Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy											Date: May 2021	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603502N *I Surface & Shallow Water MCM*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	181.983	387.991	47.575	58.013	-	58.013	-	-	-	-	-	-
1234: *Unmanned Surface Vehicle (USV)*	130.982	30.450	19.082	20.277	-	20.277	-	-	-	-	-	-
2989: *Barracuda*	48.311	27.519	28.493	37.736	-	37.736	-	-	-	-	-	-
3066: *Large Unmanned Surface Vessel (LUSV)*	0.000	258.620	0.000	0.000	-	0.000	-	-	-	-	-	-
3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	48.438	0.000	0.000	-	0.000	-	-	-	-	-	-
3428: *Medium Unmanned Surface Vehicle (MUSV)*	2.690	22.964	0.000	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This program element provides resources for development of unmanned mine countermeasures systems to provide minehunting, minesweeping, and mine neutralization to counter known and projected mine threats. The mine countermeasures systems provide mobile, quick reaction forces capable of land-based or sea-based minehunting and minesweeping operations worldwide. Resources are for developing and deploying advanced minehunting and minesweeping systems and the intelligence and oceanographic capabilities that will enable mine warfare superiority. Tactics and techniques used vary across a diversity of environments and a diversity of threats, including both asymmetric and emerging. Resources provide for systems and support of mine warfare systems, maritime systems, and expeditionary systems to allow for continuous operations of the Navy's warships and support vessels, other military vessels, and commercial vessels. Core capabilities include forward presence, deterrence, sea control, power projection, maritime security, humanitarian assistance and disaster response to maintain freedom of the seas. Increased capability includes conducting minefield reconnaissance (mine density and location) at high area search rates, improving detection capability, decreasing sensor false alarm rates, reducing or eliminating post-mission analysis detect, classify, identify, decide time, improving neutralization time, improving network communications, automatic target recognition, and achieving in-stride detect-to-engage capability. Concept of operations includes development of cooperative, unmanned, modular systems; the establishment of a capable networked command and control system; and standing up an accurate and interactive environmental system with the ability to form and disseminate a Common Environmental Picture. Efforts benefit the Mine Countermeasure (MCM) force by transforming the Navy from the platform-centered legacy set of systems to a capability-centered force that is distributed, networked, and able to provide unique maritime influence and access across the entire maritime domain.

The Surface Mine Countermeasures (SMCM) programs are in general platform independent and will provide detection, classification, localization, identification, neutralization, and influence clearance capabilities. Programs develop: (1) unmanned minehunting capability for surface platforms; (2) the integration and improvement of new and existing systems; (3) support for systems which detect, localize, classify, identify, and neutralize all mine types across Littoral Combat Ship (LCS) Class and other vessels of opportunity (VOO) platforms; (4) systems for neutralizing mines through the entire water column to include deep water, open water, and shallow water in support of operations.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy	Date: May 2021
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603502N *I Surface & Shallow Water MCM*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	407.800	52.358	57.289	-	57.289
Current President's Budget	387.991	47.575	58.013	-	58.013
Total Adjustments	-19.809	-4.783	0.724	-	0.724
• Congressional General Reductions	-	-0.233			
• Congressional Directed Reductions	-	-4.550			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-4.000	0.000			
• SBIR/STTR Transfer	-15.809	0.000			
• Program Adjustments	0.000	0.000	1.700	-	1.700
• Rate/Misc Adjustments	0.000	0.000	-0.976	-	-0.976

Change Summary Explanation

Program Adjustments:
FY20: -$19,809K total; -$4,000K reprogramming, -$15,809K SBIR reduction
FY21: -$4,783K total; -$233K general congressional reduction, -$4,550 Barracuda schedule delays
FY22: +$724K total; +$1,700K program adjustments, -$976K misc rate adjustments

Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
1234: *Unmanned Surface Vehicle (USV)*	130.982	30.450	19.082	20.277	-	20.277	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

In FY 2020, the UISS program was subsumed into the MCM USV program.

A. Mission Description and Budget Item Justification

This project provides resources for development, improvement and integration of Unmanned Surface Vehicle (USV) Mine Countermeasure (MCM) systems. A description of the major planned programs includes the following:

1) The Unmanned Influence Sweep System (UISS) utilizes an Unmanned Surface Vehicle (USV) integrated with an Unmanned Surface Sweep System (US3), a magnetic/acoustic sweep system developed to sweep acoustic/magnetic influence mines. It can be deployed from the Littoral Combat Ship (LCS) or a Vessel of Opportunity (VOO).

2) Mine Hunting USVs (MHUs) were delivered in FY 2014 to 5th Fleet in response to an Urgent Operational Need (UON) from Naval Forces Central Command concerning MCM capacity and capability gaps. Four systems (referred to as MHUs 1-4) were provided to Combined Task Force (CTF) 52 to conduct Minehunting Operations. Each MHU consists of a USMI Naval Special Warfare (NSW) 11-meter Rigid Hull Inflatable Boat (RHIB), which was converted to a USV by Naval Undersea Warfare Center (NUWC) Division Newport, and tows an AN/AQS-24B Minehunting sonar. The systems are controlled from a Command and Control (C2) container located on either an underway host platform or on pier-side. MHUs 1-4 are currently in sustainment and will support CTF52 until MCM Mission Packages are deployed to United States 5th Fleet (C5F) Area of Responsibility (AOR). In FY 2016-2017, Speed to Fleet (S2F) funding supported the design and fabrication of an additional minehunting asset (referred to as "MHU 5") based on the MCM USV craft and integrating the AQS-24B. Beyond FY 2017, all future efforts with MHU 5 are within the MCM USV program.

3) The MCM USV program leverages the USV from the UISS Program of Record (PoR) and adds a modular mission capability employing multiple payloads (mine sweep, mine hunt, mine neutralize). The MCM USV plus mine sweep payload consists of the USV craft and the US3. The MCM USV plus mine hunt payload integrates the existing AQS-20C minehunting sonar. The MCM USV plus mine neutralization payload integrates the Barracuda neutralizer.

In FY 2022, the MCM USV will complete MCM MP IOTE, complete detailed design of mine neutralization payload, before starting fabrication.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: MCM USV Product Development	18.114	11.460	13.562	0.000	13.562

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Articles:	-	-	-	-	-
FY 2021 Plans: - Continued tactics development, requirements definition and design of Mine Neutralization (Barracuda) payload and integration with MCM USV. - Achieved Ready for Training (RFT) status. - Commenced MCM MP Development Testing (DT) and Technical Evaluation. - Conduct MCM USV + MH DT and User Operational Evaluation System (UOES). - Continued ECP development for Engineering Development Model (EDM), Low Rate Initial Production (LRIP), and Full Rate Production (FRP) units. - Continued systems engineering efforts in support of program and test efforts. - Completed program plans and documents in support of MCM USV Initial Operational Capability (IOC)					
FY 2022 Base Plans: - Continue tactics development, requirements definition and design of Mine Neutralization (Barracuda) payload and integration with MCM USV. Design reference mission profile Top-level requirements document for Barracuda integration - Continue detail design of Mine Neutralization (Barracuda) payload and integration with MCM USV. - Initiate development in support of Mine Neutralization (Barracuda) payload fabrication - Incorporation of USV improvement ECPs					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement: Increase from FY 2021 to FY 2022 to fund the development of standardized Navy Unmanned Systems common control system, as well as the mine neutralization development, detailed design, and fabrication.					
Title: MCM USV Support	5.532	3.295	3.256	0.000	3.256
Articles:	-	-	-	-	-
FY 2021 Plans: - Continue to support testing and assessment of system capabilities to determine Military utility. - Support program efforts under the USV Indefinite Delivery, Indefinite Quantity contract. - Continue to update MCM USV documentation to include Mine Neutralization, Minehunting, and Minesweeping.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
- Procure additional spares for test events. - Continue to support MCM MP integration and testing. - Conduct efforts in support of FRP source selection and award. - Develop MCM USV plans for depot and in-service support. ***FY 2022 Base Plans:*** - Continue to support integration, testing and assessment of system capabilities with MCM Mission Package. - Update MCM USV documentation to include Mine Neutralization, Minehunting, and Minesweeping. - Commence Engineering Change Proposal (ECP) development based on test reporting. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No Significant Changes					
Title: MCM USV Test and Evaluation	5.500	3.255	3.313	0.000	3.313
Articles:	-	-	-	-	-
FY 2021 Plans: - Complete UISS TECHEVAL and IOT&E. - Complete contractor integration testing of MCM USV w/ AQS-20C. - Complete MCM USV Shock testing. - Complete MCM USV DT with AQS-20C. - Complete AQS-20C IOT&E with MCM USV. - Conduct MCM USV test and evaluation efforts associated with ECP incorporation. - Continue MCM MP DT support. - Support MCM MP Technical Evaluation efforts. ***FY 2022 Base Plans:*** - Support MCM MP Initial Operation Test and Evaluation. - Conduct Minehunt Test and Evaluation efforts. - Support of MCM MP End to End IOT&E efforts. ***FY 2022 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No Significant changes					
Title: MCM USV Management Services ***Articles:*** ***FY 2021 Plans:*** - Provided program planning, management and acquisition document updates for the MCM USV program. - Conducted FRP proposal evaluation and managed award of FRP contract. ***FY 2022 Base Plans:*** - Provide program planning, management and acquisition document updates for the MCM USV program. - Manage FRP contract and options. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No Changes	0.391 -	0.146 -	0.146 -	0.000 -	0.146 -
Title: MHU Support ***Articles:*** ***FY 2021 Plans:*** - Provided program management, engineering and logistics support for product improvements to forward-deployed MHU 1-4 USVs and C2 Station. Maintained Cybersecurity compliance by developing, managing and installing software updates on fielded MHUs and the C2 container. ***FY 2022 Base Plans:*** N/A ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Requirements transitioned to Sustainment and Maintenance funding	0.913 -	0.926 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	30.450	19.082	20.277	0.000	20.277

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0603596N: *LCS Mission Modules*	1.800	0.000	0.000	-	0.000	-	-	-	-	-	-
• OPN/1601: *LCS MCM Mission Modules*	64.789	189.397	40.630	-	40.630	-	-	-	-	-	-
• OPN/2622: *Minesweeping System Replacement*	19.448	15.744	15.640	-	15.640	-	-	-	-	-	-

Remarks

RDT&E/0603596N - Funding shown only reflects funding for required USV development efforts.

OPN/1601 - The above funding line accounts for several programs, of which the Unmanned Surface Vehicle programs are only a portion.

OPN/2622 - The above funding line accounts for several programs, of which the Unmanned Surface Vehicle programs are only a portion.

D. Acquisition Strategy

UISS - Requirements are documented in the Unmanned Influence Sweep System (UISS) Capability Production Document (CPD). An Engineering and Manufacturing Development (E&MD) contract was awarded in FY 2014 with options for Low Rate Initial Production (LRIP) in FY 2019.
In FY 2020, MCM USV awarded three LRIP craft with sweep payload, following a Milestone C Decision on development contract.
In FY 2020-2021, MCM USV developed a Capability Production Document (CPD) Annex leveraging existing requirements (UISS, AN/AQS-20, MCM MP, etc.).
In FY 2021, MCM USV anticipates a Full Rate Production (FRP) decision (USV craft and mine sweep payload) and will conduct a full and open competition for production.
In FY 2022, MCM USV will complete Full Rate Production (FRP) decision and conduct full and open competition for mine hunt payload production. MCM USV will also complete mine neutralization payload detailed design and start fabrication.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Product Development	C/CPIF	Textron Systems, Inc : Hunt Valley, MD	33.145	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Product Development	SS/CPFF	JHU APL : Laurel, MD	12.215	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Product Development	C/FPIF	Textron Systems, Inc : Hunt Valley, MD	7.545	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Product Development	WR	NSWC PC : Panama City, FL	0.922	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Product Development	WR	NUWC N : Newport, RI	0.740	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Product Development	WR	NSWC CD : Bethesda, MD	0.235	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Product Development	WR	Various : Various	0.570	0.000		0.000		0.000		-		0.000	-	-	-
MCM USV: Product Development 1	C/CPIF	Textron Systems, Inc : Hunt Valley, MD	0.000	2.050	Jan 2020	0.000		0.000		-		0.000	-	-	-
MCM USV: Product Development 2	C/FPIF	Textron Systems, Inc : Hunt Valley, MD	15.559	0.000		0.000		0.000		-		0.000	-	-	-
MCM USV: Product Development1	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	3.100	8.975	Nov 2019	6.583	Nov 2020	1.021	Nov 2021	-		1.021	-	-	-
MCM USV: Product Development	SS/CPFF	Raytheon : Portsmouth, RI	12.177	1.800	Nov 2019	1.000	Feb 2021	0.300	Feb 2022	-		0.300	-	-	-
MCM USV: Product Development	SS/CPFF	JHU APL : Laurel, MD	0.750	1.500	Feb 2020	1.000	Feb 2021	1.235	Feb 2022	-		1.235	-	-	-
MCM USV: Product Development	WR	NSWC PC : Panama City, FL	3.535	3.000	Nov 2019	1.823	Nov 2020	1.652	Nov 2021	-		1.652	-	-	-
MCM USV: Product Development	WR	NUWC N : Newport, RI	1.445	0.250	Nov 2019	0.296	Nov 2020	0.323	Nov 2021	-		0.323	-	-	-
MCM USV: Product Development	WR	NSWC CD : Bethesda, MD	3.030	0.539	Nov 2019	0.758	Nov 2020	0.443	Nov 2021	-		0.443	-	-	-
MCM USV: Product Development	C/IDIQ	TBD : TBD	0.000	0.000		0.000		8.588	Jan 2022	-		8.588	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	94.968	18.114		11.460		13.562		-		13.562	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Engineering Support	WR	NUWC N : Newport, RI	0.850	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Engineering Support	WR	NSWC PC : Panama City, FL	2.289	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Engineering Support	WR	NSWC CD : Bethesda, MD	1.911	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Engineering Support	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	1.270	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Integrated Logistics	WR	NSWC PC : Panama City, FL	0.665	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Integrated Logistics	WR	NSWC CD : Bethesda, MD	0.951	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Integrated Logistics	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	1.128	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Engineering Support	WR	SSC PAC : San Diego, CA	0.368	0.036	Dec 2019	0.040	Dec 2020	0.000		-		0.000	-	-	-
MHU: Engineering Support	WR	NSWC PC : Panama City, FL	1.773	0.841	Feb 2020	0.846	Feb 2021	0.000		-		0.000	-	-	-
MHU: Engineering Support	WR	NUWC N : Newport, RI	0.853	0.000		0.000		0.000		-		0.000	-	-	-
MHU: Engineering Support	WR	NSWC CD : Bethesda, MD	0.308	0.036	Dec 2019	0.040	Dec 2020	0.000		-		0.000	-	-	-
MHU: Engineering Support	WR	Various : Various	0.520	0.000		0.000		0.000		-		0.000	-	-	-
MCM USV: Engineering Support	WR	NSWC PC : Panama City, FL	5.128	1.750	Nov 2019	1.038	Nov 2020	1.354	Nov 2021	-		1.354	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM USV: Engineering Support	WR	NUWC N : Newport, RI	2.920	0.750	Nov 2019	0.443	Nov 2020	0.434	Nov 2021	-		0.434	-	-	-
MCM USV: Engineering Support	WR	NSWC CD : Bethesda, MD	0.300	0.400	Dec 2019	0.235	Nov 2020	0.232	Nov 2021	-		0.232	-	-	-
MCM USV: Engineering Support	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.215	1.000	Nov 2019	0.590	Nov 2020	0.423	Nov 2021	-		0.423	-	-	-
MCM USV: Integrated Logistics	WR	NSWC PC : Panama City, FL	0.000	0.062	Dec 2019	0.099	Nov 2020	0.219	Nov 2021	-		0.219	-	-	-
MCM USV: Integrated Logistics	WR	NSWC CD : Bethesda, MD	0.000	0.061	Dec 2019	0.089	Nov 2020	0.092	Nov 2021	-		0.092	-	-	-
MCM USV: Integrated Logistics	SS/CPFF	Raytheon : Portsmouth, RI	0.400	0.400	Dec 2019	0.178	Jan 2021	0.050	Jan 2022	-		0.050	-	-	-
MCM USV: Integrated Logistics	SS/CPFF	Northrup Grumman : Annapolis, MD	0.300	0.300	Mar 2020	0.178	Jan 2021	0.000		-		0.000	-	-	-
MCM USV: Integrated Logistics	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.985	0.809	Feb 2020	0.445	Dec 2020	0.452	Dec 2021	-		0.452	-	-	-
		Subtotal	23.134	6.445		4.221		3.256		-		3.256	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Test and Evaluation	WR	NSWC PC : Panama City, FL	2.055	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Test and Evaluation	WR	NSWC CD : Bethesda, MD	1.731	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Test and Evaluation	C/CPIF	Textron Systems, Inc : Hunt Valley, MD	1.884	0.000		0.000		0.000		-		0.000	-	-	-
MCM USV: Test and Evaluation	WR	NSWC PC : Panama City, FL	2.050	2.500	Dec 2019	1.465	Dec 2020	1.495	Dec 2021	-		1.495	-	-	-
MCM USV: Test and Evaluation	WR	NSWC CD : Bethesda, MD	0.200	1.500	Dec 2019	0.879	Dec 2020	0.897	Dec 2021	-		0.897	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM USV: Test and Evaluation	SS/CPFF	Raytheon : Portsmouth, RI	0.400	0.500	Dec 2019	0.325	Dec 2020	0.323	Dec 2021	-		0.323	-	-	-
MCM USV: Test and Evaluation	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	1.500	1.000	Dec 2019	0.586	Dec 2020	0.598	Dec 2021	-		0.598	-	-	-
		Subtotal	9.820	5.500		3.255		3.313		-		3.313	-	-	N/A

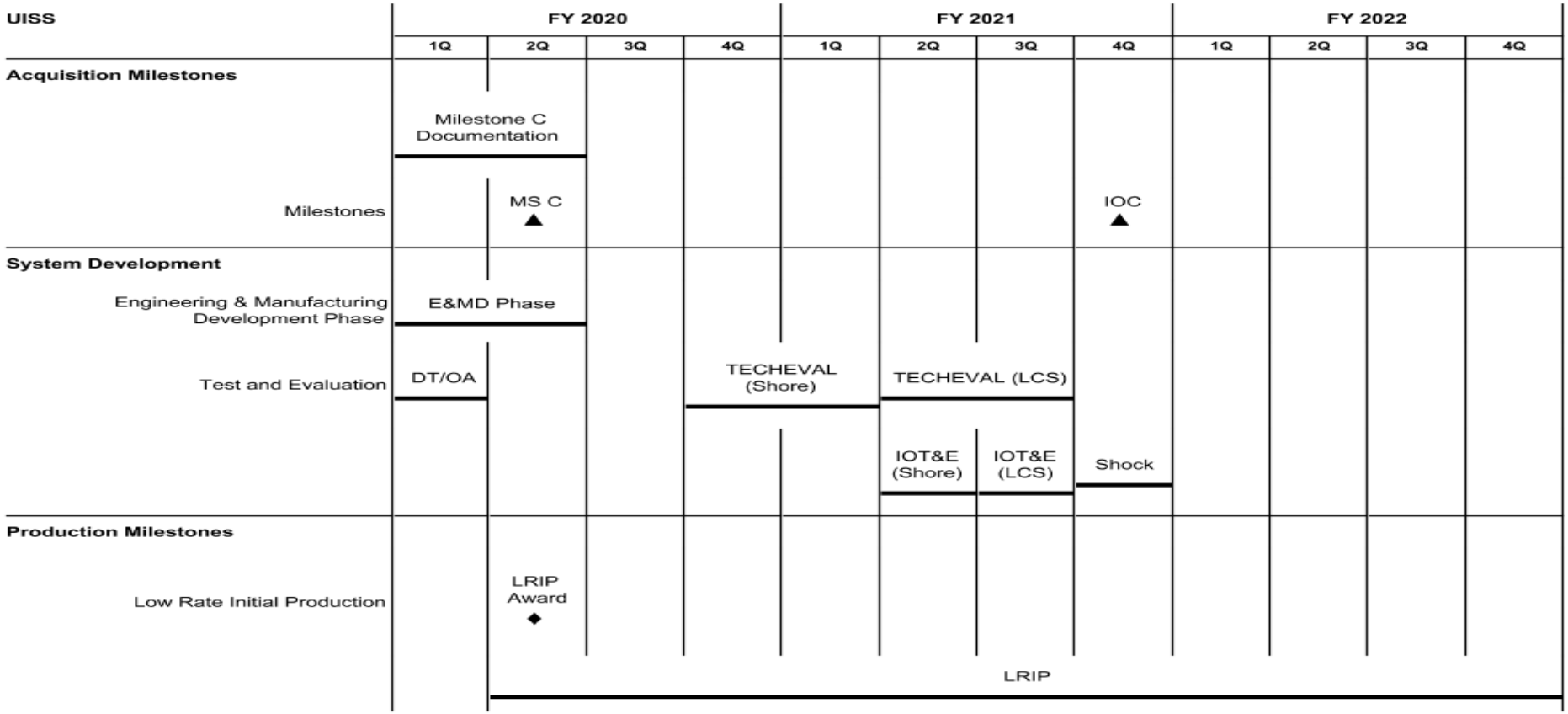
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Travel	WR	NAVSEA : Washington, DC	0.295	0.000		0.000		0.000		-		0.000	-	-	-
UISS: Management	C/CPAF	TBD : TBD	2.274	0.000		0.000		0.000		-		0.000	-	-	-
MCM USV: Travel	WR	NAVSEA : Washington, DC	0.200	0.120	Jan 2020	0.069	Jan 2021	0.069	Jan 2022	-		0.069	-	-	-
MCM USV: Management	C/CPAF	TBD : TBD	0.291	0.271	Nov 2019	0.077	Nov 2020	0.077	Nov 2021	-		0.077	-	-	-
		Subtotal	3.060	0.391		0.146		0.146		-		0.146	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	130.982	30.450		19.082		20.277		-		20.277	-	-	N/A

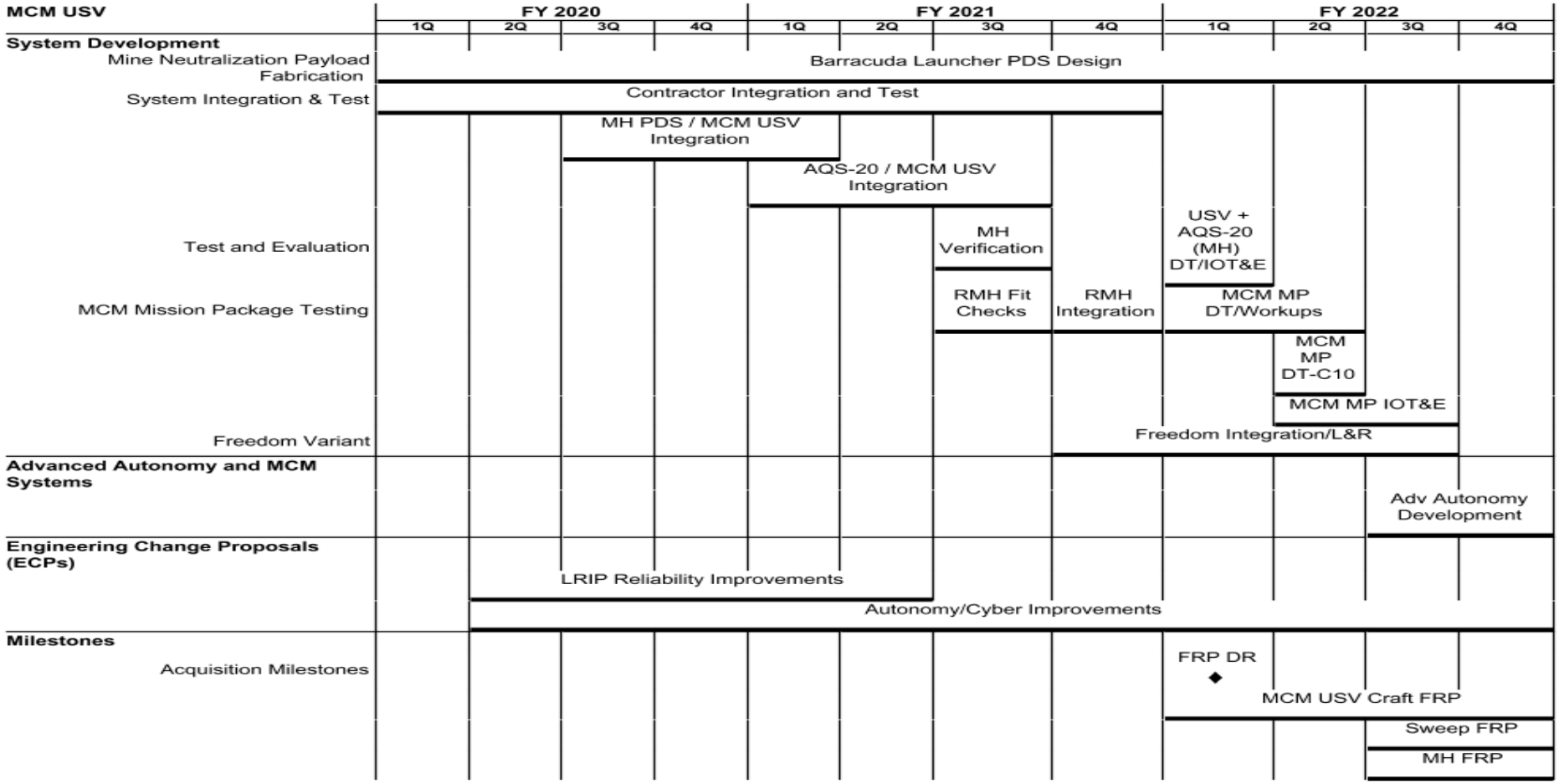
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*



2022PB - 0603502N - 1234

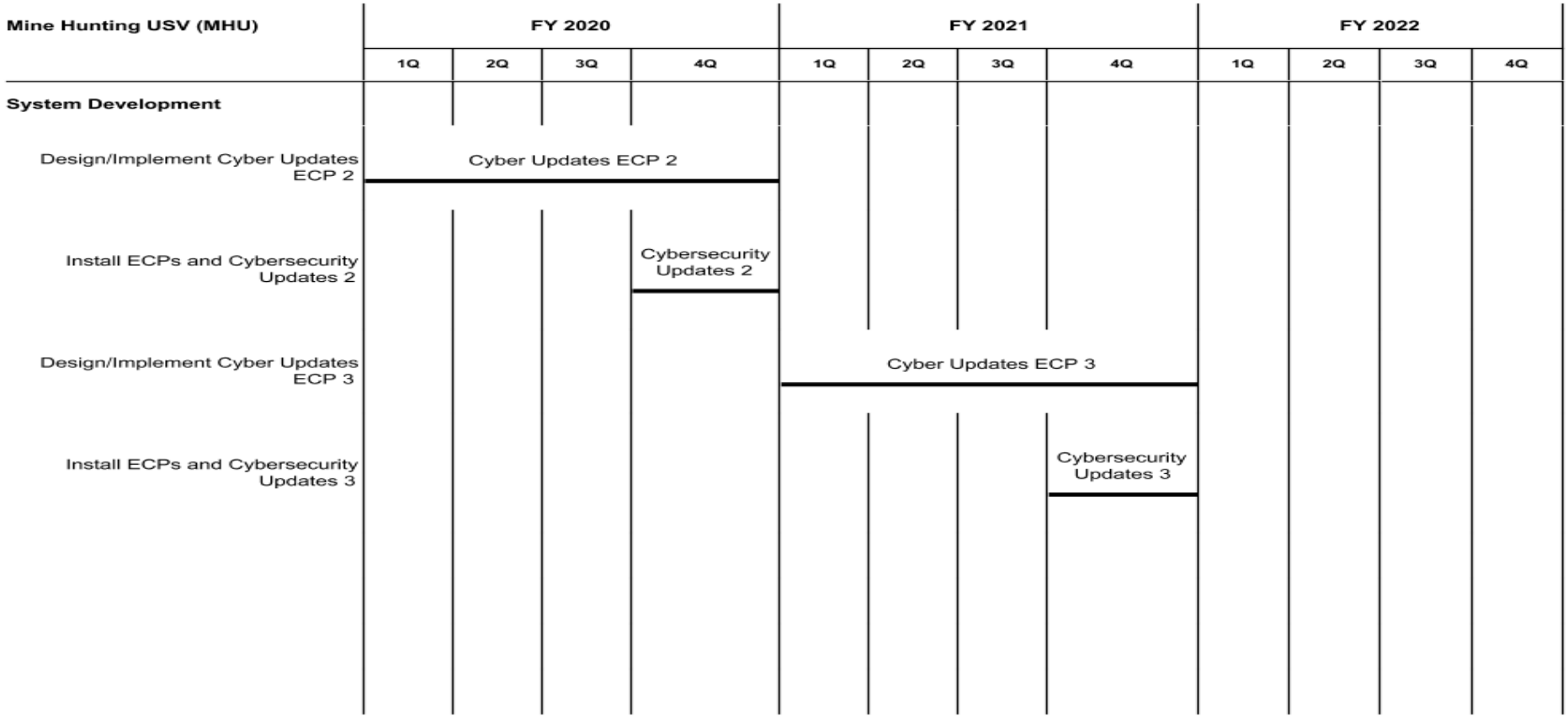
Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*



2022PB - 0603502N - 1234

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*



2022PB - 0603502N - 1234

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UISS				
Acquisition Milestones: Milestone C Documentation	1	2020	2	2020
Acquisition Milestones: Milestones: Milestone C	2	2020	2	2020
Acquisition Milestones: Milestones: Initial Operational Capability	4	2021	4	2021
System Development: Engineering & Manufacturing Development Phase: Engineering & Manufacturing Development Phase	1	2020	2	2020
System Development: Test and Evaluation: DT Testing	1	2020	1	2020
System Development: Test and Evaluation: TECHEVAL (Shore-Based)	4	2020	1	2021
System Development: Test and Evaluation: TECHEVAL (LCS-Based San Diego)	2	2021	3	2021
System Development: Test and Evaluation: IOT&E (Shore-Based NSWC PCD)	2	2021	2	2021
System Development: Test and Evaluation: IOT&E (LCS-Based San Diego)	3	2021	3	2021
System Development: Test and Evaluation: Shock Testing	4	2021	4	2021
Production Milestones: Low Rate Initial Production: LRIP Contract Award	2	2020	2	2020
Production Milestones: Low Rate Initial Production: LRIP Production	2	2020	4	2022
MCM USV				
System Development: Mine Neutralization Payload Fabrication: Barracuda Launcher / Payload Delivery System (PDS) Design	1	2020	4	2022
System Development: System Integration & Test: System Integration and Test	1	2020	4	2021
System Development: System Integration & Test: Minehunting Payload Delivery System (PDS) / MCM USV Integration	3	2020	1	2021
System Development: System Integration & Test: AQS-20 / MCM USV Integration (Lab, Pier-Side, At-Sea)	1	2021	3	2021
System Development: Test and Evaluation: USV + AQS-20 (Minehunting) DT/IOT&E	1	2022	1	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
System Development: Test and Evaluation: MH Performance Verification Testing	3	2021	3	2021
System Development: MCM Mission Package Testing: RMH MM / LCS Fit Checks	3	2021	3	2021
System Development: MCM Mission Package Testing: RMH MM / LCS Integration Testing	4	2021	4	2021
System Development: MCM Mission Package Testing: Developmental Testing	1	2022	2	2022
System Development: MCM Mission Package Testing: MCM MP DT-C10	2	2022	2	2022
System Development: MCM Mission Package Testing: IOT&E	2	2022	3	2022
System Development: Freedom Variant: LCS Freedom Integration / Launch & Recovery (L&R)	4	2021	3	2022
Advanced Autonomy and MCM Systems: Advanced Autonomy Development	3	2022	4	2022
Engineering Change Proposals (ECPs): LRIP Reliability Improvements	2	2020	2	2021
Engineering Change Proposals (ECPs): Autonomy/Cyber Improvements	2	2020	4	2022
Milestones: Acquisition Milestones: MCM USV Full Rate Production Decision Review	1	2022	1	2022
Milestones: Acquisition Milestones: MCM USV Full Rate Production	1	2022	4	2022
Milestones: Acquisition Milestones: Minesweeping PDS Full Rate Production	3	2022	4	2022
Milestones: Acquisition Milestones: Minehunting PDS Full Rate Production	3	2022	4	2022
Mine Hunting USV (MHU)				
System Development: Design/Implement Cyber Updates ECP 2: Design/Implement Cyber Updates ECP 2	1	2020	4	2020
System Development: Install ECPs and Cybersecurity Updates 2: Install ECPs and Cybersecurity Updates 2	4	2020	4	2020
System Development: Design/Implement Cyber Updates ECP 3: Design/Implement Cyber Updates ECP 3	1	2021	4	2021
System Development: Install ECPs and Cybersecurity Updates 3: Install ECPs and Cybersecurity Updates 3	4	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 2989 / *Barracuda*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
2989: *Barracuda*	48.311	27.519	28.493	37.736	-	37.736	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Barracuda system is an expendable, modular, mine neutralizer launched from the Mine Countermeasures (MCM) Unmanned Surface Vessel (USV) as part of the Littoral Combat Ship (LCS) MCM Mission Package (MP) to autonomously reacquire and neutralize previously detected near-surface mines. Upon entering the water, the vehicle will conduct a search, capture an image, and use a communications buoy to send the image to the operator in the MCM MP to evaluate the image and order the weapon to fire, abort, or continue searching.
Future capabilities may include launch from manned or unmanned aircraft or vessels of opportunity as well as the ability to neutralize mines in volume and on the bottom.

The Barracuda detailed design and development contract includes system design, program management, systems engineering, software development, integrated product support and contractor testing. In FY2019, contractor requested an Over-Target-Baseline / Over-Target-Schedule. In FY2020, the contract was rebaselined to an executable schedule to align program execution and delivery with the phased funding profile.
FY2022 continues to fund the detailed design and development contract.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Barracuda: Product Development	23.238	25.345	32.855	0.000	32.855
Articles:	-	-	-	-	-
FY 2021 Plans: Continue development of support elements, including System Integration Lab (SIL), peculiar support equipment (PSE), test support equipment (TSE), and surrogate console, and conduct support equipment PDR. Contractor will conduct system prototyping to inform critical design, including: acoustic communications and acoustic tracking sub-system prototype; vehicle modular prototypes, and full vehicle prototype assembly, integration, and checkout. The program will continue risk reduction for warhead, fuze, and autonomy.					
FY 2022 Base Plans: Complete system prototyping, development, and initiate qualification testing and conduct open water testing. Complete the design of the SIL, PSE, and TSE. The program will conduct Critical Design Review (CDR).					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Conduct Battery Integration. Conduct host and deployment platform integration including the command and control (C2) functionality. Commence training and technical manual development. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increased funding required to conduct CDR.					
Title: Barracuda: Engineering Support	3.985	2.903	4.571	0.000	4.571
Articles:	-	-	-	-	-
FY 2021 Plans: Continue detailed system design; conduct and manage technical and safety reviews as design matures. Evaluate and manage contractor deliverables, overseeing system engineering design and establish system configuration management. The program will conduct risk reduction for warhead, fuze, and autonomy. ***FY 2022 Base Plans:*** Continue to conduct and manage technical and safety reviews as design matures. Continue to evaluate and manage contractor deliverables, overseeing system engineering design and maintain system configuration management. Continue detailed system design and conduct CDR. Conduct host and deployment platform integration including the C2 functionality. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increased funding will support ramp-up required to conduct CDR.					
Title: Barracuda: Management Services	0.296	0.245	0.310	0.000	0.310
Articles:	-	-	-	-	-
FY 2021 Plans: Provide program management, financial management and engineering support. ***FY 2022 Base Plans:*** Continue to provide program management, financial management and engineering support. ***FY 2022 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increased management costs support ramp up required to support CDR.					
Accomplishments/Planned Programs Subtotals	27.519	28.493	37.736	0.000	37.736

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Barracuda program awarded a competitive contract in FY2018 to Raytheon Technologies Missiles and Defense (formerly Raytheon Integrated Defense Systems) in Portsmouth, RI. The Barracuda program is developing a semi-autonomous mine neutralization system that will be incorporated in LCS MCM MP. Initial concepts were based on small UUVs developed as part of the ONR Single Sortie, Detect to Engage Future Naval Capabilities project (FY2015-2018).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Hardware/ Support	C/CPIF	Raytheon (Integrated Defense Systems) : Portsmouth, RI	38.882	23.238	Jan 2020	25.345	Dec 2020	32.855	Dec 2021	-		32.855	-	-	-
		Subtotal	38.882	23.238		25.345		32.855		-		32.855	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Engineering Support	WR	NUWC NPT : Newport, RI	0.993	0.337	Dec 2019	0.344	Dec 2020	0.409	Dec 2021	-		0.409	-	-	-
Barracuda Engineering Services	C/CPIF	JHU APL : Baltimore, MD	1.308	0.459	Dec 2019	0.263	Dec 2020	0.532	Dec 2021	-		0.532	-	-	-
Barracuda Engineering Support	WR	NSWC, PC : Panama City, FL	2.674	2.522	Nov 2019	1.745	Nov 2020	2.885	Nov 2021	-		2.885	-	-	-
Barracuda Support	WR	NSWC, IHD : Indian Head, MD	2.616	0.296	Nov 2019	0.262	Nov 2020	0.330	Nov 2021	-		0.330	-	-	-
Barracuda Support	WR	Naval Research Lab : Washington, DC	0.771	0.094	Dec 2019	0.061	Dec 2020	0.109	Dec 2021	-		0.109	-	-	-
Barracuda Support	WR	NSWC, Carderock : Bethesda, MD	0.564	0.277	Nov 2019	0.228	Nov 2020	0.306	Nov 2021	-		0.306	-	-	-
		Subtotal	8.926	3.985		2.903		4.571		-		4.571	-	-	N/A

Management Services ($ in Millions)

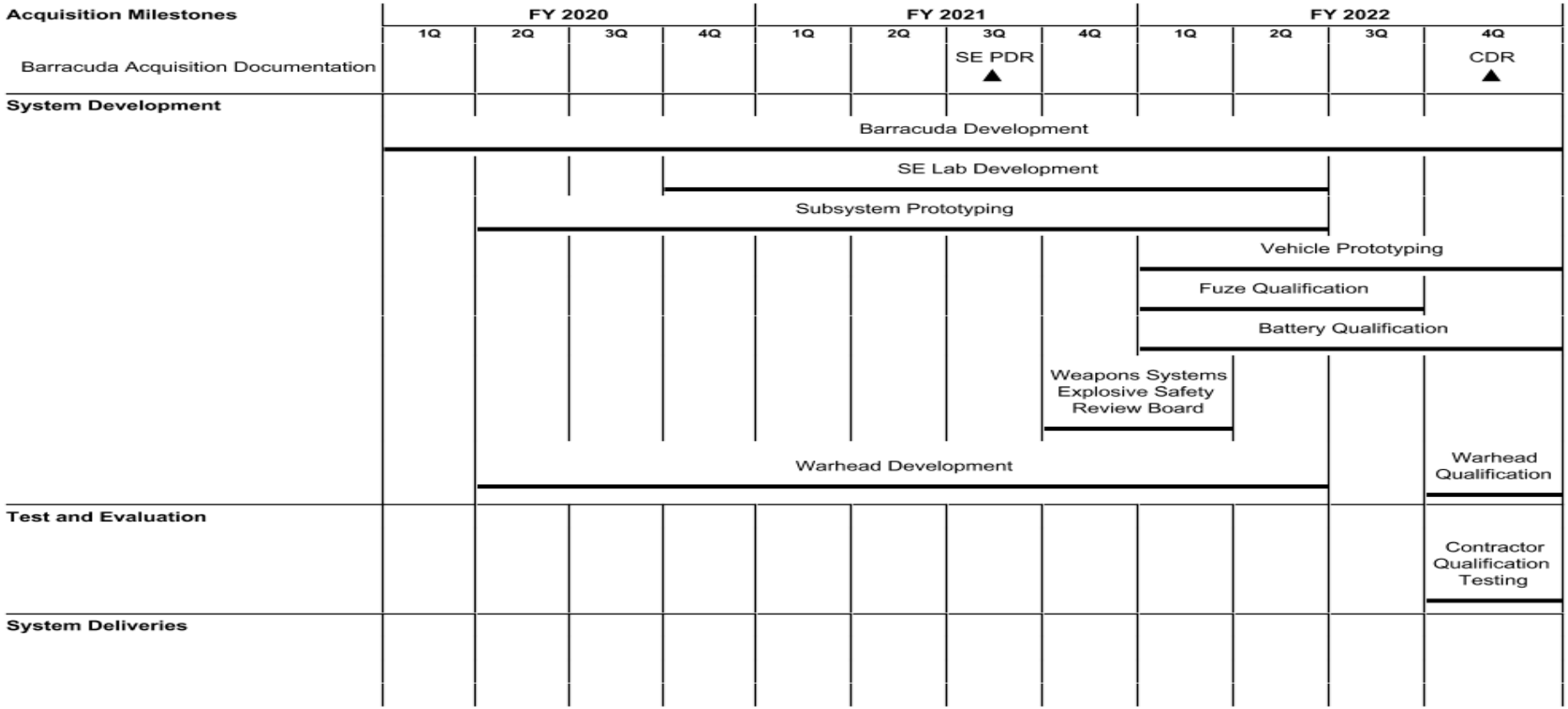
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Management Support	WR	NSWC, PC : Panama City, FL	0.503	0.296	Nov 2019	0.245	Nov 2020	0.310	Nov 2021	-		0.310	-	-	-
		Subtotal	0.503	0.296		0.245		0.310		-		0.310	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 2989 / *Barracuda*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	48.311	27.519		28.493		37.736		-		37.736	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*



2022PB - 0603502N - 2989

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acquisition Milestones				
Barracuda Acquisition Documentation: Support Equipment Preliminary Design Review	3	2021	3	2021
Barracuda Acquisition Documentation: Critical Design Review	4	2022	4	2022
System Development: Barracuda Development	1	2020	4	2022
System Development: Systems Engineering Lab Development	4	2020	2	2022
System Development: Subsystem Prototyping	2	2020	2	2022
System Development: Vehicle Prototyping	1	2022	4	2022
System Development: Fuze Qualification	1	2022	3	2022
System Development: Battery Qualification	1	2022	4	2022
System Development: Weapons Systems Explosive Safety Review Board	4	2021	1	2022
System Development: Warhead Development	2	2020	2	2022
System Development: Warhead Qualification	4	2022	4	2022
Test and Evaluation: Contractor Qualification Testing	4	2022	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy											Date: May 2021	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*				Project (Number/Name) 3066 / *Large Unmanned Surface Vessel (LUSV)*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
3066: *Large Unmanned Surface Vessel (LUSV)*	0.000	258.620	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

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. In FY 2021, the Navy will continue efforts started in FY 2020 and will procure Overlord prototypes, based on commercial ship designs and intended to employ modular payloads.

FY 2021 and future funding for Project 3066 were realigned to Program Element 0603178N.

A. Mission Description and Budget Item Justification

The Large Unmanned Surface Vessel (LUSV) project provides resources for the detailed design, construction, testing, fleet introduction, and support of the LUSV.

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.

The LUSV will be delivered and fielded initially as 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. In FY 2020, the Navy intends to procure Overlord prototypes capable of employing modular payloads but also integrating the organic capability needed for the LUSV program. These vessels will also continue to build on the lessons learned through the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) Ghost Fleet - Overlord project. Future LUSVs will incorporate reservations in the design for future combat capabilities as a step toward the desired goal of delivering a LUSV in FY 2026 with an integrated combat system and organic payloads supporting Anti-Surface Warfare (ASuW) and Strike mission areas. 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 operations (CONOPs) are developed. Fielding of LUSV will provide the Navy increased capability and necessary capacity at lower projected procurement and sustainment costs, reduced risk to sailors and increased readiness by assuming missions from manned combatants.

LUSVs will be based on commercial specifications and greater than 190ft in length in order to provide a long-endurance platform with sufficient margin in the design to support the incorporation of combat systems and future payloads. 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).

The LUSV integrated combat system will be developed under the Unmanned Surface Vehicle Enabling Capabilities (Project 3067). Modular 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 that supports both the LUSV and MUSV projects. Key combat systems and payload technologies and enablers will continue to be developed and matured, leading to an at-sea capstone demonstration of the complete firing chain remotely commanded from a surface combatant in FY 2022.

The LUSV equipped with an integrated combat system and organic payload capability 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. The LUSV's combat systems and C4I configuration will ensure that a remote human operator must always positively command all payload activation, deactivation, and engagement.

The LUSV 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). LUSV 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. LUSVs will employ a Risk Management Framework (RMF) approach with physical, technical and administrative security controls and LUSVs will have hardware and software components to protect classified/sensitive functions, countermeasures designed to thwart adversary exploitation, anti-tamper mechanisms to prevent disclosure of data, and electronic warfare defenses.

LUSV will continue to leverage efforts external to this project unit accomplished through the OSD SCO Ghost Fleet - Overlord project that will complete in FY 2021. Overlord converts existing commercial fast supply vessels into experimentation LUSVs, with the end goal to demonstrate relevant Navy Surface Warfare missions utilizing modular prototype payloads. The Overlord systems are advancing the technology needed for autonomous operation of pier-launched vessels as well as increase the reliability and redundancy required to support Hull, Mechanical, and Electrical (HM&E) systems for unmanned vessels. The two existing Ghost Fleet Overlord prototypes procured in FY 2019 will be turned over to the Navy at the conclusion of the testing program at the end of FY 2021. The Navy's Surface Development Squadron (SURFDEVRON) will use the vessels for continued testing, experimentation, and refinement of unmanned platform CONOPs and Tactics, Techniques, and Procedures (TTPs) to operate and fight alongside crewed platforms. Each vessel is anticipated to provide up to 1,000 hours annually of experimentation time, which will be used to further test and prove autonomous behaviors and reliability and automation of hull, mechanical, and electrical systems.

In FY 2020, the Navy will procure two Overlord prototypes which will deliver in FY 2021. One vessel will be procured from each of the vendors on the current Washington Headquarters Services contract. Additional Overlord prototype(s) will be procured in FY21.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	237.604	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N/A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Title: Support	19.016	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N/A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Title: Management Services	2.000	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N/A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	258.620	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTEN/0603178N/3066: *Large Unmanned Surface Vehicle (LUSV)*	0.000	69.634	144.846	-	144.846	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

In FY 2020, the Navy purchased two prototype USVs as a means to mitigate technical risk and continue to generate lessons learned through testing and experimentation. Also in FY 2020, the Navy awarded multiple LUSV Studies 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 plans to purchase two additional prototype USVs 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 FY20, the Navy implemented a comprehensive reliability improvement program, which will allow continuous engagement with industry to improve reliability of representative machinery plants (main engines, generators, and ancillary equipment) as well as provide a path to qualify the MUSV (and prototype USV) main engine and representative LUSV engines and generators. This effort will continue through FY 2020-FY 2023 with the goal to qualify machinery plants for incorporation into the LUSV design as well as provide a set of standards for offerors to use to prove reliability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LUSV Conceptual Design	C/CPIF	TBD : TBD	0.000	50.000	Feb 2020	0.000		0.000		-		0.000	-	-	-
OVERLORD Fabrication & System/Payload Integration	C/CPIF	TBD : TBD	0.000	80.100	Jan 2020	0.000		0.000		-		0.000	-	-	-
LUSV GFE/Long Lead Time Material	C/FFP	TBD : TBD	0.000	26.000	May 2020	0.000		0.000		-		0.000	-	-	-
LUSV Specification/ Hardware Contract Support	WR	Various : Various	0.000	6.000	Jan 2020	0.000		0.000		-		0.000	-	-	-
LUSV Combat Systems/ C4I/HM&E Automation Design and Testing	Various	TBD : TBD	0.000	57.255	Feb 2020	0.000		0.000		-		0.000	-	-	-
Overlord Experimentation	Various	Various : Various	0.000	18.249	Mar 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.000	237.604		0.000		0.000		-		0.000	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SUPSHIP, WF Center Support	WR	Various : Various	0.000	17.766	Feb 2020	0.000		0.000		-		0.000	-	-	-
LUSV Source Selection	WR	Various : Various	0.000	1.250	Jan 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.000	19.016		0.000		0.000		-		0.000	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : Washington, DC	0.000	0.200	Jan 2020	0.000		0.000		-		0.000	-	-	-
Management Services	WR	Various : Various	0.000	1.800	Jan 2020	0.000		0.000		-		0.000	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

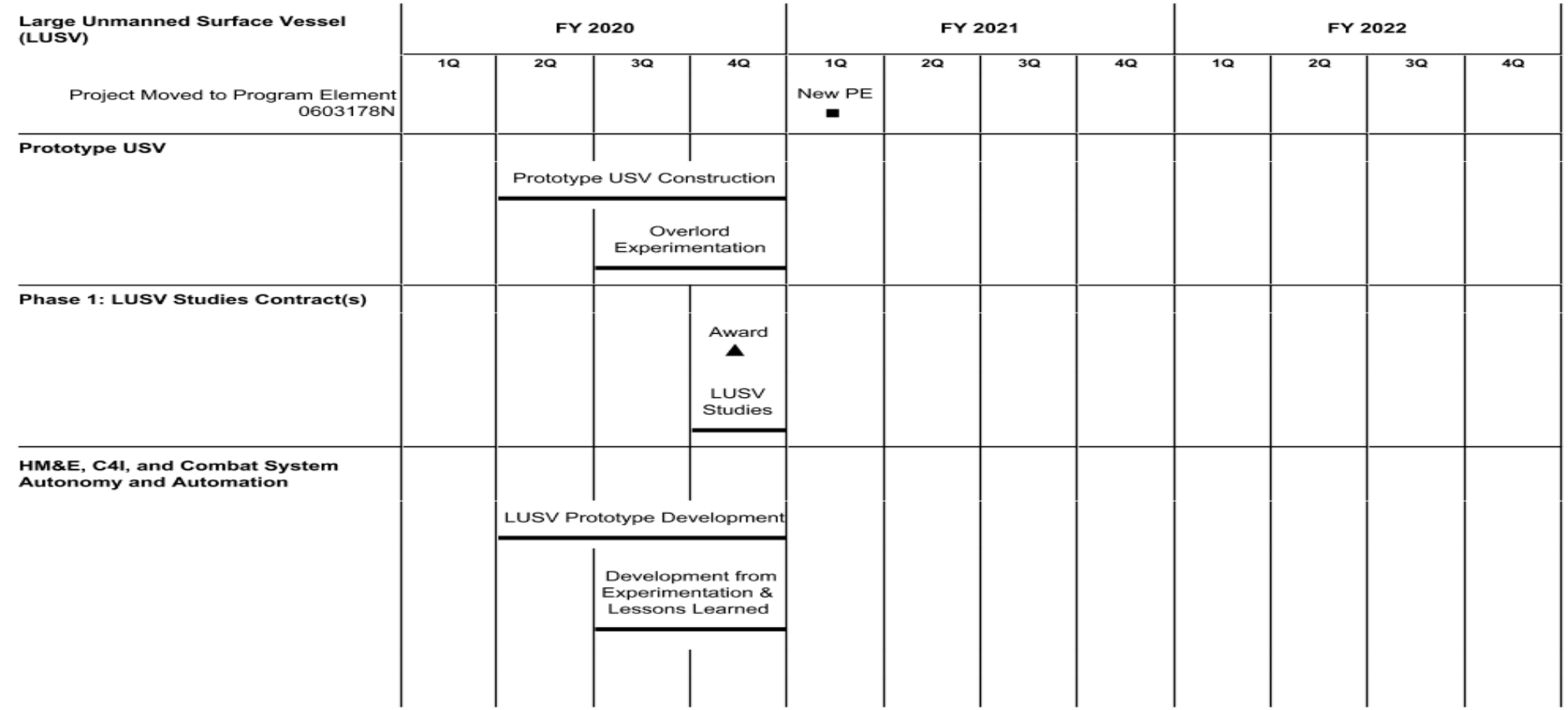
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	0.000	2.000		0.000		0.000		-		0.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	258.620		0.000		0.000		-		0.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*



2022PB - 0603502N - 3066

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vessel (LUSV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Large Unmanned Surface Vessel (LUSV)				
Project Moved to Program Element 0603178N: Project Moved to Program Element 0603178N	1	2021	1	2021
Prototype USV: Prototype USV Construction (options on WHS contract)	2	2020	4	2020
Prototype USV: Overlord Experimentation	3	2020	4	2020
Phase 1: LUSV Studies Contract(s): LUSV Studies Contract(s) Award	4	2020	4	2020
Phase 1: LUSV Studies Contract(s): LUSV Studies	4	2020	4	2020
HM&E, C4I, and Combat System Autonomy and Automation: LUSV Prototype Development	2	2020	4	2020
HM&E, C4I, and Combat System Autonomy and Automation: Development from Experimentation & Lessons Learned	3	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy												Date: May 2021
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*				Project (Number/Name) 3067 / *Unmanned Surface Vehicle Enabling Capabilities*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	48.438	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2021 funding for Project 3067 was realigned to Program Element 0603178N. FY 2022 and future funding for Project 3067 was realigned to Program Element 0605513N.

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 their 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. 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 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**
Title: Product Development	42.638	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A ***FY 2022 Base Plans:*** N/A ***FY 2022 OCO Plans:*** N/A					
Title: Support ***Articles:*** ***FY 2021 Plans:*** N/A ***FY 2022 Base Plans:*** N/A ***FY 2022 OCO Plans:*** N/A	5.750 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Management Services ***Articles:*** ***FY 2021 Plans:*** N/A ***FY 2022 Base Plans:*** N/A ***FY 2022 OCO Plans:*** N/A	0.050 -	0.000 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	48.438	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTEN/0603178N/3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	22.113	0.000	-	0.000	-	-	-	-	-	-

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, 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, Detailed Design, and existing contracts for payload fabrication.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3067 / *Unmanned Surface Vehicle Enabling Capabilities*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Combat Systems (ICS) Integration Development	Various	TBD : TBD	0.000	36.763	Jan 2020	0.000		0.000		-		0.000	-	-	-
Technical Services	WR	Various : Various	0.000	1.625	Jan 2020	0.000		0.000		-		0.000	-	-	-
Elevated Sensors	C/CPIF	TBD : TBD	0.000	0.750	Jan 2020	0.000		0.000		-		0.000	-	-	-
Experimentation	WR	Various : Various	0.000	3.500	Jan 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.000	42.638		0.000		0.000		-		0.000	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Autonomy	Various	Various : Various	0.000	0.750	Jan 2020	0.000		0.000		-		0.000	-	-	-
Command and Control (C2) Integration	Various	Various : Various	0.000	1.500	Jan 2020	0.000		0.000		-		0.000	-	-	-
USV Squadron Operations	WR	Various : Various	0.000	2.500	Jan 2020	0.000		0.000		-		0.000	-	-	-
Delta Req, RFP Dev, Evaluation	WR	Various : Various	0.000	1.000	Jan 2020	0.000		0.000		-		0.000	-	-	-
RFP Development	WR	Various : Various	0.000	0.000		0.000		0.000		-		0.000	-	-	-
		Subtotal	0.000	5.750		0.000		0.000		-		0.000	-	-	N/A

Management Services ($ in Millions)

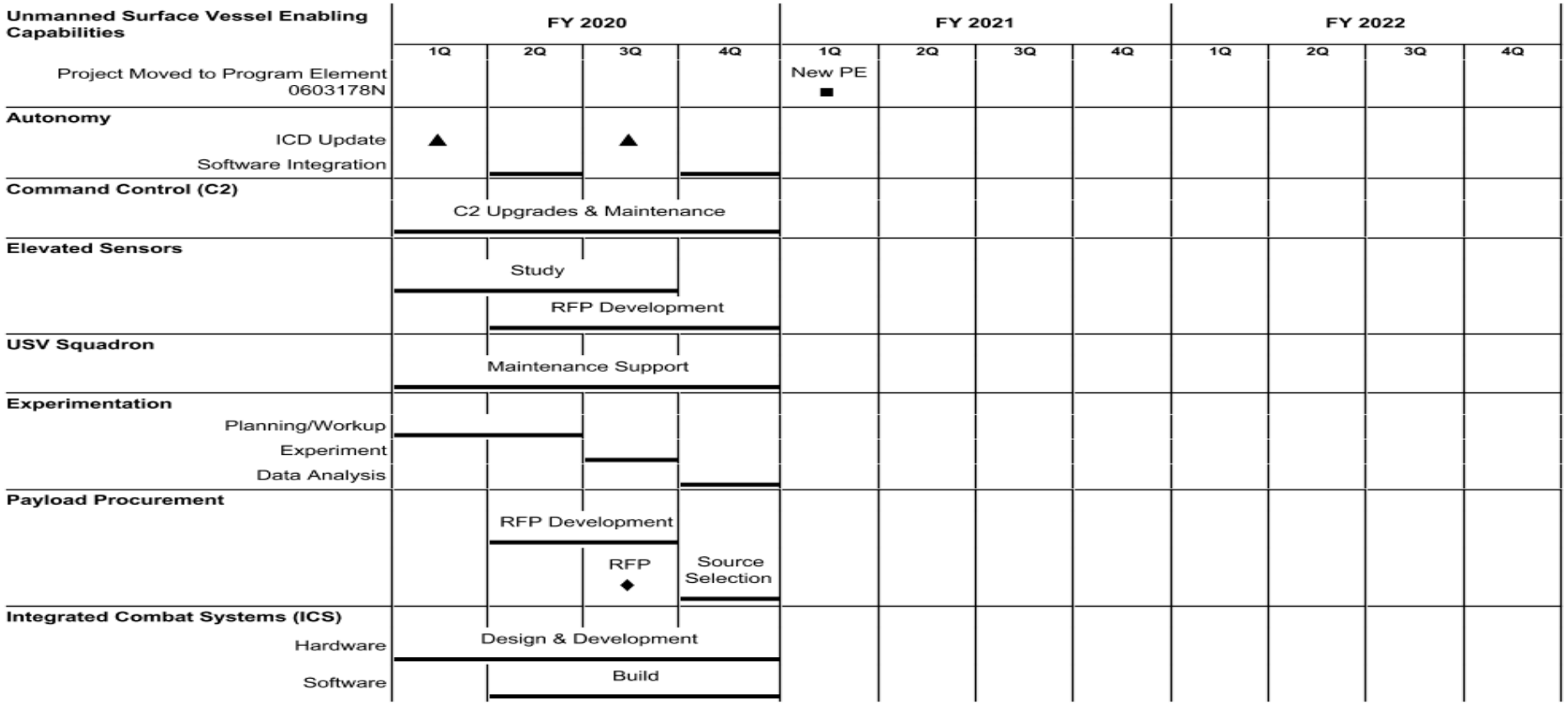
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	WR	NAVSEA : Washington, DC	0.000	0.050	Jan 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.000	0.050		0.000		0.000		-		0.000	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3067 / *Unmanned Surface Vehicle Enabling Capabilities*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	48.438		0.000		0.000		-		0.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*



2022PB - 0603502N - 3067

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Unmanned Surface Vessel Enabling Capabilities				
Project Moved to Program Element 0603178N: New PE	1	2021	1	2021
Autonomy: ICD Update: 1	1	2020	1	2020
Autonomy: ICD Update: 2	3	2020	3	2020
Autonomy: Software Integration: 1	2	2020	2	2020
Autonomy: Software Integration: 2	4	2020	4	2020
Command Control (C2): Command and Control (C2)	1	2020	4	2020
Elevated Sensors: Study	1	2020	3	2020
Elevated Sensors: RFP Solicitation Development	2	2020	4	2020
USV Squadron: Maintenance Support	1	2020	4	2020
Experimentation: Planning/Workup: 1	1	2020	2	2020
Experimentation: Experiment: 1	3	2020	3	2020
Experimentation: Data Analysis: 1	4	2020	4	2020
Payload Procurement: RFP Development	2	2020	3	2020
Payload Procurement: RFP Released	3	2020	3	2020
Payload Procurement: Source Selection	4	2020	4	2020
Integrated Combat Systems (ICS): Hardware: Design and Development	1	2020	4	2020
Integrated Combat Systems (ICS): Software: Software Build	2	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy									Date: May 2021			
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*				Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
3428: *Medium Unmanned Surface Vehicle (MUSV)*	2.690	22.964	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

The MUSV project builds on efforts executed in FY 2019 under 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.

FY 2021 and future funding for Project 3428 realigned to Program Element 0605512N.

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 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	15.064	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N/A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Title: Support	6.200	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N/A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A					
Title: Management Services	1.700	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2021 Plans: N/A					
FY 2022 Base Plans: N/A					
FY 2022 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	22.964	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTEN/0603178N/3428: *Medium Unmanned Surface Vehicle (MUSV)*	0.000	26.302	29.998	-	29.998	-	-	-	-	-	-

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 structure of the contract awarded to L3 Harris in July 2020 allows for options to be added should funding become available. Delivery of the initial prototype is planned FY 2023 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 transition to an ACAT program with formalized requirements through a Capability Development Document and procurement funding in FY26.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Detailed Design & Construction	TBD	TBD : TBD	0.000	14.044	Jan 2020	0.000		0.000		-		0.000	-	-	-
Requirements Development	WR	NSWC DD : Dahlgren, VA	0.250	0.000		0.000		0.000		-		0.000	-	-	-
Requirements Development	WR	NSWC CD : Bethesda, MD	0.298	0.000		0.000		0.000		-		0.000	-	-	-
Requirements Development	WR	SSC PAC : San Diego, CA	0.240	0.000		0.000		0.000		-		0.000	-	-	-
Requirements Development	WR	NSWC PD : Philadelphia, PA	0.345	0.000		0.000		0.000		-		0.000	-	-	-
Requirements Development	SS/CPFF	JHU APL : Laurel, MD	0.657	0.000		0.000		0.000		-		0.000	-	-	-
Technical Services	TBD	TBD : TBD	0.000	1.020	Jan 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	1.790	15.064		0.000		0.000		-		0.000	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	WR	Various : Various	0.000	3.840	Jan 2020	0.000		0.000		-		0.000	-	-	-
Engineering Support	WR	NSWC DD : Dahlgren, VA	0.230	0.480	Dec 2019	0.000		0.000		-		0.000	-	-	-
Engineering Support	WR	SSC PAC : San Diego, CA	0.240	1.340	Dec 2019	0.000		0.000		-		0.000	-	-	-
Engineering Support	WR	NSWC PD : Philadelphia, PA	0.150	0.180	Dec 2019	0.000		0.000		-		0.000	-	-	-
Engineering Support	SS/CPFF	JHU APL : Laurel, MD	0.080	0.360	Dec 2019	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.700	6.200		0.000		0.000		-		0.000	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*	

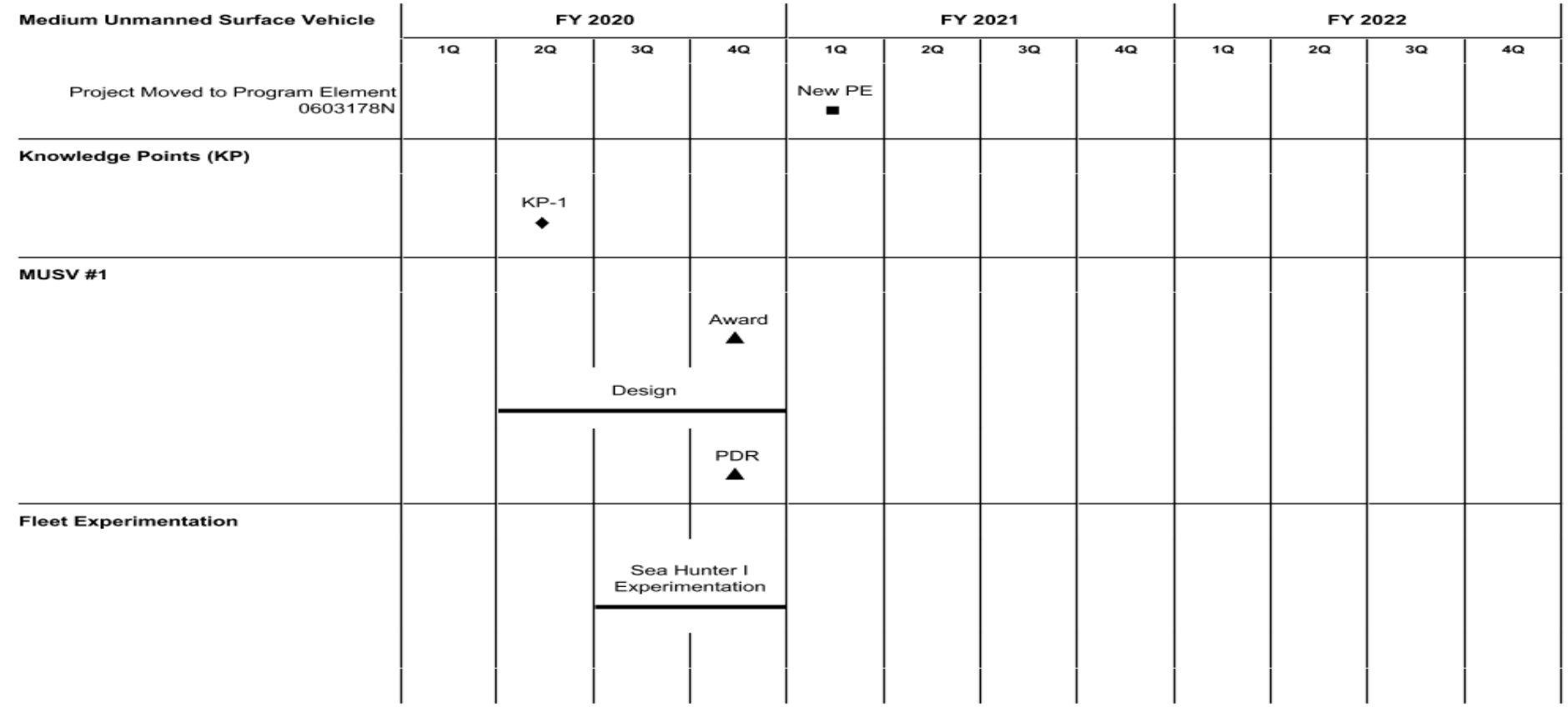
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	Various : Washington, DC	0.200	1.700	Dec 2019	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.200	1.700		0.000		0.000		-		0.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.690	22.964		0.000		0.000		-		0.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*



2022PB - 0603502N - 3428

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Medium Unmanned Surface Vehicle				
Project Moved to Program Element 0603178N: New PE	1	2021	1	2021
Knowledge Points (KP): Knowledge Point 1	2	2020	2	2020
MUSV #1: Contract Award	4	2020	4	2020
MUSV #1: Detail Design	2	2020	4	2020
MUSV #1: Preliminary Design Review (PDR)	4	2020	4	2020
Fleet Experimentation: Sea Hunter I Experimentation	3	2020	4	2020