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 0604029N *I UUV Core Technologies*

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	26.406	41.910	40.060	-	40.060	40.735	48.280	40.196	40.441	Continuing	Continuing
3393: *UxS Autonomy, C2*	0.000	11.869	8.563	4.898	-	4.898	4.058	5.662	5.767	5.880	Continuing	Continuing
3395: *UxS Payloads*	0.000	7.763	16.565	5.911	-	5.911	7.264	11.355	11.582	9.336	Continuing	Continuing
3396: *UxS Endurance*	0.000	6.774	16.782	20.906	-	20.906	19.526	19.590	15.685	19.682	Continuing	Continuing
4053: *UxS Platform*	0.000	0.000	0.000	8.345	-	8.345	9.887	11.673	7.162	5.543	Continuing	Continuing

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Projects moved from PE 0604536N starting in FY 2019. FY 2020 establishes new project descriptions that focus on the key enabling technology areas in support of the entire Family of UUVs.

A. Mission Description and Budget Item Justification

In order to accelerate future capabilities and support steady growth of the Navy's Family of Unmanned Undersea Vehicle (UUVs), UUV Core Technologies will: Drive standardization across the Family of UUVs; Enable Fleet learning and experimentation via Industry involvement and capability demonstrations; Transition mature technologies from the Science and Technology communities and Industry that are aligned to Fleet priorities. This Program Element leverages Office of Naval Research (ONR), Defense Advanced Research Projects Agency (DARPA), and Industry technology development efforts in the key areas of autonomy, communications, command and control (C2), precision navigation endurance and energy, sensors & payloads, payload integration, and host ship/submarine integration and launch and recovery.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	27.483	54.376	52.704	-	52.704
Current President's Budget	26.406	41.910	40.060	-	40.060
Total Adjustments	-1.077	-12.466	-12.644	-	-12.644
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-12.466			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.077	0.000			
• Program Adjustments	0.000	0.000	-12.625	-	-12.625
• Rate/Misc Adjustments	0.000	0.000	-0.019	-	-0.019

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 0604029N *I UUV Core Technologies*

Change Summary Explanation

Program Changes:
FY19- -$1,077K Small Business Innovation Research (SBIR)
FY20 - -$12,466K Project 4053 duplicative effort
FY21 - -$12,625K realignment for core technologies wholeness, -$19K miscellaneous rate adjustments
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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3393 / *UxS Autonomy, C2*	

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
3393: *UxS Autonomy, C2*	0.000	11.869	8.563	4.898	-	4.898	4.058	5.662	5.767	5.880	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Project moved from PE 0604536N starting in FY 2019. Project renamed UxS Autonomy, C2 and precision navigation starting in FY20 (previously titled Adv Undersea Prototyping-Remote Command & Control in FY19 and prior years).

A. Mission Description and Budget Item Justification

The Autonomy and Command and Control (C2) portion of this project funds efforts to develop common standards, interfaces, and systems to support cross-domain (Surface and 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 C2 architectures and interface definitions will be incorporated into near-term and future UUV requests for proposals (RFP) to drive contractor development efforts. The Precision Navigation portion of this project seeks to study and develop innovative undersea navigation capabilities for UUVs. In summary, coordinated autonomy and C2 efforts, coupled with precision navigation solutions, 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.

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	9.639	7.067	4.318	0.000	4.318
Articles:	-	-	-	-	-
FY 2020 Plans: Autonomy: Update standards and Interface Control Documents as needed, and continue Cyber/Safety/ Standards development. Investigate autonomy metrics and tech insertion process. Demonstrate autonomy software integration with a UUV using simulation and in-water test. Continue support of autonomy lab standup. C2: Update models for Common Control System (CCS) software extensions and begin detailed design of CCS implementation into first UUV program. Precision Navigation: Initiate Precision Nav study to identify capability gaps and assess mature technology solutions.					
FY 2021 Base Plans: Autonomy: Continue working with industry to develop the Unmanned Maritime Autonomy Architecture (UMAA) interfaces. The UMAA team will shift into demonstration interfaces on both UUV and USV reference					

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
implementations. Autonomy development will begin and be demonstrated on the reference implementations. This development will be applicable across both UUVs and USVs. Automated Target Recognition (ATR) Warfighting Lab: Provide specific ATR advancements starting with the development of complex modeling and simulation of representative ocean environments to produce synthetic data that can augment actual data. Future years will focus on training of ATR algorithms and in-water demonstration on UUVs. COMMS SME: Commence utilization of navy Subject Matter Expert (SME) support to track S&T communications investments across the Navy as well as manage the standup of the UUV operations center (UOC). Common Control System (CCS): Demonstrate CCS software performing mission planning in both a UUV and USV demonstration. The demonstration will provide risk reduction for the software as it is implemented and delivered on various UxV program contracts. These demonstrations will include extending the software baseline to include vehicle specific functionality. Individual baselines for CCS software will transition to sustainment as they are delivered to the Navy. Precision Nav: Provide support to track and manage Navigation efforts identified in previous studies. The study will lead to additional research investment focused areas for future navigation efforts. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease attributed to conclusion of studies and transition of ICDs into RFPs and vehicle programs.					
Title: Support	1.780	1.194	0.100	0.000	0.100
Articles:	-	-	-	-	-
FY 2020 Plans: Autonomy: Update documentation and continue work to integrate common autonomy standards, interfaces, and systems; support modeling/simulation efforts and test bed development. C2: Update CCS documentation and continue to support development and implementation efforts. Precision Nav: Support study documentation. ***FY 2021 Base Plans:***					

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Funding provides dedicated engineering support to manage Autonomy, C2 and Precision Navigation. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease attributed to conclusion of studies and required support.					
Title: Management Services	0.450	0.302	0.480	0.000	0.480
Articles:	-	-	-	-	-
FY 2020 Plans: Autonomy: Continue guidance, project planning, financial and contracting support, and coordination of common autonomy standards, interfaces, and systems. C2: Continue guidance, project planning, financial and contracting support, and coordination of Common Control System (CCS) analysis and implementation. Precision Nav: Guidance, project planning, financial and contracting support, and coordination of Precision Nav effort. ***FY 2021 Base Plans:*** Provides support for project planning, financial and engineering support in the areas of autonomy, C2 and Precision Navigation. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Slight increase in required management services for program office support.					
Accomplishments/Planned Programs Subtotals	11.869	8.563	4.898	0.000	4.898

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Family of Unmanned Undersea Vehicles (UUVs). UUV Core Technologies will: drive standardization across the Family of UUVs; enable Fleet learning and experimentation via industry involvement and capability demonstrations;

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

and transition mature technologies from the Science and Technology communities and Industry which are aligned to Fleet priorities. The program will leverage existing efforts from the Naval Research and Development Enterprise and will utilize rapid contracting approaches such as the Naval Undersea Warfare Center (NUWC) Newport UUV Family of Systems multi-award Indefinite Delivery Indefinite Quantity contract to facilitate Industry involvement. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. The objective of this project (UxS Autonomy, C2) is to develop requirements and standards, define key interfaces, develop innovative navigation solutions, and mandate compliance to common architecture for Autonomy and Common Control System (CCS) to improve unmanned system capability, reliability and affordability through enabling system modularity, permitting standardized test and evaluation, and enabling cross-platform communication and collaborative mission engagement.

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

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
UUV Operation Center	WR	NUWC KPT : Keyport, WA	0.000	2.000	Dec 2018	2.000	Jan 2020	0.000		-		0.000	Continuing	Continuing	Continuing
Future Capability Studies	WR	Various : Various	0.000	1.635	Dec 2018	0.000		0.000		-		0.000	0.000	1.635	-
Common Control System (CCS) Cross-Domain Architecture Development	Various	Various : Various	0.000	2.653	Dec 2018	1.225	Jan 2020	0.750	Jan 2021	-		0.750	Continuing	Continuing	Continuing
Autonomy Archituture UMAA	Various	Various : Various	0.000	3.351	Dec 2018	3.342	Dec 2019	1.480	Dec 2020	-		1.480	Continuing	Continuing	Continuing
Precision Navigation	Various	Various : Various	0.000	0.000		0.500	Dec 2019	0.000	Dec 2020	-		0.000	Continuing	Continuing	Continuing
UUV COMMS SME	Various	Various : Various	0.000	0.000		0.000		0.500	Dec 2020	-		0.500	0.000	0.500	-
ATR Warfighting Lab	Various	Various : Various	0.000	0.000		0.000		1.588	Dec 2020	-		1.588	0.000	1.588	-
		Subtotal	0.000	9.639		7.067		4.318		-		4.318	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0604536N.

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, C2 and Nav Eng Support	Various	Various : Various	0.000	0.794	Dec 2018	0.000		0.100	Dec 2020	-		0.100	Continuing	Continuing	Continuing
Autonomy Support	Various	NAVSEA Activities : Washington, DC	0.000	0.506	Dec 2018	0.280	Dec 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Common Control System (CCS) Engineering Support	Various	Various : Various	0.000	0.480	Dec 2018	0.250	Dec 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Precision Navigation	Various	Various : Various	0.000	0.000		0.664	Jan 2020	0.000		-		0.000	0.000	0.664	-
		Subtotal	0.000	1.780		1.194		0.100		-		0.100	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0604536N.

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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3393 / *UxS Autonomy, C2*	

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
Energy Prototype	Various	Various : Various	0.000	0.150	Jan 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Autonomy	Various	NAVSEA Activities : Washington, DC	0.000	0.150	Jan 2019	0.115	Dec 2019	0.175	Dec 2020	-		0.175	Continuing	Continuing	Continuing
Common Control System (CCS)	Various	Various : Various	0.000	0.150	Jan 2019	0.115	Feb 2020	0.175	Jan 2021	-		0.175	Continuing	Continuing	Continuing
Precision Navigation	Various	Various : Various	0.000	0.000		0.072	Feb 2020	0.130	Jan 2021	-		0.130	0.000	0.202	-
		Subtotal	0.000	0.450		0.302		0.480		-		0.480	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0604536N.

	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
Project Cost Totals	0.000	11.869		8.563		4.898		-		4.898	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

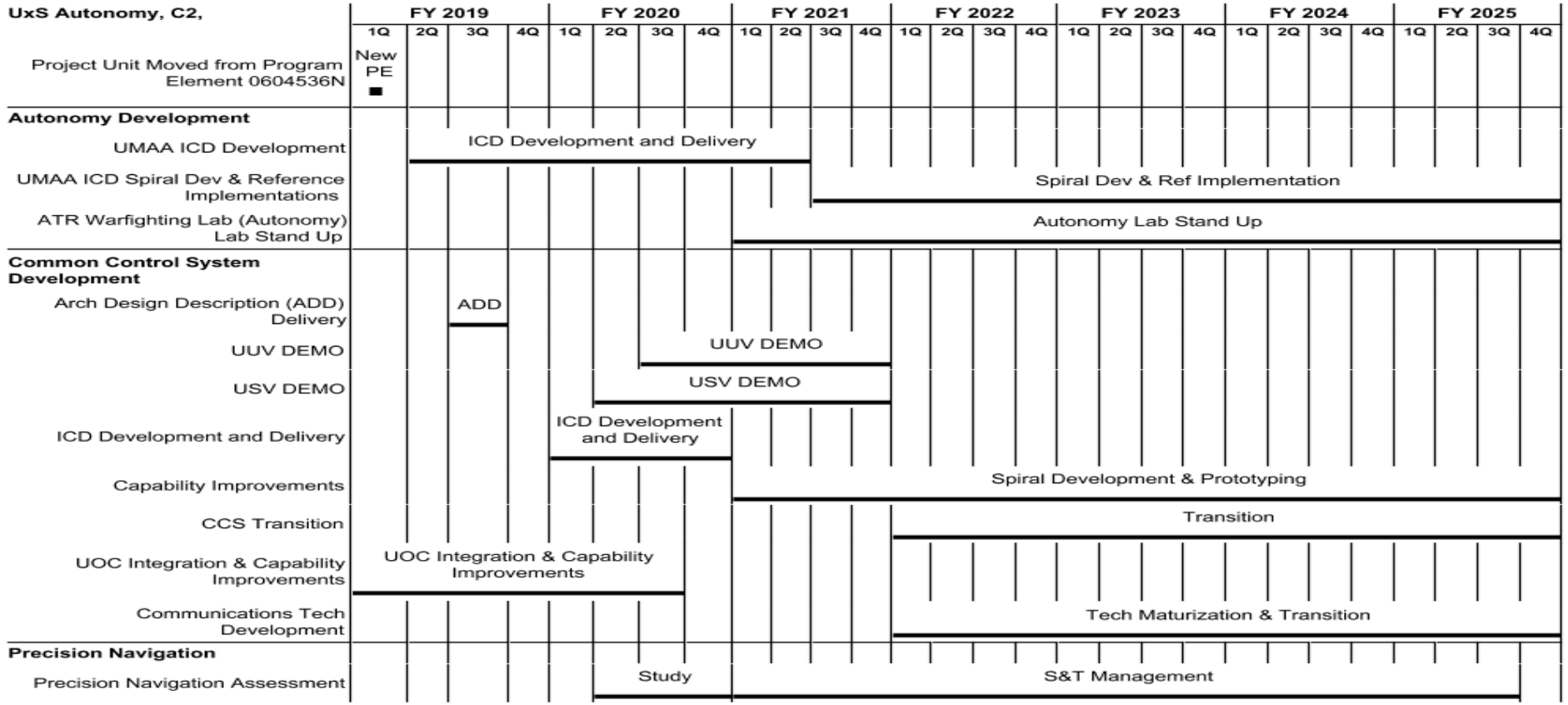

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Autonomy, C2,				
Project Unit Moved from Program Element 0604536N: New PE	1	2019	1	2019
Autonomy Development: UMAA ICD Development: ICD Development	2	2019	2	2021
Autonomy Development: UMAA ICD Spiral Dev & Reference Implementations:	3	2021	4	2025
Autonomy Development: ATR Warfighting Lab (Autonomy) Lab Stand Up:	1	2021	4	2025
Common Control System Development: Arch Design Description (ADD) Delivery:	3	2019	3	2019
Common Control System Development: UUV DEMO: UUV DEMO	3	2020	4	2021
Common Control System Development: USV DEMO: USV DEMO	2	2020	4	2021
Common Control System Development: ICD Development and Delivery:	1	2020	4	2020
Common Control System Development: Capability Improvements:	1	2021	4	2025
Common Control System Development: CCS Transition:	1	2022	4	2025
Common Control System Development: UOC Integration & Capability Improvements:	1	2019	3	2020
Common Control System Development: Communications Tech Development:	1	2022	4	2025
Precision Navigation: Precision Navigation Assessment: Study	2	2020	4	2020
Precision Navigation: Precision Navigation Assessment: S&T Management	1	2021	3	2025

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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3395 / *UxS Payloads*	

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
3395: *UxS Payloads*	0.000	7.763	16.565	5.911	-	5.911	7.264	11.355	11.582	9.336	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Projects moved from PE 0604536N starting in FY 2019. Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

A. Mission Description and Budget Item Justification

Funding supports advanced prototyping, integration, and demonstration of undersea payloads initially with Extra Large Unmanned Undersea Vehicles (XLUUV) class vehicles, and then eventually with Large, Medium, and Small UUVs in the Family of UUVs. These efforts leverage developments at the Office of Naval Research (ONR), Defense Advanced Research Project Agency (DARPA), Industry, and other activities for UUV payloads, and work to complete analysis of feasibility, policy, lethality and performance of integrating undersea sensor and weapons systems. The program will design new hardware, investigate and develop new interfaces/systems to increase lethality in both undersea and surface targets and investigate the possibilities of employing non-lethal payloads and other sensor systems across the Family of UUVs, as applicable.

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	6.472	13.749	5.121	0.000	5.121
Articles:	-	-	-	-	-
FY 2020 Plans: Hold Technical Reviews for XLUUV advanced payload. Procure materials and fabricate prototypes. Refine Concepts of Operations (CONOPS) for demonstrations, finalize Interface Control Documents (ICDs) and continue ICD delivery, and continue payload autonomy software development. Initiate Automated Target Recognition (ATR) maturation efforts. Begin transition of energy and communications payload from ONR. Perform payload interface development of classified payloads for Medium UUVs.					
FY 2021 Base Plans: Support Payload Integration Group (PIG) - subject matter experts chartered with management of payload interfaces and supporting various payload developers. This work includes development of processes for approval of payloads on-board vehicles. Continue transition of Office of Naval Research (ONR) Future Naval Capability (FNC) effort.					

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Continue payload efforts for Medium UUVs, including miniaturization of advanced payloads. Continue interface development and integration of prototypes for classified payloads for Medium UUVs, including miniaturization of advanced sensing and communications payloads. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease attributed to ramp down and conclusion of XLUUV payload assessments.					
Title: Support	0.991	2.153	0.200	0.000	0.200
Articles:	-	-	-	-	-
FY 2020 Plans: Support XLUUV and medium UUV payload efforts. Payload Integration Group continues to guide and support standard interface development and assists in technology integration. Provide technical support for ATR development. ***FY 2021 Base Plans:*** Support Medium UUV and remaining XLUUV payload efforts. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease attributed to ramp down of XLUUV efforts.					
Title: Management Services	0.300	0.663	0.590	0.000	0.590
Articles:	-	-	-	-	-
FY 2020 Plans: Continue guidance, project planning, financial and contracting support, and coordination for evaluation and integration of payloads. ***FY 2021 Base Plans:*** Continue guidance, project planning, financial and contracting support, and coordination for evaluation and integration of payloads. ***FY 2021 OCO Plans:***					

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

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 attributed to ramp down of XLUUV efforts.					
Accomplishments/Planned Programs Subtotals	7.763	16.565	5.911	0.000	5.911

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Family of Unmanned Undersea Vehicles (UUVs). UUV Core Technologies will: drive standardization across the Family of UUVs; enable Fleet learning and experimentation via Industry involvement and capability demonstrations; and transition mature technologies from the Science and Technology communities and Industry which are aligned to Fleet priorities. The program will leverage existing efforts from the Naval Research and Development Enterprise and will utilize rapid contracting approaches such as the Naval Undersea Warfare Center (NUWC) Newport UUV Family of Systems multi-award Indefinite Delivery Indefinite Quantity contract to facilitate Industry involvement. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. The objective of this project (UxS Payloads) is to evaluate, mature, and integrate advanced, innovative payloads onto UUVs to improve warfighting capabilities. Payloads are defined by Navy Fleet capability needs and are developed by leveraging modular designs through collaborative efforts with Industry, ONR, DARPA, and the entire Naval Research and Development Enterprise. A Payload Integration Group (PIG) will define Government-owned interfaces to ensure efficient and affordable payload integration across the Family of UUVs to support interoperable, innovative solutions. Initial payloads will be integrated and demonstrated on the Extra Large Unmanned Undersea Vehicle (XLUUV) and then be developed for integration into other applicable Family of UUVs after they are demonstrated successfully.

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

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
Payload Interface Design	C/CPIF	Various : Various	0.000	4.083	Jan 2019	4.100	Dec 2019	1.121	Dec 2020	-		1.121	0.000	9.304	-
Command and Control	WR	Various : Various	0.000	1.609	Dec 2018	0.000		0.000		-		0.000	0.000	1.609	-
Safety	WR	Various : Various	0.000	0.780	Jan 2019	0.624	Jan 2020	0.000		-		0.000	0.000	1.404	-
Automatic Target Recognition	WR	Various : Various	0.000	0.000		3.000	Jan 2020	0.000		-		0.000	Continuing	Continuing	Continuing
Medium Vehicle Payload Development	WR	Various : Various	0.000	0.000		3.025	Dec 2019	1.000	Dec 2020	-		1.000	Continuing	Continuing	Continuing
ONR FNC Project	WR	Various : Various	0.000	0.000		3.000	Dec 2019	3.000	Dec 2020	-		3.000	Continuing	Continuing	Continuing
Payload B	WR	PSUARL : PSUARL	0.000	0.000		0.000		0.000	Dec 2020	-		0.000	0.000	0.000	-
		Subtotal	0.000	6.472		13.749		5.121		-		5.121	Continuing	Continuing	N/A

Remarks

Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

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
Technical Support	WR	Various : Various	0.000	0.991	Dec 2019	0.200	Feb 2020	0.200	Dec 2020	-		0.200	Continuing	Continuing	Continuing
Payload Integration Group	Various	Various : Various	0.000	0.000		1.000	Dec 2019	0.000	Dec 2020	-		0.000	Continuing	Continuing	Continuing
Engineering Support	Various	Various : Various	0.000	0.000		0.600	Nov 2019	0.000	Nov 2020	-		0.000	Continuing	Continuing	Continuing
Integrated Logistic Support	Various	Various : Various	0.000	0.000		0.353	Nov 2019	0.000	Nov 2020	-		0.000	Continuing	Continuing	Continuing
		Subtotal	0.000	0.991		2.153		0.200		-		0.200	Continuing	Continuing	N/A

Remarks

Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3395 / *UxS Payloads*	

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 & Management Support	WR	Various : Various	0.000	0.300	Nov 2018	0.663	Dec 2019	0.590	Dec 2020	-		0.590	Continuing	Continuing	Continuing
		Subtotal	0.000	0.300		0.663		0.590		-		0.590	Continuing	Continuing	N/A

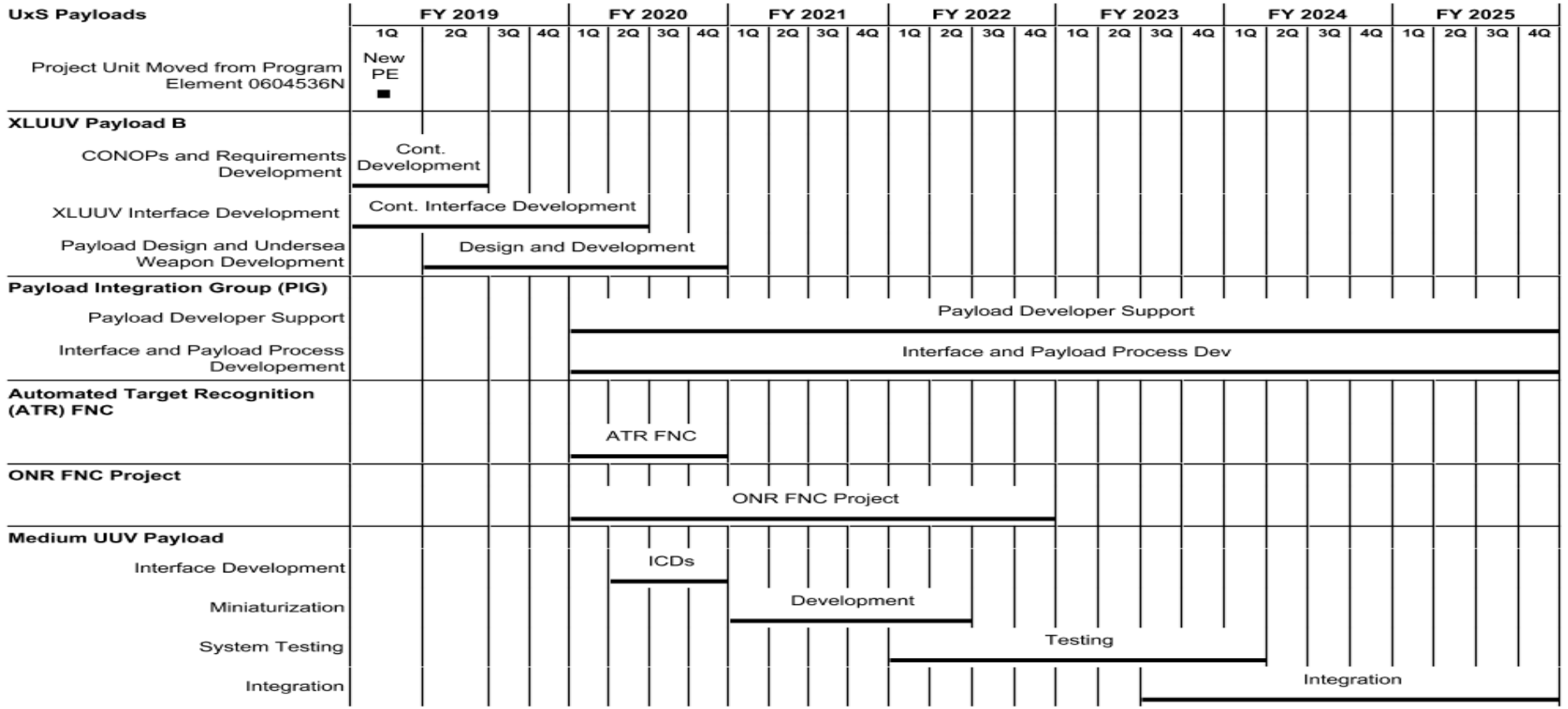
Remarks

Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

	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	7.763		16.565		5.911		-		5.911	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*



2021PB - 0604029N - 3395

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Payloads				
Project Unit Moved from Program Element 0604536N: New PE	1	2019	1	2019
XLUUV Payload B: CONOPs and Requirements Development: CONOPs and Requirements	1	2019	2	2019
XLUUV Payload B: XLUUV Interface Development: Schedule Detail	1	2019	2	2020
XLUUV Payload B: Payload Design and Undersea Weapon Development: Phase A concept design- XL UUV Interface development	2	2019	4	2020
Payload Integration Group (PIG): Payload Developer Support: Payload Developer Support	1	2020	4	2025
Payload Integration Group (PIG): Interface and Payload Process Developement: Interface and Payload Process Developement	1	2020	4	2025
Automated Target Recognition (ATR) FNC: ATR Development	1	2020	4	2020
ONR FNC Project: ONR FNC Project	1	2020	4	2022
Medium UUV Payload: Interface Development: ICDs	2	2020	4	2020
Medium UUV Payload: Miniaturization: Development	1	2021	2	2022
Medium UUV Payload: System Testing: Testing	1	2022	1	2024
Medium UUV Payload: Integration: Integration	3	2023	4	2025

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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3396 / *UxS Endurance*	

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
3396: *UxS Endurance*	0.000	6.774	16.782	20.906	-	20.906	19.526	19.590	15.685	19.682	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Project moved from PE 0604536N starting in FY 2019. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY 2019 and prior years).

A. Mission Description and Budget Item Justification

Advanced undersea energy efforts leverage existing independent research and development of energy-dense systems to meet future power requirements for Family of Unmanned Undersea Vehicle (UUV) missions, which are limited by both constraints imposed by the operational environment and the amount of power that can be carried. Efforts under this project include research, development, test, and evaluation of advanced energy solutions. Energy development and transition efforts are applicable to all classes of UUVs for increased endurance and efficiency to extend the reach of unmanned undersea systems. Parallel efforts include development and certification of safe, reliable, high energy density Lithium Ion (Li-Ion) batteries to enable both safe operation and UUV integration onboard host ships and submarines.

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	6.699	13.929	18.530	0.000	18.530
Articles:	-	-	-	-	-

FY 2020 Plans:

Execute submarine integration for Li-Ion batteries, including full certification and testing. Commence modeling and simulation and testing of Li-Ion battery and battery management systems to evaluate performance and system safety. Begin cell selection and screening to include requirements/ICD development and quality assurance processes. Release Request for Information (RFI) to identify facilities that could safely screen and/or secure large quantities of lithium ion cells. Certify and integrate a propagation resistant Li-Ion battery system for use on submarine deployed Large Displacement Unmanned Undersea Vehicle (LDUUV).

FY 2021 Base Plans:

Continue transition efforts as a high-density, by-class UUV energy solution, including vehicle integration development
efforts and initial testing. Continue advanced aluminum technology development and integration efforts for XLUUV
systems. Continue modeling and simulation of advanced energy technologies for XLUUV. Continuation of propagation

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
resistant Li-Ion cells effort (i.e., battery architecture, Battery Management System (BMS) design, testing, fabrication. Release Request for Proposal (RFP) for potential Quality Assurance/Quality Control (QA/QC) facilities (government and industry) based off Request for Information (RFI) feedback and down select eligible candidates. Continue cell selection and evaluation to include requirements/ICD development and quality assurance processes. The UUV Operations Center (UOC) provides planning, operational over-watch, reach-back, and command and control capabilities for the family of UUVs and serves as a test-bed environment for continuous experimentation, integration, verification, and training for the S&T and operational communities. Initial planning and standup of the UOC was previously performed in PU 3393. Starting in FY21, this activity will be budgeted for in this project. Complete multiple cyber accreditation packages under Risk Management Framework (RMF) to achieve multiple Authority to Operate (ATO) approvals across different security enclaves (Unclassified and Top Secret Networks) for both operational and test bed environments. Maintain existing computing environment and RMF cyber security accreditations (Secret Network). Integrate fleet identified high-priority data feeds from external systems and data producers into the UOC for use in mission planning and execution. Complete initial demonstration of UUV common command and control system prototype. Complete initial platform integration testing with Orca and Snakehead systems. Support missions opportunities as required for Unmanned Undersea Vehicle Squadron ONE (UUVRON-1) ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase attributed to the design and development of propagation resistant Li-Ion batteries and supporting infrastructure as well as the shift of the UUV Operation Center standup and integration activities into this project (previously PU 3393).					
Title: Support	0.075	2.182	1.386	0.000	1.386
Articles:	-	-	-	-	-
FY 2020 Plans: Continue integration and related certification efforts of Li-Ion battery assets. Continue fuel cell effort support. ***FY 2021 Base Plans:***					

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Continue integration and related certification efforts of Li-Ion battery assets. Continue UUV Operation Center Management. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decreased due to reducing Advanced Energy Support (Aluminum Water) activities in FY21.					
Title: Management Services ***Articles:*** ***FY 2020 Plans:*** Provide guidance, project planning, financial and contracting support, and coordination for energy system evaluation and integration. ***FY 2021 Base Plans:*** Provide guidance, project planning, financial and contracting support, and coordination for Li Ion and UUV Operation Center Activities. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Slight increase due to additional financial and planning management services for new Li Ion efforts.	0.000 -	0.671 -	0.990 -	0.000 -	0.990 -
Accomplishments/Planned Programs Subtotals	6.774	16.782	20.906	0.000	20.906

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Family of Unmanned Undersea Vehicles (UUVs). UUV Core Technologies will: drive standardization across the Family of UUVs; enable Fleet learning and experimentation via industry involvement and capability demonstrations; and transition mature technologies from the Science and Technology communities and Industry which are aligned to Fleet priorities. The program will leverage existing efforts from the Naval Research and Development Enterprise and will utilize rapid contracting approaches such as the Naval Undersea Warfare Center (NUWC) Newport UUV Family of Systems multi-award Indefinite Delivery Indefinite Quantity contract to facilitate Industry involvement. Coordination with UxS platforms will

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. The objective of this project (UxS Endurance) is to mature advanced energy systems developed by Industry, National Aeronautics and Space Administration (NASA), ONR, DARPA, and the Naval Research and Development Enterprise, and integrate into UUVs for increased endurance, power, and reach; and develop safe, reliable battery solutions, including Li-Ion technologies, on UUVs for integration onto host surface ships and submarines.

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

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
Li-Ion Battery Certification	WR	NUWC : Newport, RI	0.000	6.699	Nov 2018	0.000	Dec 2019	0.000	Dec 2020	-		0.000	Continuing	Continuing	Continuing
XL Advanced Energy	TBD	Various : Various	0.000	0.000		5.000	Dec 2019	1.100	Dec 2020	-		1.100	0.000	6.100	-
Propagation Resistant Li-Ion Battery	TBD	Various : Various	0.000	0.000		3.034	Dec 2019	8.330	Dec 2020	-		8.330	0.000	11.364	-
UUV Operations Center (UOC)	TBD	Various : Various	0.000	0.000		5.895	Dec 2019	2.500	Dec 2020	-		2.500	0.000	8.395	-
Li-Ion Battery Screening/ Warehousing	WR	NSWC Crane : Crane, Indiana	0.000	0.000		0.000		6.600	Dec 2020	-		6.600	0.000	6.600	-
		Subtotal	0.000	6.699		13.929		18.530		-		18.530	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY19 and prior years).

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
Program Support	C/FFP	various : Arlington, VA	0.000	0.075	Nov 2018	1.082	Jan 2020	1.386	Dec 2020	-		1.386	Continuing	Continuing	Continuing
Design Analysis	WR	NRL : Washington, DC	0.000	0.000		1.100	Dec 2020	0.000		-		0.000	0.000	1.100	-
		Subtotal	0.000	0.075		2.182		1.386		-		1.386	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY19 and prior years).

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 Task	Various	Various : Various	0.000	0.000		0.671	Dec 2019	0.990	Dec 2020	-		0.990	0.000	1.661	-

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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3396 / *UxS Endurance*	

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		0.671		0.990		-		0.990	0.000	1.661	N/A

Remarks

FY 2018 and prior funding under PE 0604536N.

	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	6.774		16.782		20.906		-		20.906	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

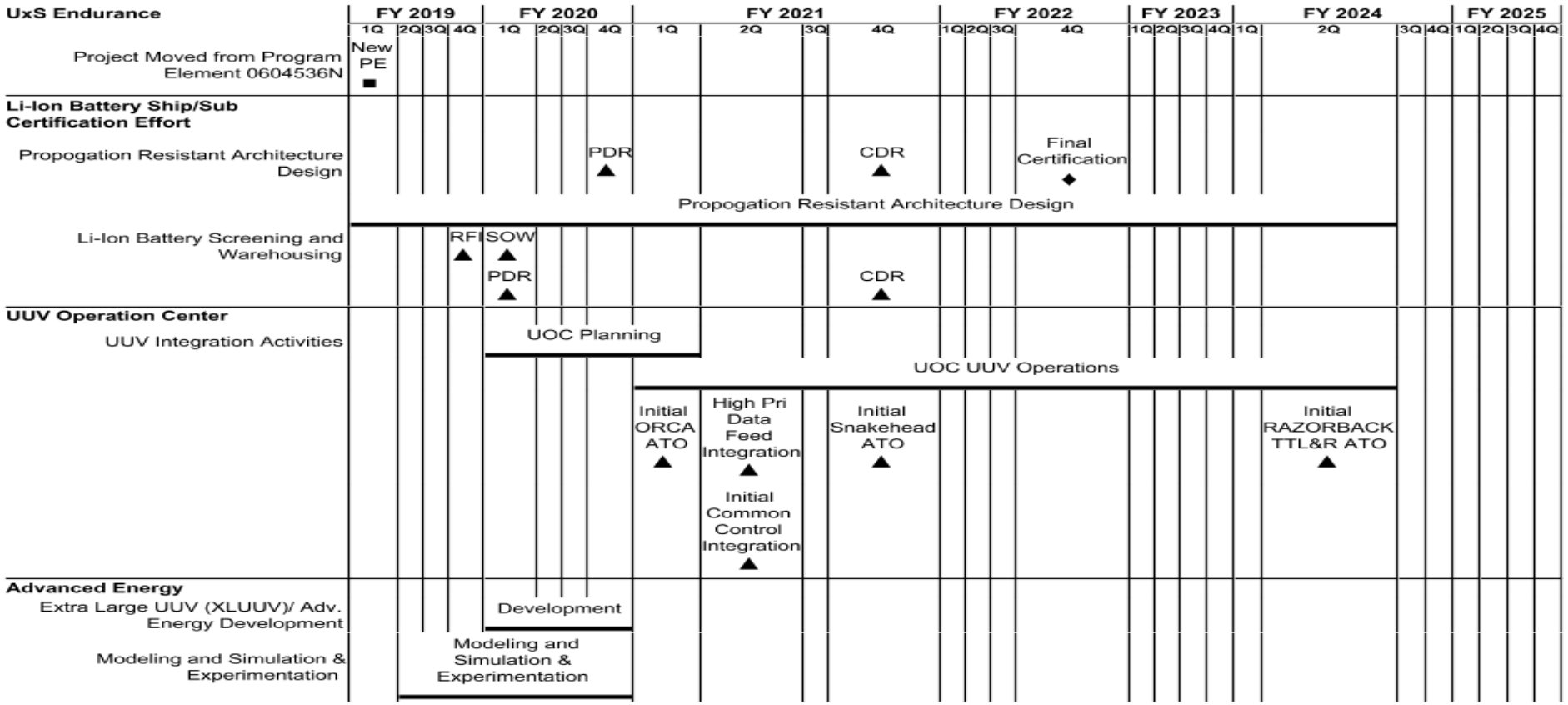


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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Endurance				
Project Moved from Program Element 0604536N:	1	2019	1	2019
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Preliminary Design Review	4	2020	4	2020
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Critical Design Review	4	2021	4	2021
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Final Certification	4	2022	4	2022
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design:	1	2019	2	2024
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Request for Information (RFI)	4	2019	4	2019
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Statement of Work (SOW)	1	2020	1	2020
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Preliminary Design Review	1	2020	1	2020
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Critical Design Review	4	2021	4	2021
UUV Operation Center: UUV Integration Activities: UOC Planning	1	2020	1	2021
UUV Operation Center: UUV Integration Activities: UOC UUV Operations	1	2021	2	2024
UUV Operation Center: UUV Integration Activities: Initial ORCA ATO	1	2021	1	2021
UUV Operation Center: UUV Integration Activities: Initial Snakehead ATO	4	2021	4	2021
UUV Operation Center: UUV Integration Activities: Initial RAZORBACK TTL&R ATO	2	2024	2	2024
UUV Operation Center: UUV Integration Activities: High Pri Data Feed Integration	2	2021	2	2021
UUV Operation Center: UUV Integration Activities: Initial Common Control Integration	2	2021	2	2021
Advanced Energy: Extra Large UUV (XLUUV)/ Adv. Energy Development:	1	2020	4	2020

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Advanced Energy: Modeling and Simulation & Experimentation:	2	2019	4	2020

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 0604029N / *UUV Core Technologies*	Project (Number/Name) 4053 / *UxS Platform*	

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
4053: *UxS Platform*	0.000	0.000	0.000	8.345	-	8.345	9.887	11.673	7.162	5.543	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

UxS Platform is a continuation of two FY19 UUV Core Technologies efforts from PE 0604029N and was planned to transition to PU 4053 beginning in FY20, however it received a Congressional mark of $12.466M resulting in no funding in FY20

A. Mission Description and Budget Item Justification

This is the sole project unit that enables deployment of operationally relevant Unmanned Undersea Vehicles (UUVs) from submarines.

UxS (Unmanned Systems) Platform is a submarine integration program that delivers rapid innovative research and development prototype efforts for deployable and/or retrievable undersea vehicles from submarines. This includes Subsea & Seabed Warfare (SSW) concepts, offboard systems, and Rapid Fielding Temporary Alterations (RF TEMPALT) for submarines & other platforms. In addition to research and development, the program will support engineering and integration of new and mature technologies to enable rapid prototyping and fielding of capabilities. This will lower the cost risks of incorporating new technologies prior to acquisition and provide rapid solutions to urgent war-fighter needs. Experimentations will be conducted with the Fleet (i.e., Commander, Naval Submarine Forces (COMSUBFOR), Unmanned Undersea Vehicle Squadron One (UUVRON ONE), etc.), enabling an agile environment through at-sea demonstrations, which will provide Fleet and acquisition stakeholders with relevant payload and vehicle employment data to inform Concepts of Operations (CONOPs)and fielding decisions using platforms of opportunity. The program will support transition of high-interest SSW systems from research and development to Programs of Record (PoRs), as appropriate. UxS Platform is comprised of Rapid Innovative R&D Prototype Initiatives, RF TEMPALTs and host platform integration.

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	7.966	0.000	7.966
Articles:	-	-	-	-	-
Description: Rapid Innovative R&D Prototype Initiatives is the development and/or prototyping of rapid technologies efforts that can be incorporated quickly into submarines/vehicles to enhance Fleet capability and operational relevance of UUVs. Initiatives will be determined by senior Navy leadership. All initiatives will be demonstrated to provide proof of concept before transitioning to a Program of Record (POR). Rapid Fielding Temporary Alterations (RF TEMPALTs) is the accelerated technical approval process that will support undersea rapid capability demonstrations (non-tactical) and tactical deployment of unmanned systems from host submarine platforms.					

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
SSW mission packages will develop vehicle interface standards to include potential hardware for all known UUVs/Remotely Operated Vehicles (ROV)s to enable streamlined development, training and vehicle reconfiguration. This includes development and implementation plans to test, analyze and integrate required SSW mission package(s) for relevant submarine operations to inform future certification into vehicle PoRs ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Initiate preliminary study to certify the use of NASA 18650 Li-Ion batteries on board a host platform. The program will also include the initiation of submarine (SSN) launch and recovery efforts for small and medium UUVs. Establish TEMPALT Coordination Activity (TCA) and databases for the Rapid Fielding TEMPALT process. Initiate submarine data exfiltration from UUVs development effort. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A					
Title: Management Services ***Articles:***	0.000 -	0.000 -	0.379 -	0.000 -	0.379 -
FY 2020 Plans: N/A ***FY 2021 Base Plans:*** - Provide guidance, project planning, financial and contracting support, and coordination for development of prototype efforts for deployable and retrievable UUVs and payload concepts. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A					
Accomplishments/Planned Programs Subtotals	0.000	0.000	8.345	0.000	8.345

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

UxS Platform is a program that leverages government laboratories, field activities, and industry to enable research and development efforts in support of technology and system development, manufacture, testing, and fielding on submarine host platforms. Engagement with industry will support development of R&D products for enhanced submarine capability via competitively awarded contracts and sole source Concept Formulation (CONFORM) contracts. These contracting vehicles will facilitate requirements development, prototype development, and prototype production support to allow rapid integration of UUVs into submarines. Projects and technology capability solutions will transition for inclusion into
existing ship baselines or initiation as new POR capabilities.

UxS Platform will coordinate with other UUV Core Technology project units to ensure all efforts are accelerating future capabilities, supporting steady growth of the Navy's Family of UUVs, ensuring efforts are not duplicative, encouraging innovation, and improving coordination of unmanned systems across multiple domains.

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

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
Product Development	WR	NUWC NPT : Newport, RI	0.000	0.000		0.000		1.100	Oct 2020	-		1.100	Continuing	Continuing	Continuing
Product Development	WR	NUWC KPT : Keyport, WA	0.000	0.000		0.000		1.584	Oct 2020	-		1.584	Continuing	Continuing	Continuing
Product Development	WR	NSWC CD : West Bethesda, MD	0.000	0.000		0.000		0.467	Nov 2020	-		0.467	Continuing	Continuing	Continuing
Product Development	FFRDC	ARL/UT : Austin, TX	0.000	0.000		0.000		1.500	Nov 2020	-		1.500	Continuing	Continuing	Continuing
Product Development	WR	PSNS : Bremerton, WA	0.000	0.000		0.000		0.200	Nov 2020	-		0.200	Continuing	Continuing	Continuing
Product Development	WR	PNSY : Portsmouth NH	0.000	0.000		0.000		0.820	Nov 2020	-		0.820	Continuing	Continuing	Continuing
Product Development	C/CPAF	Leidos : Reston, VA	0.000	0.000		0.000		1.383	Nov 2020	-		1.383	Continuing	Continuing	Continuing
Product Development	C/CPAF	L3 : New River, MA	0.000	0.000		0.000		0.912	Nov 2020	-		0.912	0.000	0.912	-
		Subtotal	0.000	0.000		0.000		7.966		-		7.966	Continuing	Continuing	N/A

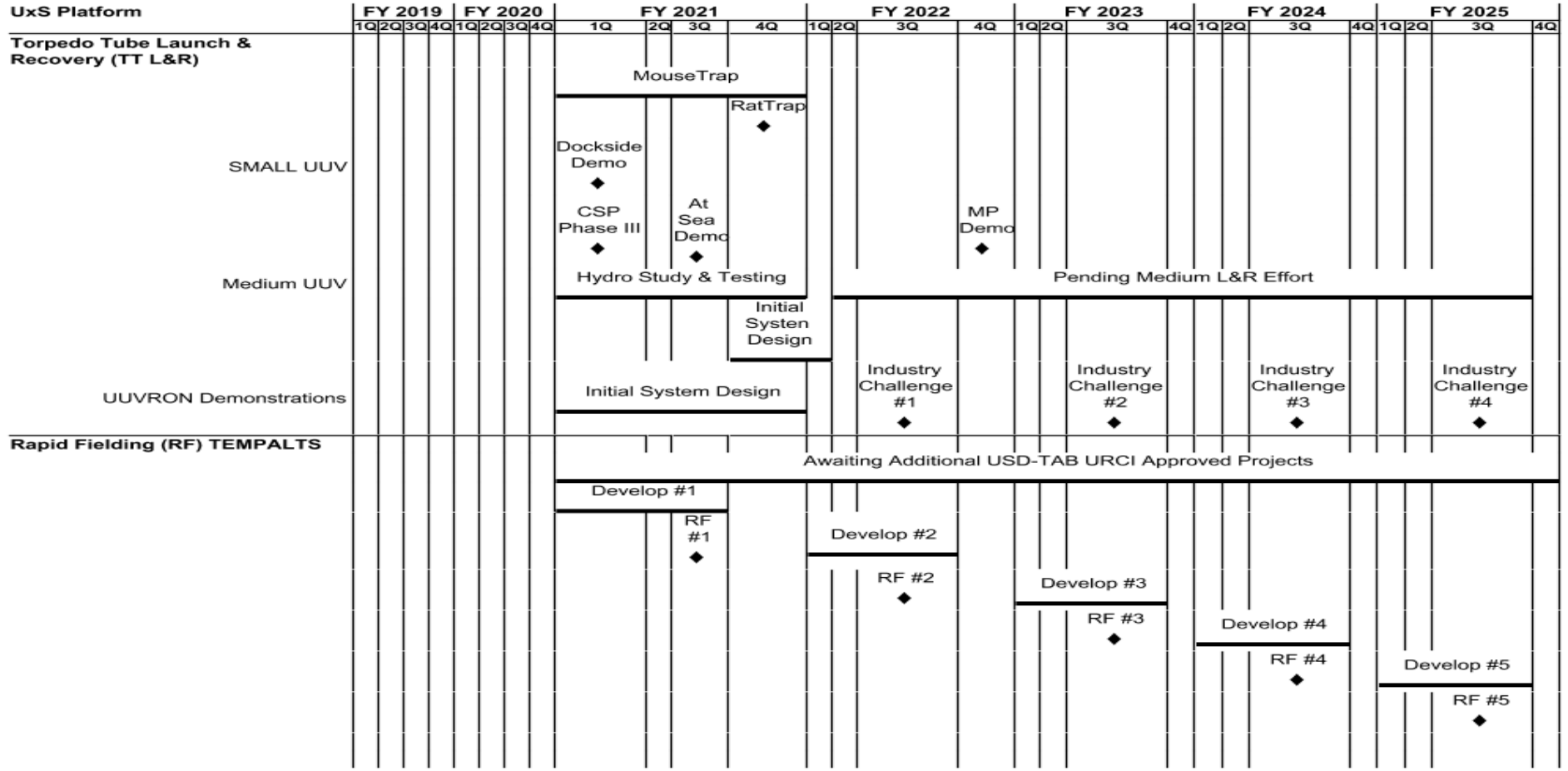
Management Services ($ in Millions)

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	Various : Various	0.000	0.000		0.000		0.379	Dec 2020	-		0.379	0.000	0.379	-
		Subtotal	0.000	0.000		0.000		0.379		-		0.379	0.000	0.379	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		8.345		-		8.345	Continuing	Continuing	N/A

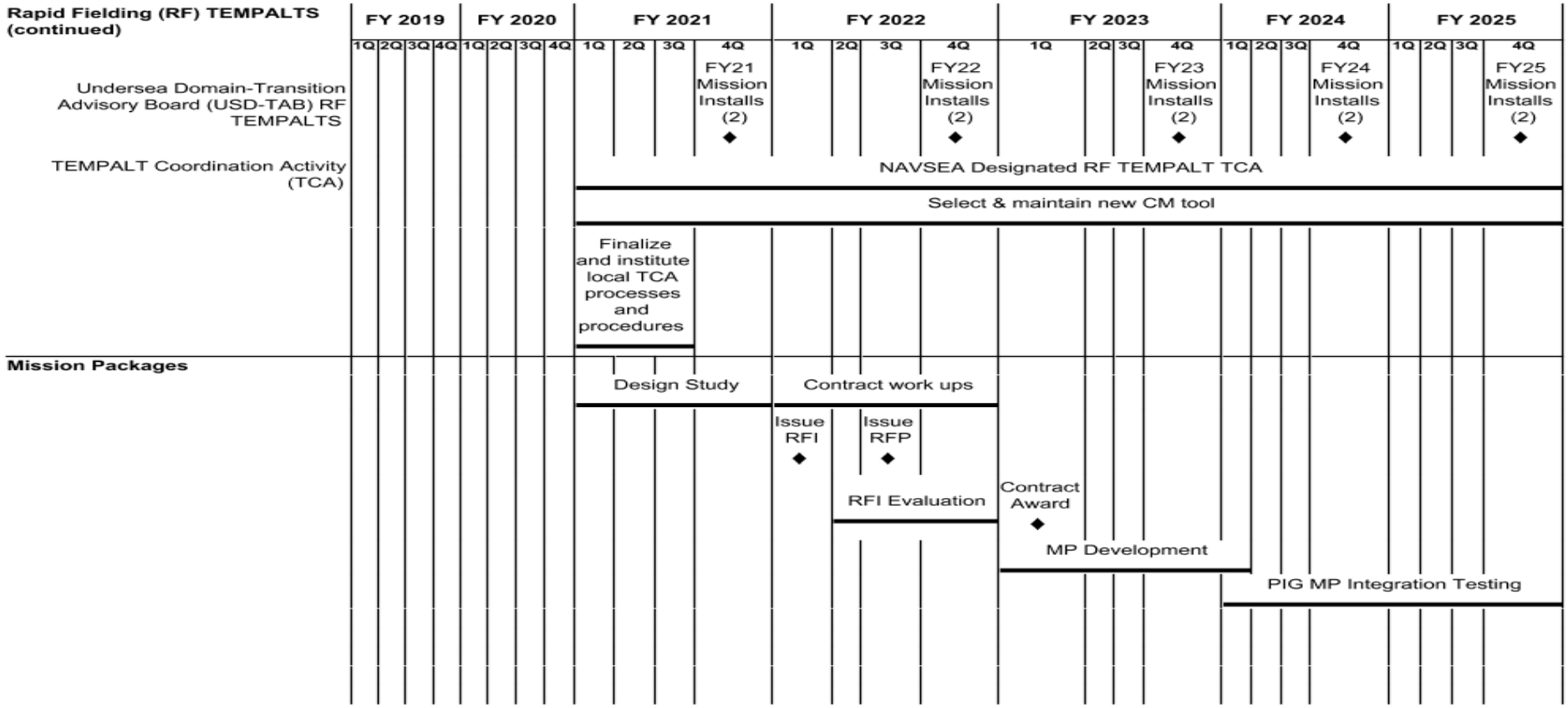
Remarks

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*



2021PB - 0604029N - 4053

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*



2021PB - 0604029N - 4053

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Platform				
Torpedo Tube Launch & Recovery (TT L&R): MouseTrap	1	2021	4	2021
Torpedo Tube Launch & Recovery (TT L&R): RatTrap	4	2021	4	2021
Torpedo Tube Launch & Recovery (TT L&R): SMALL UUV: Dockside Demo	1	2021	1	2021
Torpedo Tube Launch & Recovery (TT L&R): SMALL UUV: CSP Phase III	1	2021	1	2021
Torpedo Tube Launch & Recovery (TT L&R): SMALL UUV: Mission Package (MP) Demonstration	4	2022	4	2022
Torpedo Tube Launch & Recovery (TT L&R): SMALL UUV: At Sea Demo	3	2021	3	2021
Torpedo Tube Launch & Recovery (TT L&R): Medium UUV: Hydro Study & Testing	1	2021	4	2021
Torpedo Tube Launch & Recovery (TT L&R): Medium UUV: Pending Medium L&R Effort Based off FY19 Results	2	2022	3	2025
Torpedo Tube Launch & Recovery (TT L&R): Medium UUV: Initial System Design	4	2021	1	2022
Torpedo Tube Launch & Recovery (TT L&R): UUVRON Demonstrations: Industry Challenge Work up	1	2021	4	2021
Torpedo Tube Launch & Recovery (TT L&R): UUVRON Demonstrations: Industry Challenge #1	3	2022	3	2022
Torpedo Tube Launch & Recovery (TT L&R): UUVRON Demonstrations: Industry Challenge #2	3	2023	3	2023
Torpedo Tube Launch & Recovery (TT L&R): UUVRON Demonstrations: Industry Challenge #3	3	2024	3	2024
Torpedo Tube Launch & Recovery (TT L&R): UUVRON Demonstrations: Industry Challenge #4	3	2025	3	2025
Rapid Fielding (RF) TEMPALTS: Awaiting Additional USD-TAB URCI Approved Projects	1	2021	4	2025
Rapid Fielding (RF) TEMPALTS: Development #1	1	2021	3	2021

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Rapid Fielding (RF) TEMPALTS: RF Approval #1	3	2021	3	2021
Rapid Fielding (RF) TEMPALTS: Development #2	1	2022	3	2022
Rapid Fielding (RF) TEMPALTS: RF Approval #2	3	2022	3	2022
Rapid Fielding (RF) TEMPALTS: Development #3	1	2023	3	2023
Rapid Fielding (RF) TEMPALTS: RF Approval #3	3	2023	3	2023
Rapid Fielding (RF) TEMPALTS: Development #4	1	2024	3	2024
Rapid Fielding (RF) TEMPALTS: RF Approval #4	3	2024	3	2024
Rapid Fielding (RF) TEMPALTS: Development #5	1	2025	3	2025
Rapid Fielding (RF) TEMPALTS: RF Approval #5	3	2025	3	2025
Rapid Fielding (RF) TEMPALTS (continued)				
Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY21 Mission Installations (2)	4	2021	4	2021
Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY22 Mission Installations (2)	4	2022	4	2022
Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY23 Mission Installations (2)	4	2023	4	2023
Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY24 Mission Installations (2)	4	2024	4	2024
Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY25 Mission Installations (2)	4	2025	4	2025
TEMPALT Coordination Activity (TCA): NAVSEA Designated RF TEMPALT TCA w/ limited technical authority	1	2021	4	2025
TEMPALT Coordination Activity (TCA): Select and maintain new CM tool	1	2021	4	2025
TEMPALT Coordination Activity (TCA): Finalize and institute local TCA processes and procedures	1	2021	3	2021
Mission Packages: Design Study	1	2021	4	2021
Mission Packages: Contract work ups	1	2022	4	2022
Mission Packages: Issue RFI	1	2022	1	2022

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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Mission Packages: Issue RFP	3	2022	3	2022
Mission Packages: RFI Evaluation	2	2022	4	2022
Mission Packages: Contract Award	1	2023	1	2023
Mission Packages: Mission Package Development	1	2023	1	2024
Mission Packages: Payload Integration Group (PIG) Mission Package Integration Testing	1	2024	4	2025