) and Strike mission areas. The first LUSVs will be delivered in FY 2026.

The ICS that will be incorporated into the LUSV will be developed under the Unmanned Surface Vehicle Enabling Capabilities (Project 3067). Non-organic payloads may be developed separately by other programs or prototyping efforts and will be further developed and/or integrated into LUSV under the Enabling Capabilities project. Key combat systems and payload technologies and enablers will continue to be developed and matured, leading to an at-sea capstone demonstration, remotely commanded from a surface combatant, in FY 2022.

Overlord prototypes and LUSVs will be capable of autonomous navigation, transit planning, and COLREGS-compliant maneuvering and will be designed with automated propulsion, electrical generation, and support systems. LUSV missions will be conducted with operators in-the-loop (with continuous or near-continuous observation or control) or on-the-loop (autonomous operation that prompts operator action/intervention from sensory input or autonomous behaviors).

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

LUSVs with integrated payload capability and prototypes employing non-organic payloads will not be capable of autonomous payload engagement or execution of a complete detect- to-engage sequence. The vessel will be incapable of payload activation, deactivation, or engagement without the deliberate action of a remote, off-hull human operator in the command and control loop. The program will integrate current Navy combat systems programs of record that have been adapted to enable remote monitoring and operational control from an off-hull command and control point, and will not be equipped with components that would enable payload engagement from onboard the vessel. USV Command and Control (C2) will be maintained via an afloat element (i.e., embarked on a United States Navy (USN) combatant/support ship), or via the ashore element (C2 station ashore).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Product Development	0.000	0.000	216.235	0.000	216.235
Articles:	-	-	-	-	-
FY 2020 Plans: FY 2020 Plans under PE 0603502N.					
FY 2021 Base Plans: In FY 2021, the Conceptual Design effort will be completed, delivering a Performance Specification supporting release of a Request for Proposal solicitation for a full and open competition leading up to the award of the Detail Design and Construction (DD&C) for a prototype LUSV designed to be capable of integrating future combat systems and payloads in FY 2022. The Conceptual Design effort along with lessons learned and technologies developed for the Overlord project will inform the LUSV design. The Navy will also execute efforts to integrate modular payloads on the two Ghost Fleet Overlord vessels procured by OSD in FY 2019 that will be transferring to the Navy in FY 2021. Technology development and maturation efforts in FY 2021 will build upon activities executed throughout FY 2020, with the goal to execute an at-sea capstone demonstration of the integrated combat system remotely from a surface combatant. Also in FY21, the Navy will purchase Overlord prototype(s) that advance lessons learned from the Ghost Fleet Overlord project, and will serve as HM&E and combat systems/C4I test vessels, and used to further refine TTPs and CONOPs.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Decrease from FY 2020 to FY 2021 accounts for the shift in acquisition strategy, which originally planned for the award of two LUSVs with an integrated combat system and organic payloads in FY 2021. The Navy's FY 2021 President's Budget request plan continues the Conceptual Design effort which will produce a Performance Specification that will be released as part of a RFP solicitation leading to a DD&C award in FY 2022. Additionally, the FY 2021 President's Budget request plan to purchase Overlord prototypes based on					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
commercial vessels capable of employing modular payloads in lieu of executing DD&C contract(s) per the original FY 2020 President's Budget plan accounts for the decrease between FY 2020 and FY 2021.					
Title: Support ***Articles:*** ***FY 2020 Plans:*** FY 2020 Plans under PE 0603502N. ***FY 2021 Base Plans:*** Complete the Conceptual Design effort started in FY 2020. Support development of the RFP and associated artifacts for the prototype LUSV DD&C contract. Execute source selection activities following the RFP leading to a planned award in FY 2022. Continue support to technology development and maturation efforts and the development of requirements and acquisition documentation including a Capability Development Document, System Engineering Plan (SEP), Test and Evaluation Master Plan (TEMP), Life Cycle Support Plan (LCSP), Cybersecurity Strategy, Open Systems Architecture Management Plan, Quality Assurance Program Plan, Reliability and Maintainability Program Plan, Configuration Management Plan, Software Development Plan, Navy Training Systems Plan (NTSP) and Program Protection Plan (PPP). Support efforts leading to purchase of Overlord prototypes that advance lessons learned from the Ghost Fleet Overlord project, and will serve as HM&E and combat systems/C4I test vessels, and used to further refine TTPs and CONOPs. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 supports efforts to execute the LUSV program incremental capability acquisition strategy and transition development technologies into future LUSV designs. Supports program ramp up to support ongoing Conceptual Design, RFP release and source selection for the planned prototype LUSV DD&C award in FY 2022, and management support to the planned purchase of the FY 2021 Overlord prototypes.	0.000 -	0.000 -	20.246 -	0.000 -	20.246 -
Title: Management Services ***Articles:*** ***FY 2020 Plans:***	0.000 -	0.000 -	2.136 -	0.000 -	2.136 -

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2020 Plans under PE 0603502N. ***FY 2021 Base Plans:*** Continue efforts started in FY 2020, developing governing LUSV program acquisition and requirements documentation. Provide management support and oversight for the construction of the two Overlord prototypes that will be procured in FY 2020 and FY 2021. Support development of prototype LUSV RFP and source selection activities leading up to the planned FY 2022 DD&C award. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 supports ongoing management of the construction of the two FY 2020 Overlord prototypes and LUSV Conceptual Design, the program ramp up to the prototype LUSV RFP release, and source selection for the planned prototype LUSV DD&C award in FY 2022, and management support to the planned purchase of the FY 2021 Overlord prototype(s).					
Accomplishments/Planned Programs Subtotals	0.000	0.000	238.617	0.000	238.617

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0603502N/3066: *Large Unmanned Surface Vehicle (LUSV)*	0.000	273.327	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	273.327
• SCN/5119: *Large Unmanned Surface Vessel*	0.000	0.000	0.000	-	0.000	0.000	455.000	373.605	536.598	0.000	1,365.203

Remarks

D. Acquisition Strategy

In FY 2020, the Navy will purchase two Overlord prototypes as a means to mitigate technical risk and continue to generate lessons learned through testing and experimentation, which will be delivered in FY 2021. In FY 2020, the Navy will award multiple Conceptual Design contracts for a LUSV with reservations in the design to integrate future payloads, which will inform the final Performance Specification. In FY 2021, the Navy intends to purchase up to two additional Overlord prototypes to build on the lessons learned through the Overlord project. Designed to employ modular payloads, they will serve as additional combat systems, C4I, and HM&E test and evaluation platforms as well as be used to further refine CONOPs and TTPs to include manned/unmanned teaming. Also in FY 2021, the Navy will release a RFP in support of a full and open competition for a DD&C contract for LUSV. The FY22 award will be for a single prototype LUSV with reservations to integrate future payloads

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

as a step towards delivering a LUSV with the ICS and VLS. In FY 2023 and following years, the Navy plans to execute contract options for production of LUSVs with ICS and VLS using SCN appropriations. The FY 2021 President's Budget request plan procures ten vessels throughout the FYDP, two Overlord prototypes and one prototype LUSV using RDTEN funding in Project 3066, then two LUSVs with ICS and VLS yearly in FY 2023 and FY 2024, and three in FY 2025 using SCN. All planned vessels are fully funded in the year of procurement, regardless of appropriation.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LUSV Combat Systems/ C4I/HM&E Automation Design and Testing	Various	TBD : TBD	0.000	0.000		0.000		97.478	Nov 2020	-		97.478	Continuing	Continuing	Continuing
LUSV Prototype Fabrication & System/ Payload Integration	C/CPIF	TBD : TBD	0.000	0.000		0.000		54.000	Jun 2021	-		54.000	Continuing	Continuing	Continuing
Government Furnished Equipment	C/CPIF	TBD : TBD	0.000	0.000		0.000		26.000	Jun 2021	-		26.000	Continuing	Continuing	Continuing
LUSV Specification/ Hardware Contract Support	WR	Various : Various	0.000	0.000		0.000		6.120	Nov 2020	-		6.120	Continuing	Continuing	Continuing
Overlord Experimentation	Various	Not Specified : Not Specified	0.000	0.000		0.000		32.637	Nov 2020	-		32.637	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		216.235		-		216.235	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SUPSHIP, WF Center Support	WR	Various : Various	0.000	0.000		0.000		18.129	Nov 2020	-		18.129	Continuing	Continuing	Continuing
LUSV Source Selection	WR	Various : Various	0.000	0.000		0.000		2.117	Nov 2020	-		2.117	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		20.246		-		20.246	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : Washington, DC	0.000	0.000		0.000		0.300	Nov 2020	-		0.300	Continuing	Continuing	Continuing
Management Services	WR	Various : Various	0.000	0.000		0.000		1.836	Nov 2020	-		1.836	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	0.000	0.000		0.000		2.136		-		2.136	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		238.617		-		238.617	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

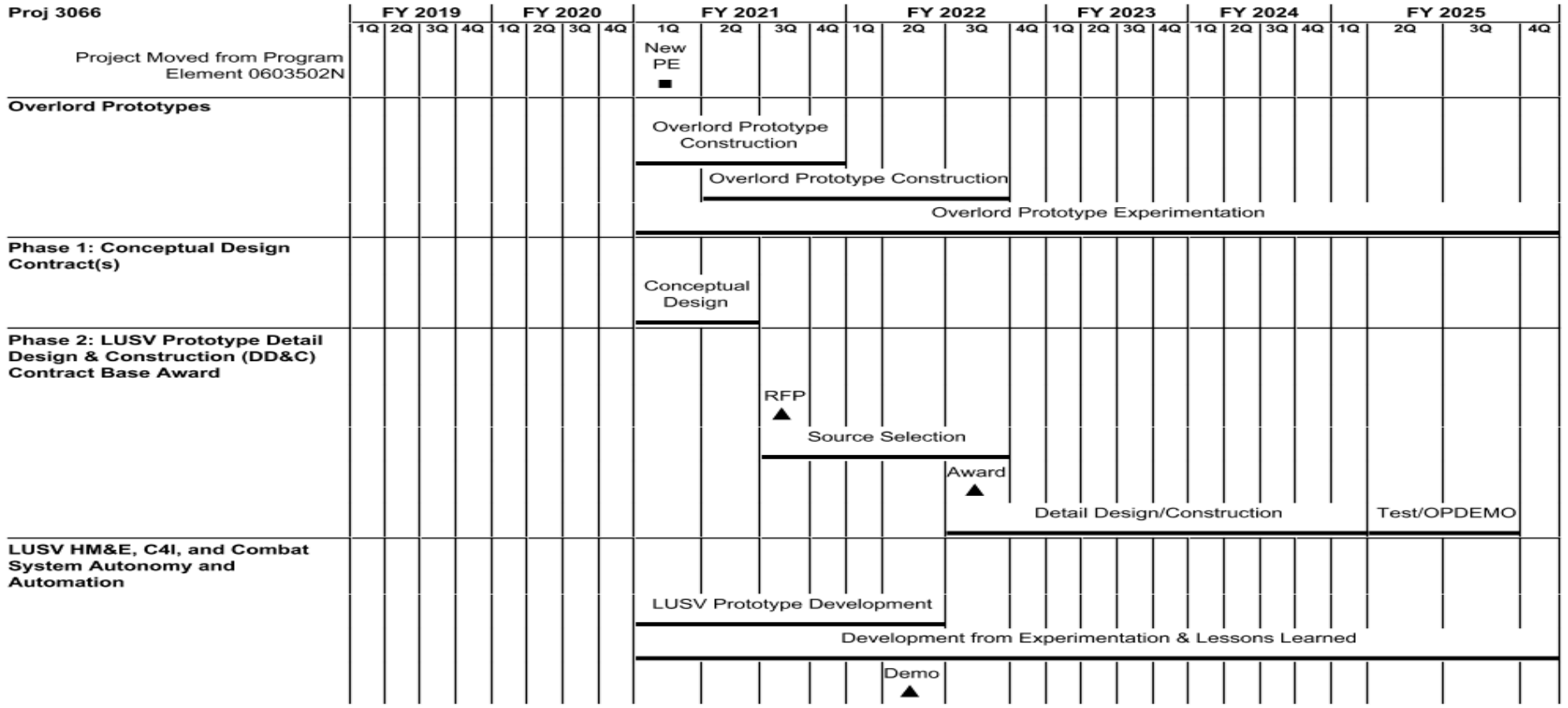

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3066				
Project Moved from Program Element 0603502N: New PE	1	2021	1	2021
Overlord Prototypes: Overlord Prototype Construction (options on WHS contract)	1	2021	4	2021
Overlord Prototypes: Overlord Prototype Construction	2	2021	3	2022
Overlord Prototypes: Overlord Prototype Experimentation	1	2021	4	2025
Phase 1: Conceptual Design Contract(s): Conceptual Design	1	2021	2	2021
Phase 2: LUSV Prototype Detail Design & Construction (DD&C) Contract Base Award: RFP	3	2021	3	2021
Phase 2: LUSV Prototype Detail Design & Construction (DD&C) Contract Base Award: Source Selection	3	2021	3	2022
Phase 2: LUSV Prototype Detail Design & Construction (DD&C) Contract Base Award: Award	3	2022	3	2022
Phase 2: LUSV Prototype Detail Design & Construction (DD&C) Contract Base Award: Detail Design and Construction (DD&C)	3	2022	1	2025
Phase 2: LUSV Prototype Detail Design & Construction (DD&C) Contract Base Award: Test/OPDEMO	2	2025	3	2025
LUSV HM&E, C4I, and Combat System Autonomy and Automation: LUSV Prototype Development	1	2021	2	2022
LUSV HM&E, C4I, and Combat System Autonomy and Automation: Development from Experimentation & Lessons Learned	1	2021	4	2025
LUSV HM&E, C4I, and Combat System Autonomy and Automation: Demonstration	2	2022	2	2022

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	Project (Number/Name) 3067 / *Unmanned Surface Vehicle Enabling Capabilities*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	0.000	0.000	199.123	-	199.123	122.837	192.836	77.854	80.857	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2020 and prior funding in Program Element (PE) 0603502N. Project 3067 realigned from PE 0603502N starting in FY 2021.

A. Mission Description and Budget Item Justification

In order to accelerate future capability and support steady growth of the Navy's Unmanned Surface Vehicle (USV) Family of Systems (FoS), the Unmanned Surface Vessel Enabling Capabilities project includes development, test, and integration of USV technologies; the advancement of Defense Advanced Research Projects Agency (DARPA), Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO), Office of Naval Research (ONR) and Industry USV efforts for associated technologies and the development and fabrication of payloads for Large Unmanned Surface Vessels (LUSVs) and Medium Unmanned Surface Vehicles (MUSVs). USV technology efforts in this project unit support demonstration of mission level autonomy, communications, command and control, navigation compliance with the International Regulations for Preventing Collisions at Sea 1972 (COLREGS), endurance, at sea replenishment, payload feasibility, mission planning and execution for the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) Overlord efforts, and enabling technologies for other USVs in the USV FoS, as applicable.

Modular payloads employed by LUSVs and MUSVs will be developed under this project unit. Payloads will be customized to meet Navy needs and demonstrate useful capability for the Fleet. MUSVs will achieve their mission capability through their employment of modular payloads. LUSVs will augment organic warfare capabilities with additional modular payloads. Efforts to develop LUSV organic warfare capability will also be executed under this project. In order to support LUSV future missions, investment in LUSV payload development, payload integration, and Integrated Combat System (ICS) development is required. Investment is also needed to support LUSV payload testing and follow-on operations.

The Autonomy portion of this project funds efforts (in conjunction with Program Element 0604029N, Project 3393 UxS Payloads, C2) to develop common standards, interfaces, and systems to support cross-domain (surface, sub-surface, aviation, and ground) applications. These efforts include advanced development, prototyping and demonstrations to accelerate the design and development of system commonality and interoperability for the cross-domain requirements of the Navy. Autonomy development efforts will demonstrate scalable, adaptable and interoperable warfighting capabilities across various unmanned systems. The advanced development emphasis will encourage innovation and enable rapid integration of UxS capabilities across domains while common standards, interfaces, and systems development occurs in parallel. Autonomy and Command and Control (C2) architectures and interface definitions will be incorporated into near-term and future USV requests for proposals (RFP) and associated artifacts. Coordinated autonomy and C2 efforts, will define, develop and demonstrate capability that advances new technology, and the hardware and software of control systems that will be used to operate multiple and dissimilar Naval UxSs.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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Under this project, the Navy is pursuing prototyping efforts to develop modular payloads to enable USVs to deploy persistent airborne systems, extending the C2 reach of host platforms and providing USVs and human operators with more time and space to identify potential threats and make critical decisions. In FY 2020, the Navy is conducting market research and technology feasibility studies that will provide options on mature technologies that can be quickly adapted into developmental systems. Following up in FY 2021, the Navy will consider promising options and will release a technical data package for bids for vendors on the Unmanned Surface Vehicle (USV) Family of Systems (FoS) Indefinite Delivery Indefinite Quantity (IDIQ) Multiple Award Contract (MAC) and plans to award a design and developmental contract in Q4FY 2021 which will deliver in FY 2025.

In FY 2021, Integrated Combat System development efforts will continue under both this project and under the Large Unmanned Surface Vehicle (LUSV) project (Project 3066). Technology development and maturation efforts will build upon activities executed throughout FY 2020, with the goal of delivering a Land Based Test Site (LBTS) software build in early FY 2022 and executing an at-sea capstone demonstration of the ICS remotely from a surface combatant. Also in FY 2021, the Navy will transition the prototype modular payloads developed by OSD SCO into production.

Due to the nature of this project, specific applications and detailed plans are available at a higher classification.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Product Development	0.000	0.000	182.732	0.000	182.732
Articles:	-	-	-	-	-
FY 2020 Plans: FY 2020 Plans under PE 0603502N.					
FY 2021 Base Plans: Continue efforts started in FY 2020 under the Future Surface Combatant Force (FSCF) strategy. Following up on FY 2020 market research and technical studies, develop the technical data package, release for bids on the USV FoS IDIQ MAC, and award the development contract for and commence production of the chosen Elevated Sensor solution following source selection efforts. Continue developmental efforts for the LUSV ICS, which will lead to the delivery of the Land Based Test Site initial build and a demonstration of ICS capabilities (details can be sent at a higher classification level) in FY 2022. Award the production contract (following source selection activities in FY 2020) for the initial prototype modular payloads, with production activities to continue throughout FY 2021. Continue to support efforts to develop the Unmanned Maritime Autonomy Architecture (UMAA) effort led in Project 3393, starting spiral development efforts and implementation of the UMAA Interface Control Document (ICD) and start efforts to establish an autonomy laboratory.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Increase from FY 2020 to FY 2021 accounts for the start of production for prototype payloads that will be integrated into the OSD SCO-configured experimentation vessels.					
Title: Support	0.000	0.000	13.591	0.000	13.591
Articles:	-	-	-	-	-
FY 2020 Plans: FY 2020 Plans under PE 0603502N.					
FY 2021 Base Plans: Continue efforts started in FY 2020 concerning development and refinement of common autonomy standards, interfaces, modeling and simulation efforts, test and evaluation, and prototype development. Continue development of interface control specifications and architecture documentation and update Common Control System documentation and support testing and design efforts. Complete any necessary plans, documents, and other artifacts to support installation and integration of the initial prototype modular payloads. Provide for the operation and maintenance of experimental platforms. Commence development of the Request for Proposals and associated artifacts and initial source selection activities for the production contract for Payload 1 that will award in FY 2021.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Increase from FY 2020 to FY 2021 accounts for support to payload production source selection efforts, increase in funding needed for operation of Sea Hunter and the OSD SCO-configured experimental vessels, and for development of the Request for Proposals for the production contracts for Payload 1.					
Title: Management Services	0.000	0.000	2.800	0.000	2.800
Articles:	-	-	-	-	-
FY 2020 Plans: FY 2020 Plans under PE 0603502N.					
FY 2021 Base Plans: Continue to provide oversight and management of product development and support efforts. Commence program					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
management activities and management for the production of the prototype modular payloads planned for award in FY 2021. Continue coordination with and across supporting activities (e.g., Program Executive Office (PEO) Integrated Warfare Systems (IWS), PEO Command, Control, Communications, Computers and Intelligence (C4I)), warfare centers, labs, and industry partners to address requirements, manage funding and execute plans for the integration of LUSV payloads with ICS. Continue to develop and refine required acquisition documents and artifacts that support required capabilities managed under this project. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 accounts for production management for prototype payloads and preparations for integration into the OSD SCO-configured experimentation vessels.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	199.123	0.000	199.123

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0603502N/3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	50.413	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	50.413

Remarks

D. Acquisition Strategy

USV Enabling Capabilities efforts will accelerate future capability and support steady growth of the Navy's Unmanned Surface Vehicle (USV) Family of Systems (FoS). By leveraging efforts from the Naval Research and Development Enterprise and industry for associated technologies and payloads and integrating them into USVs at the appropriate level of technical maturity, USV capabilities for the Fleet will be increasingly enhanced. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation and improve coordination of unmanned systems across multiple domains. Leveraging SCO-developed standalone capabilities, the plan is to develop these capabilities for the initial LUSVs and then transition those capabilities into the LUSV through incremental development and integration across the funding portfolio. The project will deliver an ICS that will be ready for combined and integrated capabilities with the infrastructure ready to support any future systems, payloads,

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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and capabilities. The Navy will accomplish efforts under USV Enabling Capabilities through existing contract vehicles prepared for SCO and ONR efforts, the USV FoS Indefinite Delivery Indefinite Quantity (IDIQ) Multiple Award Contract (MAC) which will be awarded in FY 2020, the prime contract awarded for MUSV design and fabrication, the prime contract(s) awarded for LUSV Conceptual Design and, later, Detail Design, and existing contracts for payload fabrication.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Combat System (ICS) Integration Development	Various	TBD : TBD	0.000	0.000		0.000		37.097	Apr 2021	-		37.097	Continuing	Continuing	Continuing
Technical Services	WR	Various : Various	0.000	0.000		0.000		1.658	Oct 2020	-		1.658	Continuing	Continuing	Continuing
Elevated Sensors	C/CPIF	TBD : TBD	0.000	0.000		0.000		2.295	Apr 2021	-		2.295	Continuing	Continuing	Continuing
Experimentation	WR	Various : Various	0.000	0.000		0.000		5.355	Oct 2020	-		5.355	Continuing	Continuing	Continuing
Payload Production	C/CPIF	TBD : TBD	0.000	0.000		0.000		136.327	Dec 2020	-		136.327	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		182.732		-		182.732	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Autonomy	Various	Various : Various	0.000	0.000		0.000		1.530	Oct 2020	-		1.530	Continuing	Continuing	Continuing
Command and Control (C2) Integration	Various	Various : Various	0.000	0.000		0.000		3.060	Oct 2020	-		3.060	Continuing	Continuing	Continuing
USV Squadron Operations	WR	Various : Various	0.000	0.000		0.000		3.901	Oct 2020	-		3.901	Continuing	Continuing	Continuing
Delta Req, RFP Dev, Evaluation	WR	Various : Various	0.000	0.000		0.000		2.200	Oct 2020	-		2.200	Continuing	Continuing	Continuing
RFP Development	WR	Various : Various	0.000	0.000		0.000		2.900	Jul 2021	-		2.900	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		13.591		-		13.591	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	WR	NAVSEA : Washington, DC	0.000	0.000		0.000		2.800	Oct 2020	-		2.800	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		2.800		-		2.800	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
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	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		199.123		-		199.123	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
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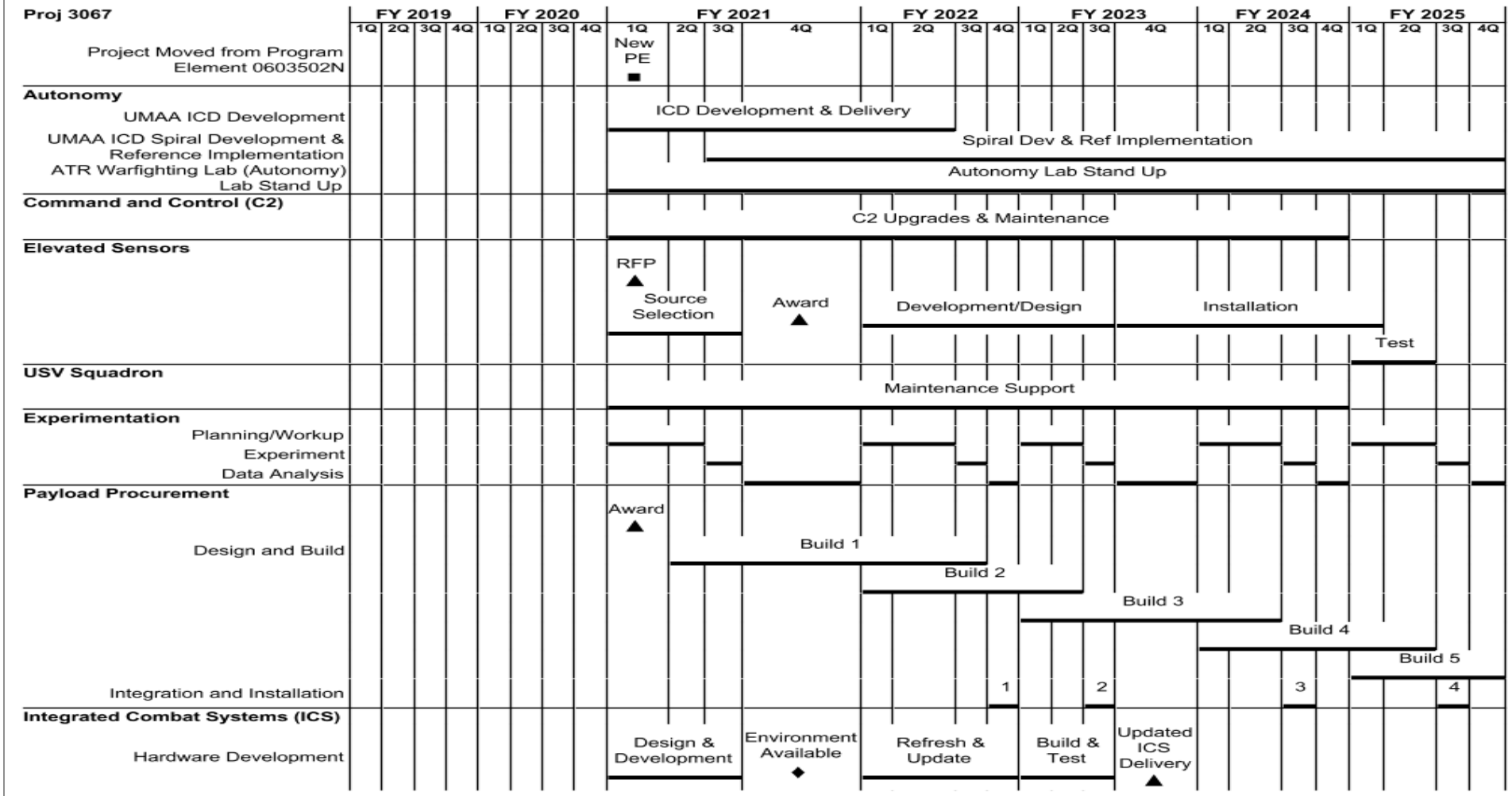

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
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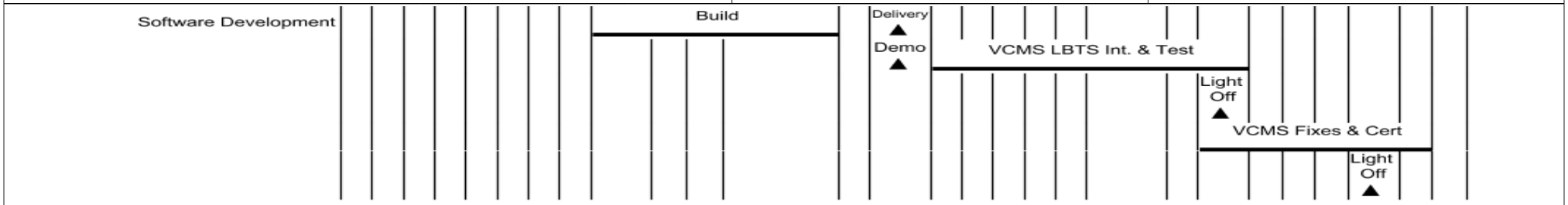

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3067				
Project Moved from Program Element 0603502N: New PE	1	2021	1	2021
Autonomy: UMAA ICD Development: ICD Development and Delivery	1	2021	2	2022
Autonomy: UMAA ICD Spiral Development & Reference Implementation: Spiral Development and Reference Implementation	3	2021	4	2025
Autonomy: ATR Warfighting Lab (Autonomy) Lab Stand Up: Autonomy Lab Stand Up	1	2021	4	2025
Command and Control (C2): Command and Control (C2)	1	2021	4	2024
Elevated Sensors: RFP Release	1	2021	1	2021
Elevated Sensors: Source Selection	1	2021	3	2021
Elevated Sensors: Award	4	2021	4	2021
Elevated Sensors: Development/Design	1	2022	3	2023
Elevated Sensors: Installation	4	2023	1	2025
Elevated Sensors: Test	1	2025	2	2025
USV Squadron: Maintenance Support	1	2021	4	2024
Experimentation: Planning/Workup: 2	1	2021	2	2021
Experimentation: Planning/Workup: 3	1	2022	2	2022
Experimentation: Planning/Workup: 4	1	2023	2	2023
Experimentation: Planning/Workup: 5	1	2024	2	2024
Experimentation: Planning/Workup: 6	1	2025	2	2025
Experimentation: Experiment: 2	3	2021	3	2021
Experimentation: Experiment: 3	3	2022	3	2022
Experimentation: Experiment: 4	3	2023	3	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Experimentation: Experiment: 5	3	2024	3	2024
Experimentation: Experiment: 6	3	2025	3	2025
Experimentation: Data Analysis: 2	4	2021	4	2021
Experimentation: Data Analysis: 3	4	2022	4	2022
Experimentation: Data Analysis: 4	4	2023	4	2023
Experimentation: Data Analysis: 5	4	2024	4	2024
Experimentation: Data Analysis: 6	4	2025	4	2025
Payload Procurement: Award	1	2021	1	2021
Payload Procurement: Design and Build: 1	2	2021	3	2022
Payload Procurement: Design and Build: 2	1	2022	2	2023
Payload Procurement: Design and Build: 3	1	2023	2	2024
Payload Procurement: Design and Build: 4	1	2024	2	2025
Payload Procurement: Design and Build: 5	1	2025	4	2025
Payload Procurement: Integration and Installation: 1	4	2022	4	2022
Payload Procurement: Integration and Installation: 2	3	2023	3	2023
Payload Procurement: Integration and Installation: 3	3	2024	3	2024
Payload Procurement: Integration and Installation: 4	3	2025	3	2025
Integrated Combat Systems (ICS): Hardware Development: Hardware Design and Development	1	2021	3	2021
Integrated Combat Systems (ICS): Hardware Development: Hardware Virtual Environment Available at Land Based Test Site	4	2021	4	2021
Integrated Combat Systems (ICS): Hardware Development: Hardware Refresh and Update	1	2022	4	2022
Integrated Combat Systems (ICS): Hardware Development: Hardware Update Build and Test	1	2023	3	2023
Integrated Combat Systems (ICS): Hardware Development: Hardware - Updated ICS HW Shipyard Delivery	4	2023	4	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Integrated Combat Systems (ICS): Software Development: Software Build	1	2021	4	2021
Integrated Combat Systems (ICS): Software Development: Virtual Combat Management System (VCMS) Software Delivery to Land Based Test Site (LBTS) Initial Build	2	2022	2	2022
Integrated Combat Systems (ICS): Software Development: Demonstration	2	2022	2	2022
Integrated Combat Systems (ICS): Software Development: VCMS LBTS Integration and Test	3	2022	2	2024
Integrated Combat Systems (ICS): Software Development: LUSV Combat System Light Off 1	2	2024	2	2024
Integrated Combat Systems (ICS): Software Development: VCMS Fixes and CS Certification Window	2	2024	3	2025
Integrated Combat Systems (ICS): Software Development: LUSV Combat System Light Off 2	2	2025	2	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
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COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3428: *Medium Unmanned Surface Vehicle (MUSV)*	0.000	0.000	0.000	26.302	-	26.302	29.998	42.994	43.853	44.730	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2020 and prior funding in Program Element (PE) 0603502N. Project 3428 realigned from PE 0603502N starting in FY 2021.

The MUSV project builds on efforts executed in FY 2019 under PE 0603502N, Project 3428 as well as through the Congressional Add of $42.000 million in Project 9999. Additionally, the project continues to leverage lessons learned through experimentation efforts external to this program element under Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and the Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/Sea Hunter projects.

A. Mission Description and Budget Item Justification

As part of the Unmanned Surface Vehicle (USV) Family of Systems (FoS), the Medium Unmanned Surface Vehicle (MUSV) project provides resources for the detail design, fabrication, testing, experimentation and support of the MUSV. The MUSV is defined as having a reconfigurable mission capability which is accomplished via modular payloads with an initial capability to support Battlespace Awareness through supporting Intelligence, Surveillance and Reconnaissance (ISR) and Information Operations (IO) mission areas. Modular payloads may be developed separately by other programs or prototyping efforts and will be further developed and/or integrated into MUSV under the Unmanned Surface Vehicle Enabling Capabilities project unit that supports MUSV and LUSV. MUSVs will provide affordable, high endurance, reconfigurable vehicles able to accommodate various payloads for unmanned missions to augment the Navy's manned surface force.

MUSVs will support the Navy's ability to produce, deploy and disburse ISR/EW capabilities in sufficient quantities and provide/improve distributed situational awareness in maritime Areas of Responsibility (AORs). MUSVs will be designed to be attritable assets if used in a peer or near-peer conflict. MUSVs will initially be capable of semi-autonomous operation, with operators in-the-loop (continuous or near-continuous observation and/or control of operations by remote operators) or on-the-loop (semi-autonomous operations where autonomy is controlling the vessel, but it may prompt the remote human operator for input based on sensory input and autonomy behaviors, or an operator may choose to intervene based on data sent from the MUSV or other sources to the remote operating station). USV Command and Control (C2) will be maintained via the afloat element (i.e., embarked on a United States Navy (USN) combatant/support ship), or via the ashore element (C2 station ashore). MUSV C2, combat and/or weapon system integration will employ tamper proofing and
security controls to prevent disclosure of data and electronic warfare defenses during autonomous operation. MUSVs will employ a Risk Management Framework (RMF) approach with physical, technical and administrative security controls. MUSVs will have hardware and software components to protect classified/sensitive functions. MUSVs will be capable of
weeks-long deployments and trans-oceanic transits, and operate aggregated with Carrier Strike Groups (CSGs) and Surface Action Groups (SAGs), as well as have the ability to deploy independently.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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MUSV leverages efforts external to this project unit accomplished through Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/Sea Hunter investments in autonomy, reliability, endurance, command and control, payloads and testing that started in FY 2017 and will continue through FY 2021. In addition, the MUSV C2 concept directly leverages the fleet-ready C2 solution developed for unmanned surface vessels in the OSD SCO Ghost Fleet Overlord LUSV experimentation program. In FY 2020, the Navy is transitioning MDUSV Sea Hunter I to the Surface Development Squadron (SURFDEVRON) under the MUSV project, and will be used for continued experimentation and Fleet learning.

The MUSV will be a key enabler of the Navy's Distributed Maritime Operations (DMO) concept, which includes being able to deploy independently or with other MUSVs as well as operate with individual manned combatants or as part of a larger battle group. Potential future missions for MUSV will continue to be explored as the Navy continues to learn through
experimentation with Sea Hunter I and the Ghost Fleet Overlord projects and as MUSV concepts of operation (CONOPs) are developed and refined. Following up on the outcome of the FSCF Analysis of Alternatives (AOA) completed in FY 2019, the Navy will have opportunities in the future to increase the MUSV capability set as technology matures. Fielding of MUSV starting in FY 2022 will provide the Navy increased capability and necessary capacity at lower procurement and sustainment costs, reduced risk to sailors and increased readiness by assuming missions from manned combatants.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Product Development	0.000	0.000	14.062	0.000	14.062
Articles:	-	-	-	-	-
FY 2020 Plans: FY 2020 Plans under PE 0603502N.					
FY 2021 Base Plans: - Execute Detail Design and Fabrication (DD&F) contract for MUSV prototype (contract award described under Congressional Add of $42.000M in Project Unit 9999/C442). Procure materials in support of fabrication. Begin construction of hull and assembly of subcomponents. Begin software modifications to existing autonomy systems to comply with Navy requirements. - Evaluate and approve industry's preliminary and detailed designs for MUSV through Preliminary Design Review (PDR) and Critical Design Review (CDR) for the MUSV prototype. Develop and review Engineering Change Proposals. The Navy will provide systems engineering, design analysis, hull and assembly oversight, and integration support related to the execution of the DD&F contract. - Develop logistics products to enable the operations, training, and sustainment of the MUSV prototype. - Perform required engineering and development to support the integration and verification of the modularized payloads for the prototype MUSV.					
FY 2021 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease from FY 2020 to FY 2021 accounts for test and evaluation efforts being broken out into a new category.					
Title: Support ***Articles:*** ***FY 2020 Plans:*** FY 2020 Plans under PE 0603502N. ***FY 2021 Base Plans:*** - Having transitioned Sea Hunter I to Commander, Naval Surface Forces / Surface Development Squadron in Q1FY20, the Navy will award support contracts to enable the sustainment of MUSVs delivered to CNSF. Develop of training and maintenance documentation in preparation of fleet-based operations and sustainment. Support the operations and sustainment for the operational tempo required by CNSF for MUSVs. Provide engineering and operational support for experimental payload integration and demonstration. Transition Sea Hunter II to CNSF Q3FY21. - Provide Systems Engineering Support of any Engineering Change Proposals or Ship Alternations required to support continued availability of the MUSV by CNSF. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 accounts for additional funding to support transition of Sea Hunter II to SURFDEVRON and for funding for experimentation efforts, maintenance, and sustainment of both Sea Hunter I and Sea Hunter II.	0.000 -	0.000 -	7.490 -	0.000 -	7.490 -
Title: Test and Evaluation ***Articles:*** ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:***	0.000 -	0.000 -	3.200 -	0.000 -	3.200 -

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
- Conduct test and trial event planning. Coordinate with required Navy and OSD testing organizations to reserve testing resources. Conduct initial Cybersecurity Testing. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 account for test and evaluation efforts being broken out from the product development category.					
Title: Management Services ***Articles:*** ***FY 2020 Plans:*** FY 2020 Plans under PE 0603502N. ***FY 2021 Base Plans:*** - Develop all governing MUSV documentation as required to support advancement of the prototype program as required by DoDI 5000.80. This includes the creation of the following artifacts or equivalents: System Engineering Plan (SEP), Test and Evaluation Strategy (TES), Life Cycle Support Plan (LCSP), Cybersecurity Strategy, and Program Protection Plan (PPP). The Navy will provide program management support related to the execution of the MUSV Prototype Contract as well as contracts to support MUSVs delivered to CNSF. - Develop Draft Capabilities Development Document to capture warfighting requirements of future increment of MUSV. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease from FY 2020 to FY 2021 accounts for completion of the governing MUSV documentation that is required for the prototype program.	0.000 -	0.000 -	1.550 -	0.000 -	1.550 -
Accomplishments/Planned Programs Subtotals	0.000	0.000	26.302	0.000	26.302

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0603502N/3428: *Medium Unmanned Surface Vehicle (MUSV)*	2.690	23.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	26.590
• RDTEN/0603502N/9999: *Congressional Add*	57.981	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	70.527

Remarks

RDT&E/0603502N/9999 - The above funding line accounts for several programs, of which the Medium Unmanned Surface Vehicle program is only a portion.

D. Acquisition Strategy

MUSV has been designated as a Rapid Prototyping Program designation and follows a Middle Tier Acquisition approach per Section 804 of the Fiscal Year (FY) 2016 National Defense Authorization Act (NDAA), as amended in FY 2017 NDAA (codified at 10 U.S.C. sub sec 2302 note). Required capabilities were codified in a Top Level Requirements (TLR) document approved by the OPNAV Director of Surface Warfare in FY 2019. While the project only has two MUSVs funded in the FYDP (one MUSV in FY 2019 and one in FY 2023), the contract structure allows for options to be added should funding become available. Delivery of the initial prototype is planned FY 2022 following completion of initial testing and a Military Utility Assessment (MUA). The prototyping efforts with the FY 2019 MUSV will inform procurement of additional MUSV units and eventual transition to an ACAT program with formalized requirements through a Capability Development Document and procurement funding.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Engineering	WR	Various : Various	0.000	0.000		0.000		2.100	Nov 2020	-		2.100	Continuing	Continuing	Continuing
Vessel Construction and Integration	C/FPIF	TBD : TBD	0.000	0.000		0.000		7.000	Oct 2020	-		7.000	Continuing	Continuing	Continuing
Logistics Package Development	C/FPIF	TBD : TBD	0.000	0.000		0.000		2.977	Oct 2020	-		2.977	Continuing	Continuing	Continuing
Payload Integration	Various	Various : Various	0.000	0.000		0.000		1.985	Oct 2020	-		1.985	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		14.062		-		14.062	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MUSV Experimentation	Various	Various : Various	0.000	0.000		0.000		5.750	Jan 2021	-		5.750	Continuing	Continuing	Continuing
In-Service Engineering Support	WR	Various : Various	0.000	0.000		0.000		1.740	Oct 2020	-		1.740	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		7.490		-		7.490	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Execution	Various	Not Specified : Not Specified	0.000	0.000		0.000		3.200	Oct 2020	-		3.200	0.000	3.200	-
		Subtotal	0.000	0.000		0.000		3.200		-		3.200	0.000	3.200	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Requirements Development	WR	Various : Washington, DC	0.000	0.000		0.000		0.800	Oct 2020	-		0.800	Continuing	Continuing	Continuing
Acquisition Management	Various	Various : Various	0.000	0.000		0.000		0.750	Oct 2020	-		0.750	0.000	0.750	-
		Subtotal	0.000	0.000		0.000		1.550		-		1.550	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		26.302		-		26.302	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

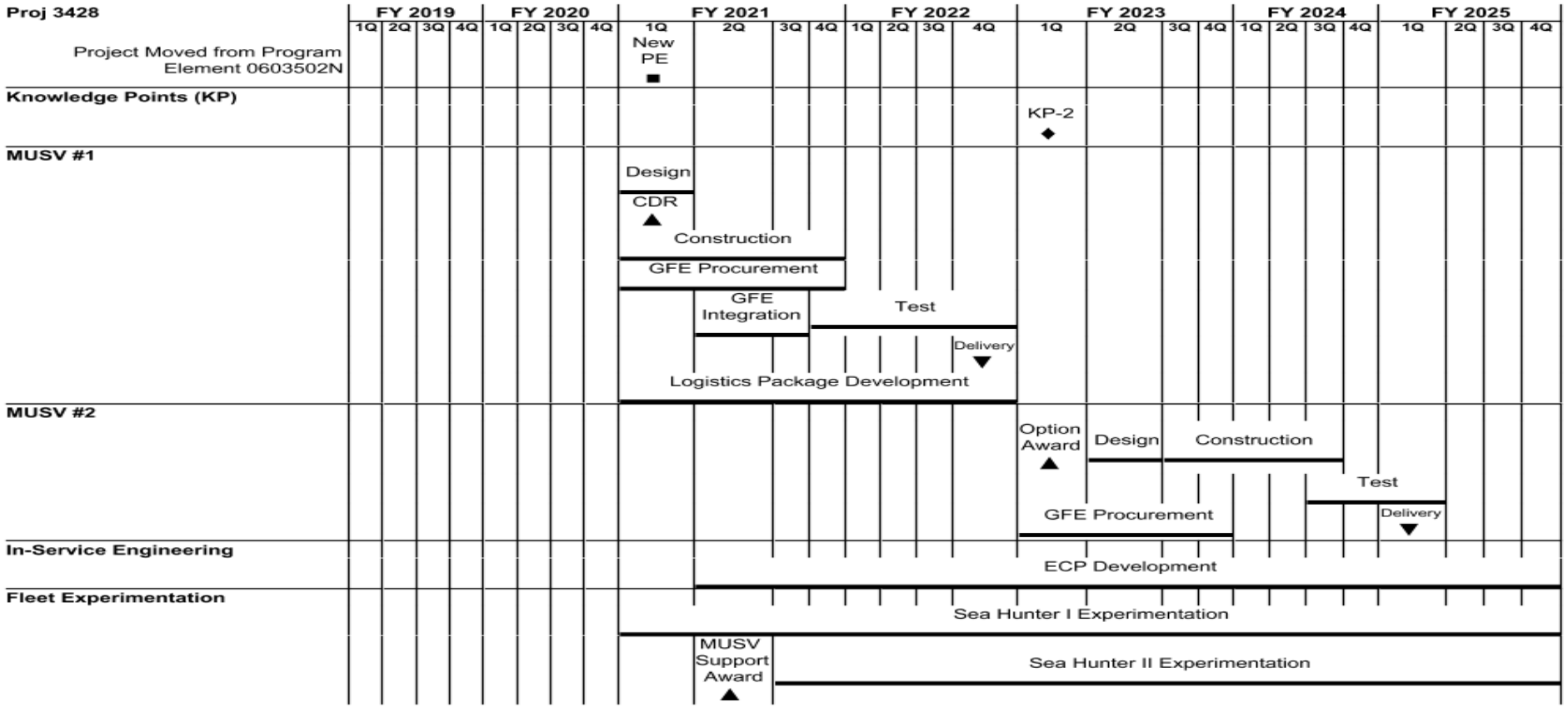

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603178N / *Medium and Large Unmanned Surface Vehicles (USVs)*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3428				
Project Moved from Program Element 0603502N: New PE	1	2021	1	2021
Knowledge Points (KP): Knowledge Point 2	1	2023	1	2023
MUSV #1: Detail Design	1	2021	1	2021
MUSV #1: Critical Design Review (CDR)	1	2021	1	2021
MUSV #1: Construction	1	2021	4	2021
MUSV #1: Government Furnished Equipment (GFE) Procurement	1	2021	4	2021
MUSV #1: GFE Integration	2	2021	3	2021
MUSV #1: Test	4	2021	4	2022
MUSV #1: Delivery	4	2022	4	2022
MUSV #1: Logistics Package Development	1	2021	4	2022
MUSV #2: Option Award	1	2023	1	2023
MUSV #2: Design	2	2023	2	2023
MUSV #2: Construction	3	2023	3	2024
MUSV #2: Test	3	2024	1	2025
MUSV #2: Delivery	1	2025	1	2025
MUSV #2: GFE Procurement	1	2023	4	2023
In-Service Engineering: Engineering Change Proposal (ECP) Development	2	2021	4	2025
Fleet Experimentation: Sea Hunter I Experimentation	1	2021	4	2025
Fleet Experimentation: Sea Hunter II Experimentation	3	2021	4	2025
Fleet Experimentation: MUSV Support Award	2	2021	2	2021