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 0604029N *I UUV Core Technologies*

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	26.406	40.400	39.882	59.299	-	59.299	-	-	-	-	-	-
3393: *UxS Autonomy, C2*	11.869	8.359	4.876	26.285	-	26.285	-	-	-	-	-	-
3395: *UxS Payloads*	7.763	15.916	5.885	7.220	-	7.220	-	-	-	-	-	-
3396: *UxS Endurance*	6.774	16.125	20.813	14.792	-	14.792	-	-	-	-	-	-
4053: *UxS Platform*	0.000	0.000	8.308	11.002	-	11.002	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

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, and 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	41.910	40.060	40.735	-	40.735
Current President's Budget	40.400	39.882	59.299	-	59.299
Total Adjustments	-1.510	-0.178	18.564	-	18.564
• Congressional General Reductions	-	-0.178			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.510	0.000			
• Program Adjustments	0.000	0.000	19.316	-	19.316
• Rate/Misc Adjustments	0.000	0.000	-0.752	-	-0.752

Change Summary Explanation

Program Changes:
FY20: -$1,510K Small Business Innovative Research (SBIR) adjustment
FY21: -$178K Congressional Undistributed Reduction - Excess to Need

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 0604029N *I UUV Core Technologies*

FY22: +$11,793K Establishment of Undersea Constellation; +$6,323K Rapid Autonomy Integration Lab (RAIL) for UxVs; +$1,200K Mine Countermeasures Urgent Operational Need Funding; -$752K Other Rate/Misc Adjustments

Technical: Not applicable.

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

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
3393: *UxS Autonomy, C2*	11.869	8.359	4.876	26.285	-	26.285	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Significant changes for FY22 include requests for the continued standup of Rapid Autonomy Integration Lab (RAIL), Undersea Constellation (UC) efforts, and the addition of the UUV Operation Center.

A. Mission Description and Budget Item Justification

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. The Autonomy and Command and Control (C2) portion of this project funds efforts to develop common standards, interfaces, and systems to support cross-domain applications. These efforts include advanced development, prototyping and demonstrations to accelerate the design and development of system commonality and interoperability for the cross-domain (Surface and Sub-Surface, Aviation and Ground) 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 Rapid Autonomy Integration Lab provides the infrastructure, tools, and processes to develop, test, certify, and deploy new and updated autonomous capabilities to vehicles. The Precision Navigation portion of this project seeks to develop innovative undersea navigation capabilities for UUVs based on results from the Precision Navigation Study. 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. Starting in FY22, the UOC will be budgeted for in this project. The Undersea Constellation (UC) is OPNAV's system of systems supporting Subsea and Seabed Warfare (SSW).

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	7.067	4.296	25.485	0.000	25.485
Articles:	-	-	-	-	-
FY 2021 Plans: Autonomy: The Unmanned Maritime Autonomy Architecture (UMAA) is a key standardization effort across unmanned maritime vehicles. In FY21, deliverables include: (1) Publish UMAA Governance Document; (2) Release first version of Communications Operations (CO) ICD; (3) Release first version of Processing Operations (PO) ICD; (4) Includes updated release for all previously published ICDs (MO, EO, SA, SO, SEM, MM); (5) Periodic Industry Days; (6) Periodic release of Reference Implementations that demonstrate UMAA interfaces.					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Rapid Autonomy Integration Lab (RAIL): The RAIL provides the infrastructure, tools, and processes to develop, test, certify, and deploy new and updated autonomous capabilities to vehicles. In FY20 and continuing into FY21, the first end-to-end demonstration of the RAIL is being piloted. This pilot demonstrates taking a new autonomous capability and transitioning it to a program of record vehicle. The pilot reduces risk for information assurance by automated incorporation of pipeline tools and measuring performance by increasing lab testing via software-in-the-loop (SIL) and hardware-in-the-loop (HIL) testing prior to in-water test. The trial case is also developing guidance for how any 3rd party should deliver capability to the RAIL as well as documenting lab processes. Automated Target Recognition (ATR): ATR is a form of machine learning that requires access to large volumes of data in order to train algorithms. While ATR exists on vehicles today, performance improvements are needed by increasing the amount of data used. In FY20, the Navy started a data pilot initiative that made significant progress in collecting, labeling and storing the information in cloud-based repositories. In FY21, detailed planning to support the development of complex modeling and simulation of representative ocean environments to produce synthetic data that can augment actual data. Development and standup of the M&S environment will begin in FY22. Future years will focus on training of ATR algorithms and in-water demonstration on UUVs. Common Control System (CCS): Demonstrate that CCS software can perform mission planning in both a UUV and USV demonstration. These demonstrations will reduce the risk of the software as we begin to implement and deliver it on various contracts. These demos include extending the software baseline to include vehicle specific functionality. Individual baselines for CCS software will transition to Common Control System Program Office for sustainment as they are delivered to the Navy. Communications: Demonstrate a secure comms capability - additional details are classified. Precision Nav: In FY21, some minimal support is required to track and manage Navigation efforts that are identified in the FY20 Study. This study will lead to S&T investment areas for the rest of the FYDP (FY22+). ***FY 2022 Base Plans:*** Unmanned Maritime Autonomy Architecture (UMAA) efforts in FY22 will build upon FY21 standardization efforts to add additional services in the areas of situation awareness, mission management, and sensor and effector management. These services will include definition of data fusion services, in-situ dynamic fault management handling services, collaborative operation services, and additional sensor services. Periodic industry days will continue as new interface content is added. In addition, UMAA reference implementations will be updated to demonstrate these interfaces. Rapid Autonomy Integration Lab (RAIL): Prototyping efforts started in previous years have shown success and the Navy will start scaling the RAIL in support of undersea platforms. The RAIL will bring in a lead integrator to coordinate autonomous capability advancement. The RAIL will be used to validate autonomous capability in					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
the lab prior to delivery. FY22 consists of expanding the RAIL prototype in the following areas: (1) setting up a prototype DevSecOps environment; (2) integrating/setting up/evaluating HIL/SIL tools; (3) demonstrating and evaluating a modified 4-step process that delivers a 3rd party autonomy solution; and (4) identifying complexities associated with verification and validation (V&V) of autonomous systems and capturing ways to improve processes. Automated Target Recognition (ATR): In FY22, the Navy focuses on utilizing cloud-based environments for hosting UUV platform and sensor data, with an emphasis on the processes necessary for curating data at scale. Initial effort on modeling and simulation capabilities will address the integration of platform, sensor, and environment models in the framework of the Navy's DevSecOps environment. Future years will focus on ATR algorithm development, training and in-water demonstration on UUVs as well as continued investment on data initiatives with warfighting value. Common Control System (CCS): FY22 will focus on the development of CCS functionality to support undersea and surface programs entering the design phase in FY22. For these programs, CCS is being delivered with monthly release candidates and quarterly releases as GFE. Capability development will link to program schedules. Communications Capability Improvements: Medium UUV MUOS Capability: R&D efforts to develop, miniaturize, integrate, and demonstrate a military SATCOM capability on a Medium Class UUV. This will be a three year project, with FY22 efforts focusing on R&D and integration into surrogate vehicle, culminating with over-the-air testing in a laboratory environment. Undersea Constellation (UC) is the Navy's system of systems supporting Subsea and Seabed Warfare (SSW). Commencing studies, development, testing, integration and deployment efforts in support of UC Missions A, B and C. Further details are classified. UUV Operations Center (UOC): Starting in FY22, the UOC is shifting from PU 3396 to PU 3393. Efforts include: Maintain existing computing environment and RMF cyber security accreditation (Unclassified and Secret Network). Complete UOC high-security enclave cyber accreditation package under Risk Management Framework (RMF) to achieve Authority to Operate (ATO) for operational environment (Top Secret Network). Complete integration of fleet-identified high-priority data feeds from external systems and data procedures into the UOC for use in mission planning and execution. Complete first incremental software release of the UUV Common Control System (CCS) for incorporation in the Navy's Unmanned Common Control System. Complete integration testing with Orca and Snakehead Phase 1 platforms. Evolve DEVOPS environment to support future					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
testing and rapid delivery of capability into fielded products. Support missions opportunities as required for Unmanned Undersea Vehicle Squadron ONE (UUVRON-1). ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Significant increase attributed to the scaling of the Rapid Autonomy Integration Lab (RAIL), the addition of Undersea Constellation, and the UUV Operations Center.					
Title: Support	0.990	0.100	0.400	0.000	0.400
Articles:	-	-	-	-	-
FY 2021 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 2022 Base Plans:*** Funding provides dedicated engineering support to manage Autonomy, C2, Precision Navigation, RAIL, UC, and UOC for the program office. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase to provide additional support to lead RAIL, UC efforts, and UUV Operations Center.					
Title: Management Services	0.302	0.480	0.400	0.000	0.400
Articles:	-	-	-	-	-
FY 2021 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.					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Precision Nav: Guidance, project planning, financial and contracting support, and coordination of Precision Nav effort. ***FY 2022 Base Plans:*** Provides general program office support in the areas of project planning, financial and engineering support in the areas of Autonomy, C2, Precision Navigation, RAIL, UC, and UOC. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease attributed to the conclusion of the Precision Navigation Study in Q3FY21.					
Accomplishments/Planned Programs Subtotals	8.359	4.876	26.285	0.000	26.285

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition approach varies by specific core tech line of effort.
UMAA: Standards are being developed by a cross-organization team comprised of ONR, Warfare Centers and UARCs. Refinement of the standards through industry interactions is incorporated through regularly scheduled industry days (4 month intervals) and 24/7 access to submit issues via the DI2E UMAAPUBLIC website. UMAA ICDs and their corresponding IDL and UMAA Compliance specifications are being levied on all USV and UUV programs.
RAIL: Industry participation will develop new autonomous capability and perform as a system integrator. It is anticipated that the RAIL acquisition strategy will be in alignment with the overall Navy autonomy strategy. Part of this strategy includes a new contracted role for an Autonomy Baseline Manager (ABM). The contract associated with this role will be awarded in Q4-FY22. This role will manage current and future autonomy portfolio baselines, as well as host and manage the RAIL integration environment.
ATR: Investments in M&S to support synthetic data are mostly at government labs with collaboration with DISC and JAIC.
CCS: Development of the mission planning software will be led by a warfare center software development team.
Undersea Constellation: The acquisition approach for the UC is classified, but will involve a mixture of government warfare centers and industry efforts and utilize rapid acquisition approaches to the extent practical.
UOC: Non-acquisition warfare center based activity that includes support infrastructure to enable command and control, mission planning, and communication capabilities in a communications-denied operational environment.

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 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 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 Archituture UMAA	Various	Various : Various	3.351	3.342	Dec 2019	1.480	Dec 2020	1.000	Dec 2021	-		1.000	-	-	-
Rapid Autonomy Integration Lab	Various	Various : Various	0.000	0.000		0.000		6.323	Dec 2021	-		6.323	-	-	-
Automated Target Recognition	Various	Various : Various	0.000	0.000		1.566	Dec 2020	2.000	Dec 2021	-		2.000	-	-	-
Common Control System	Various	Various : Various	2.653	1.225	Jan 2020	0.750	Jan 2021	0.750	Jan 2022	-		0.750	-	-	-
Comms Capability Improvements	Various	Various : Various	0.000	0.000		0.500	Dec 2020	0.600	Jan 2022	-		0.600	-	-	-
Undersea Constellation	Various	Various : Various	0.000	0.000		0.000		11.793	Dec 2021	-		11.793	-	-	-
UUV Operations Center	WR	NUWC KPT : Keyport, WA	2.000	2.000	Jan 2020	0.000		3.019	Dec 2021	-		3.019	-	-	-
Future Capability Studies	WR	Various : Various	1.635	0.000		0.000		0.000		-		0.000	-	-	-
Precision Navigation	Various	Various : Various	0.000	0.500	Dec 2019	0.000	Dec 2020	0.000		-		0.000	-	-	-
		Subtotal	9.639	7.067		4.296		25.485		-		25.485	-	-	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, C2 and Nav Eng Support	Various	Various : Various	0.794	0.000		0.100	Dec 2020	0.400	Dec 2021	-		0.400	-	-	-
Autonomy Support	Various	NAVSEA Activities : Washington, DC	0.506	0.280	Dec 2019	0.000		0.000		-		0.000	-	-	-
Common Control System (CCS) Engineering Support	Various	Various : Various	0.480	0.250	Dec 2019	0.000		0.000		-		0.000	-	-	-
Precision Navigation	Various	Various : Various	0.000	0.460	Jan 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	1.780	0.990		0.100		0.400		-		0.400	-	-	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 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 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	NAVSEA Activities : Washington, DC	0.150	0.115	Dec 2019	0.175	Dec 2020	0.200	Dec 2021	-		0.200	-	-	-
Common Control System (CCS)	Various	Various : Various	0.150	0.115	Feb 2020	0.175	Jan 2021	0.200	Dec 2021	-		0.200	-	-	-
Energy Prototype	Various	Various : Various	0.150	0.000		0.000		0.000		-		0.000	-	-	-
Precision Navigation	Various	Various : Various	0.000	0.072	Feb 2020	0.130	Jan 2021	0.000		-		0.000	-	-	-
		Subtotal	0.450	0.302		0.480		0.400		-		0.400	-	-	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	11.869	8.359		4.876		26.285		-		26.285	-	-	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

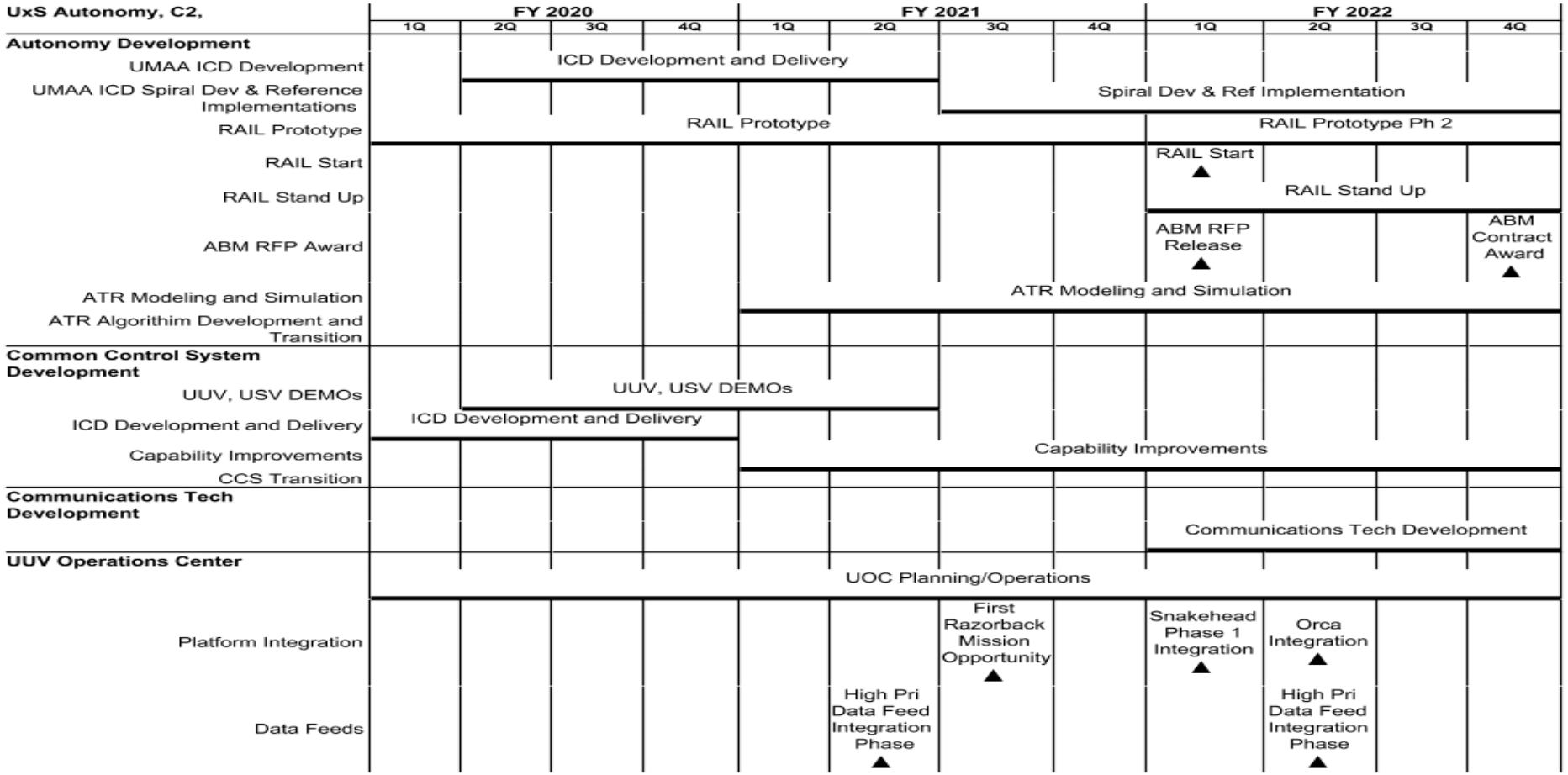

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

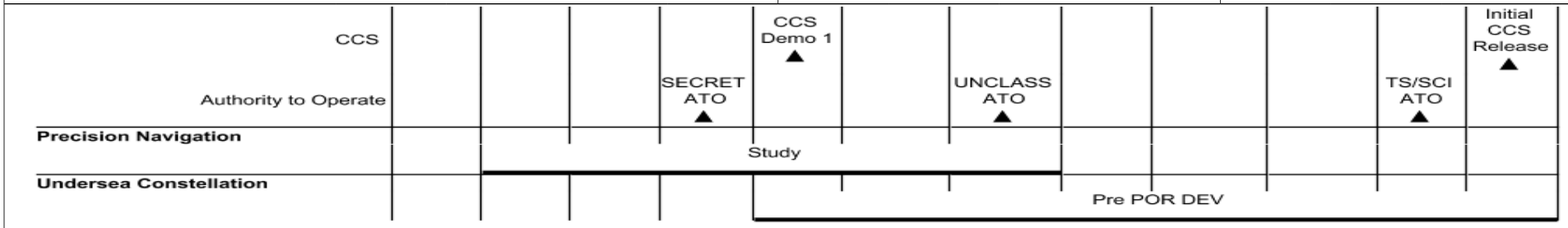

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Autonomy, C2,				
Autonomy Development: UMAA ICD Development: ICD Development	2	2020	2	2021
Autonomy Development: UMAA ICD Spiral Dev & Reference Implementations:	3	2021	4	2022
Autonomy Development: RAIL Prototype: Rail Protoype	1	2020	4	2021
Autonomy Development: RAIL Prototype: Rail Protoype Phase 2	1	2022	4	2022
Autonomy Development: RAIL Start:	1	2022	1	2022
Autonomy Development: RAIL Stand Up: Schedule Detail	1	2022	4	2022
Autonomy Development: ABM RFP Award: Schedule Detail	1	2022	1	2022
Autonomy Development: ABM RFP Award:	4	2022	4	2022
Autonomy Development: ATR Modeling and Simulation:	1	2021	4	2022
Common Control System Development: UUV, USV DEMOs:	2	2020	2	2021
Common Control System Development: ICD Development and Delivery:	1	2020	4	2020
Common Control System Development: Capability Improvements:	1	2021	4	2022
Communications Tech Development:	1	2022	4	2022
UUV Operations Center: UOC Planning/Operations	1	2020	4	2022
UUV Operations Center: Platform Integration: First Razorback Mission Opportunity	3	2021	3	2021
UUV Operations Center: Platform Integration: Snakehead Phase 1 Integration	1	2022	1	2022
UUV Operations Center: Platform Integration: Orca Integration	2	2022	2	2022
UUV Operations Center: Data Feeds: High Pri Data Feed Integration Phase 1	2	2021	2	2021
UUV Operations Center: Data Feeds: High Pri Data Feed Integration Phase 2	2	2022	2	2022
UUV Operations Center: CCS: CCS Demo 1	1	2021	1	2021
UUV Operations Center: CCS: Initial CCS Release	4	2022	4	2022
UUV Operations Center: Authority to Operate: SECRET ATO	4	2020	4	2020

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

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UUV Operations Center: Authority to Operate: UNCLASS ATO	3	2021	3	2021
UUV Operations Center: Authority to Operate: TS/SCI ATO	3	2022	3	2022
Precision Navigation: Precision Navigation Assessment	2	2020	3	2021
Undersea Constellation: PRE POR DEV	1	2021	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 0604029N / *UUV Core Technologies*				Project (Number/Name) 3395 / *UxS Payloads*			
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**
3395: *UxS Payloads*	7.763	15.916	5.885	7.220	-	7.220	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding supports the 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 weapon 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	13.100	5.095	6.390	0.000	6.390
Articles:	-	-	-	-	-
FY 2021 Plans: Avalanche Future Naval Capability (FNC): This Office of Naval Research FY20-22 FNC is a core element and top priority of the Navy's Undersea Constellation. Details are classified. Payload Integration Group (PIG): In FY21, the PIG will achieve completion of UUV payload processes (Payload Certification Process, Payload Technical Data Package) and complete a Payload Interface Design Document (Payload IDD).					
FY 2022 Base Plans: Avalanche Future Naval Capability (FNC): This Office of Naval Research FY20-22 FNC is a core element and top priority of the Navy's Undersea Constellation. Details are classified. Payload Integration Group (PIG): In FY22, the PIG will work with fleet stake holders to maintain payload roadmaps for small, medium, large, and extra-large classes of UUVs. Additionally, the group will facilitate integration of various XLUUV and Medium UUV payloads (Clandestine Delivered Mine (CDM), Hammerhead, C-ENCAP FNC, Avalanche FNC, and Under C-Wolf) and champion the Payload Integration Document.					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement:					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Increase is in accordance with the Avalanche transition agreement.					
Title: Support	2.153	0.200	0.240	0.000	0.240
Articles:	-	-	-	-	-
FY 2021 Plans: Support Avalanche transition and payload efforts.					
FY 2022 Base Plans: Support Avalanche transition and payload efforts.					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement: Minor increase for additional support for payload efforts.					
Title: Management Services	0.663	0.590	0.590	0.000	0.590
Articles:	-	-	-	-	-
FY 2021 Plans: Continue guidance, project planning, financial and contracting support, and coordination for evaluation and integration of payloads.					
FY 2022 Base Plans: Continue guidance, project planning, financial and contracting support, and coordination for evaluation and integration of payloads.					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement: No change.					
Accomplishments/Planned Programs Subtotals	15.916	5.885	7.220	0.000	7.220

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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

D. Acquisition Strategy

Acquisition approach varies by specific core tech line of effort.

Avalanche FNC: At the completion of the FNC, a final deliverable is a Technical Data Package (TDP) that can be competed to industry.

Payload Integration Group (PIG) is a cross-organization team comprised of ONR, Warfare Centers and UARCs SMEs who define government-owned interfaces and develop payload roadmaps to allow efficient and affordable integration of payloads from government and industry partners.

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 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 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
Payload Integration Group	C/CPIF	Various : Various	4.083	4.100	Dec 2019	1.095	Dec 2020	1.309	Dec 2021	-		1.309	-	-	-
ONR FNC Project	WR	Various : Various	0.000	3.000	Dec 2019	3.000	Dec 2020	5.081	Dec 2021	-		5.081	-	-	-
Medium Vehicle Payload Development	WR	Various : Various	0.000	2.376	Dec 2019	1.000	Dec 2020	0.000		-		0.000	-	-	-
Automatic Target Recognition	WR	Various : Various	0.000	3.000	Jan 2020	0.000		0.000		-		0.000	-	-	-
Command and Control	WR	Various : Various	1.609	0.000		0.000		0.000		-		0.000	-	-	-
Safety	WR	Various : Various	0.780	0.624	Jan 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	6.472	13.100		5.095		6.390		-		6.390	-	-	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
Technical Support	WR	Various : Various	0.991	0.200	Feb 2020	0.200	Dec 2020	0.240	Dec 2021	-		0.240	-	-	-
Payload Integration Group	Various	Various : Various	0.000	1.000	Dec 2019	0.000	Dec 2020	0.000		-		0.000	-	-	-
Engineering Support	Various	Various : Various	0.000	0.600	Nov 2019	0.000	Nov 2020	0.000		-		0.000	-	-	-
Integrated Logistic Support	Various	Various : Various	0.000	0.353	Nov 2019	0.000	Nov 2020	0.000		-		0.000	-	-	-
		Subtotal	0.991	2.153		0.200		0.240		-		0.240	-	-	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 & Management Support	WR	Various : Various	0.300	0.663	Dec 2019	0.590	Dec 2020	0.590	Dec 2021	-		0.590	-	-	-
		Subtotal	0.300	0.663		0.590		0.590		-		0.590	-	-	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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3395 / *UxS Payloads*	

	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	7.763	15.916		5.885		7.220		-		7.220	-	-	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

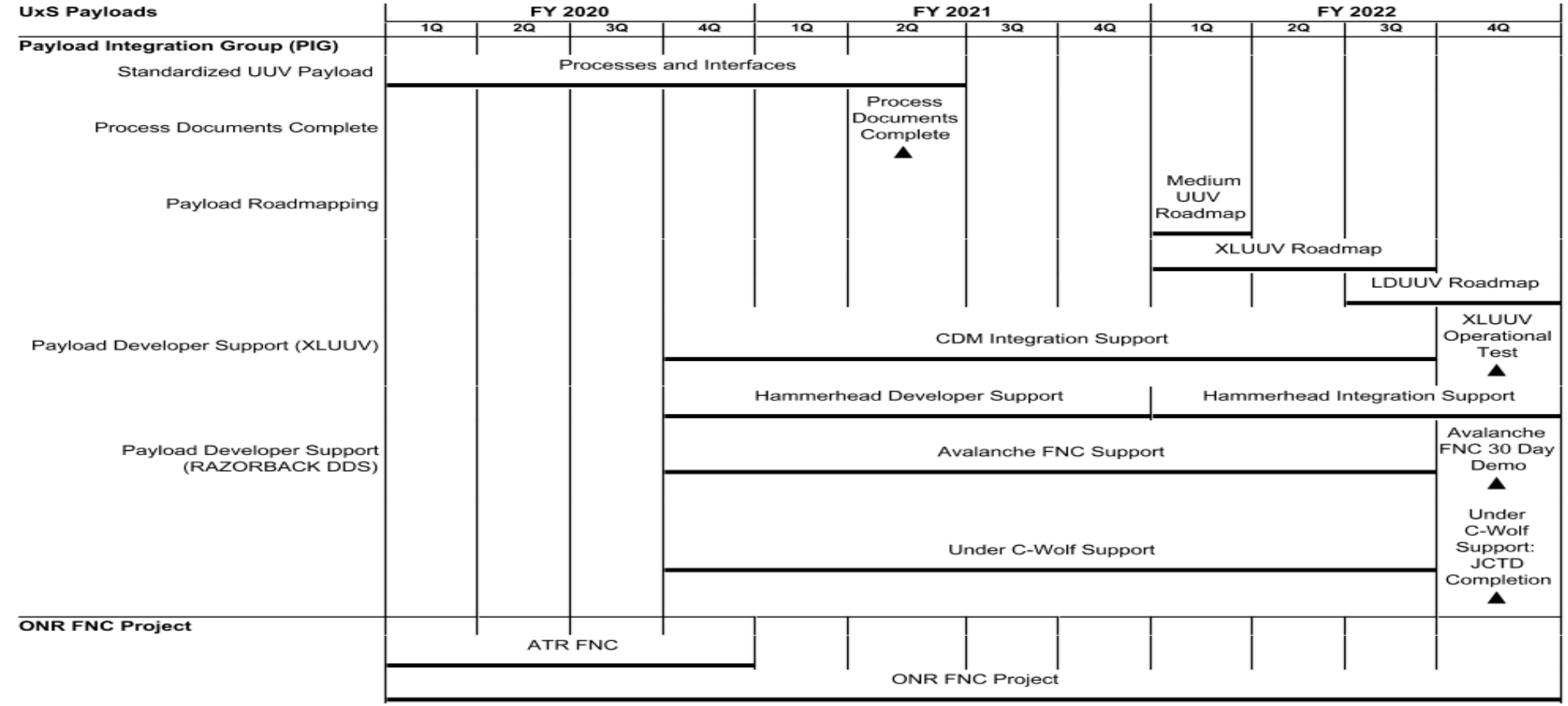

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Payloads				
Payload Integration Group (PIG): Standardized UUV Payload: Processes and Interfaces	1	2020	2	2021
Payload Integration Group (PIG): Process Documents Complete: Process Documents Complete	2	2021	2	2021
Payload Integration Group (PIG): Payload Roadmapping: Medium UUV Roadmap	1	2022	1	2022
Payload Integration Group (PIG): Payload Roadmapping: XLUUV Roadmap	1	2022	3	2022
Payload Integration Group (PIG): Payload Roadmapping: LDUUV Roadmap	3	2022	4	2022
Payload Integration Group (PIG): Payload Developer Support (XLUUV): CDM Integration Support	4	2020	3	2022
Payload Integration Group (PIG): Payload Developer Support (XLUUV): XLUUV Operational Test	4	2022	4	2022
Payload Integration Group (PIG): Payload Developer Support (XLUUV): Hammerhead Developer Support	4	2020	4	2021
Payload Integration Group (PIG): Payload Developer Support (XLUUV): Hammerhead Integration Support	1	2022	4	2022
Payload Integration Group (PIG): Payload Developer Support (RAZORBACK DDS): Avalanche FNC Support	4	2020	3	2022
Payload Integration Group (PIG): Payload Developer Support (RAZORBACK DDS): Avalanche FNC 30 Day Demo	4	2022	4	2022
Payload Integration Group (PIG): Payload Developer Support (RAZORBACK DDS): Under C-Wolf Support	4	2020	3	2022
Payload Integration Group (PIG): Payload Developer Support (RAZORBACK DDS): Under C-Wolf Support: JCTD Completion	4	2022	4	2022
ONR FNC Project: ATR Development	1	2020	4	2020

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

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ONR FNC Project: ONR FNC Project	1	2020	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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3396 / *UxS Endurance*	

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
3396: *UxS Endurance*	6.774	16.125	20.813	14.792	-	14.792	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 the 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	13.272	18.437	13.937	0.000	13.937
Articles:	-	-	-	-	-
FY 2021 Plans: Continuation of propagation resistant Li-Ion cells effort (i.e.,battery architecture, Battery Management System (BMS) design, testing, fabrication, etc.). Develop full-scale design unit and test asset to support initial battery design/fabrication validation. Pursue propagation resistance concepts for next-generation battery. Includes shock test and certification. UUV Operations Center (UOC): Maintain existing computing environment and RMF cyber security accreditations (Secret Network). Complete UOC unclassified enclave cyber accreditation package under Risk Management Framework (RMF) to achieve Authority to Operate (ATO) for test and operational environment (unclassified environment). Continue to develop system engineering architecture products to include Architecture Description, Interface Design Description, and maturing the systems engineering UOC model. Begin initial integration of fleet identified high-priority data feeds from external systems and data procedures into the UOC for use in mission planning and execution. Complete prototype demonstration of UUV Common Control System (CCS) in UOC. Support testing, training, and initial operational mission of Razorback program. In FY22, the UOC is shifting to 3393.					
FY 2022 Base Plans: Continuation of propagation resistant Li-Ion cells effort (i.e., battery architecture, Battery Management System (BMS)					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
design, testing, fabrication, etc.). Conduct initial battery shock test to support future platform integration and demonstrations. Develop next generation battery propagation resistance concepts, as well as full scale engineering design unit. Finalize Quality Assurance/Quality Control (QA/QC) facilities development (government and industry) plan. Establish initial cell screening protocol (i.e. manual and pursue automation). ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease due to the shift of the UUV Operations Center Activities to PU 3393.					
Title: Support	2.182	1.386	0.525	0.000	0.525
Articles:	-	-	-	-	-
FY 2021 Plans: Continue integration and related certification efforts of Li-Ion battery assets. ***FY 2022 Base Plans:*** Continue integration and related certification efforts of Li-Ion battery assets. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease due to transition of UOC to Project 3393					
Title: Management Services	0.671	0.990	0.330	0.000	0.330
Articles:	-	-	-	-	-
FY 2021 Plans: Provide guidance, project planning, financial and contracting support, and coordination for energy system evaluation and integration. ***FY 2022 Base Plans:*** Provide guidance, project planning, financial and contracting support, and coordination for Li-Ion. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:***					

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Decrease due to transition of UOC to Project 3393					
Accomplishments/Planned Programs Subtotals	16.125	20.813	14.792	0.000	14.792

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 of 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 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 to 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 2022 Navy			Date: May 2021
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 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
Propagation Resistant Li-Ion Battery	TBD	Various : Various	0.000	3.034	Dec 2019	8.237	Dec 2020	7.918	Dec 2021	-		7.918	-	-	-
Li-Ion Battery Screening/ Warehousing	WR	NSWC Crane : Crane, Indiana	0.000	0.000		6.600	Dec 2020	6.019	Dec 2021	-		6.019	-	-	-
UUV Operations Center (UOC)	TBD	Various : Various	0.000	5.895	Dec 2019	2.500	Dec 2020	0.000		-		0.000	-	-	-
XL Advanced Energy	TBD	Various : Various	0.000	4.343	Dec 2019	1.100	Dec 2020	0.000		-		0.000	-	-	-
Li-Ion Battery Certification	WR	NUWC : Newport, RI	6.699	0.000	Dec 2019	0.000	Dec 2020	0.000		-		0.000	-	-	-
		Subtotal	6.699	13.272		18.437		13.937		-		13.937	-	-	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
Program Support	C/FFP	various : Arlington, VA	0.075	1.082	Jan 2020	1.386	Dec 2020	0.525	Dec 2021	-		0.525	-	-	-
Design Analysis	WR	NRL : Washington, DC	0.000	1.100	Dec 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.075	2.182		1.386		0.525		-		0.525	-	-	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 Task	Various	Various : Various	0.000	0.671	Dec 2019	0.990	Dec 2020	0.330	Dec 2021	-		0.330	-	-	-
		Subtotal	0.000	0.671		0.990		0.330		-		0.330	-	-	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	6.774	16.125		20.813		14.792		-		14.792	-	-	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 0604029N / *UUV Core Technologies*	Project (Number/Name) 3396 / *UxS Endurance*	

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

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

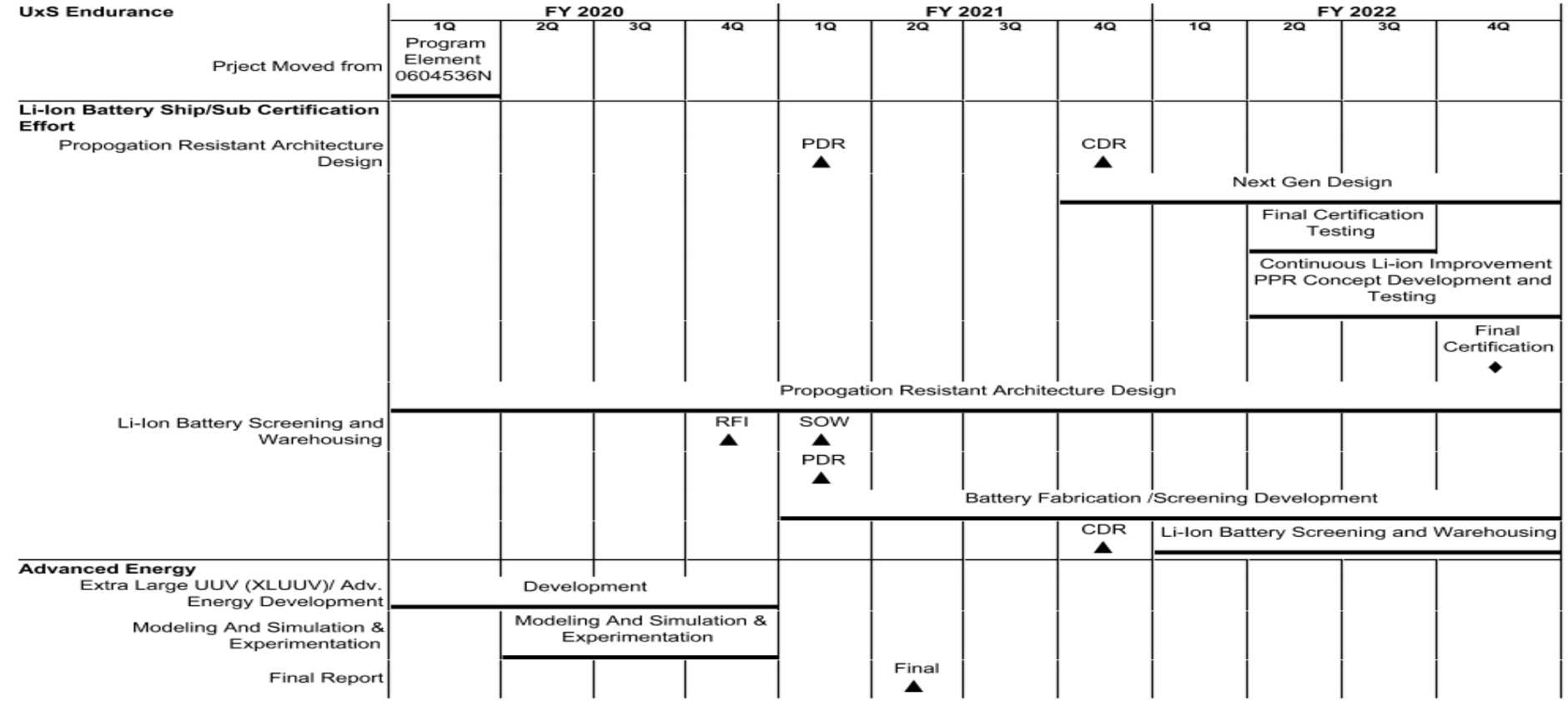

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Endurance				
Prject Moved from: Project Moved from	1	2020	1	2020
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Preliminary Design Review	1	2021	1	2021
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: Battery Next Generation Design	4	2021	4	2022
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Battery Final Certification Testing	2	2022	3	2022
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Continuous Li-Ion Improvement Passive Propagation Resistant (PPR) Concept Development and Testing	2	2022	4	2022
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Battery Final Certification	4	2022	4	2022
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Propogation Resistant Architecture Design	1	2020	4	2022
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Request for Information (RFI)	4	2020	4	2020
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Statement of Work (SOW)	1	2021	1	2021
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Preliminary Design Review	1	2021	1	2021
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Battery Fabrication /Screening Development	1	2021	4	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Critical Design Review	4	2021	4	2021
Li-Ion Battery Ship/Sub Certification Effort: Li-Ion Battery Screening and Warehousing: Li-Ion Battery Screening and Warehousing	1	2022	4	2022
Advanced Energy: Extra Large UUV (XLUUV)/ Adv. Energy Development: Development	1	2020	4	2020
Advanced Energy: Modeling And Simulation & Experimentation: Modeling And Simulation & Experimentation	2	2020	4	2020
Advanced Energy: Final Report:	2	2021	2	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 0604029N / *UUV Core Technologies*				Project (Number/Name) 4053 / *UxS Platform*			
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**
4053: *UxS Platform*	0.000	0.000	8.308	11.002	-	11.002	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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 (e.g. TETRA), offboard systems, and Rapid Fielding Temporary Alterations (RF TEMPALT) for submarines and 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 (e.g. MCM UON, RATTRAP, etc.). 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 (CONOP) 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	0.000	7.966	10.602	0.000	10.602
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. 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. SSW mission packages will develop vehicle interface standards to include potential hardware for all known UUVs/Remotely Operated Vehicles (ROVs) 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 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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Submarine (SSN) launch and recovery efforts for small and medium UUVs including integration and testing on various platforms. TEMPALT Coordination Activity (TCA) executing Fleet prioritized TEMPALTs and databases for the Rapid Fielding TEMPALT process. Initiate SSW concepts and packages to be integrated into UUV/ROVs and include consideration of shipboard integration. Execute MCM UON hardware procurement and integration testing. ***FY 2022 Base Plans:*** Continuation of submarine (SSN) launch and recovery efforts for small and medium UUVs to include hardware modifications, benchtop testing, and demonstrations with the Fleet. Execute Rapid Fielding TEMPALTs with TEMPALT Coordination Activity (TCA) and maintain databases & processes. Down-select SSW concepts and packages to be integrated into UUV/ROVs and begin contract actions to initiate development. Finalize MCM UON shipboard integration, testing and TEMPALT activities. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in FY22 provides additional support to MCM UON integration and testing efforts, and continues to support SSN launch and recovery efforts.					
Title: Management Services	0.000	0.342	0.400	0.000	0.400
Articles:	-	-	-	-	-
FY 2021 Plans: Provide guidance, project planning, financial and contracting support, and coordination for development of prototype efforts for deployable and retrievable UUVs and SSW mission package concepts. ***FY 2022 Base 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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Provide guidance, project planning, financial and contracting support, and coordination for development of prototype efforts for deployable and retrievable UUVs and Subsea and Seabed Warfare (SSW) mission package concepts. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY21 to FY22 is due to inflation					
Accomplishments/Planned Programs Subtotals	0.000	8.308	11.002	0.000	11.002

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 (e.g. Family of UUV IDIQ Contract) 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.

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 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 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
Product Development	WR	NUWC NPT : Newport, RI	0.000	0.000		1.434	Oct 2020	2.165	Oct 2021	-		2.165	-	-	-
Product Development	WR	NSWC CD : West Bethesda, MD	0.000	0.000		1.028	Apr 2021	1.365	Oct 2021	-		1.365	-	-	-
Product Development	FFRDC	ARL/UT : Austin, TX	0.000	0.000		2.210	Apr 2021	1.250	Nov 2021	-		1.250	-	-	-
Product Development	WR	PSNS : Bremerton, WA	0.000	0.000		0.000	Nov 2020	0.527	Oct 2021	-		0.527	-	-	-
Product Development	WR	PNSY : Portsmouth NH	0.000	0.000		0.486	Nov 2020	0.820	Oct 2021	-		0.820	-	-	-
Product Development	C/CPAF	Leidos : Reston, VA	0.000	0.000		0.000	Nov 2020	0.700	Dec 2021	-		0.700	-	-	-
Product Development	C/CPAF	L3 : New River, MA	0.000	0.000		0.000	Nov 2020	0.650	Nov 2021	-		0.650	-	-	-
Product Development	FFRDC	ARL/PSU : State College, PA	0.000	0.000		2.000	Apr 2021	0.850	Dec 2021	-		0.850	-	-	-
Prodcut Development	FFRDC	APL/JHU : Columbia, MD	0.000	0.000		0.000		0.250	Dec 2021	-		0.250	-	-	-
Product Development	C/CPAF	Northop Grumman : Annapolis, MD	0.000	0.000		0.000	Jun 2021	0.325	Dec 2021	-		0.325	-	-	-
Prodcut Development	WR	NSWC IH : Indian Head, MD	0.000	0.000		0.000		0.450	Oct 2021	-		0.450	-	-	-
Prodcut Development	C/CPAF	OII : Hanover, MD	0.000	0.000		0.808	Jun 2021	1.250	Dec 2021	-		1.250	-	-	-
		Subtotal	0.000	0.000		7.966		10.602		-		10.602	-	-	N/A

Remarks

The increase in FY22 is to continue SSN launch and recovery efforts and UON efforts.

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	Various : Various	0.000	0.000		0.342	Dec 2020	0.400	Dec 2021	-		0.400	-	-	-
		Subtotal	0.000	0.000		0.342		0.400		-		0.400	-	-	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 0604029N / *UUV Core Technologies*	Project (Number/Name) 4053 / *UxS Platform*	

	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	0.000		8.308		11.002		-		11.002	-	-	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 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

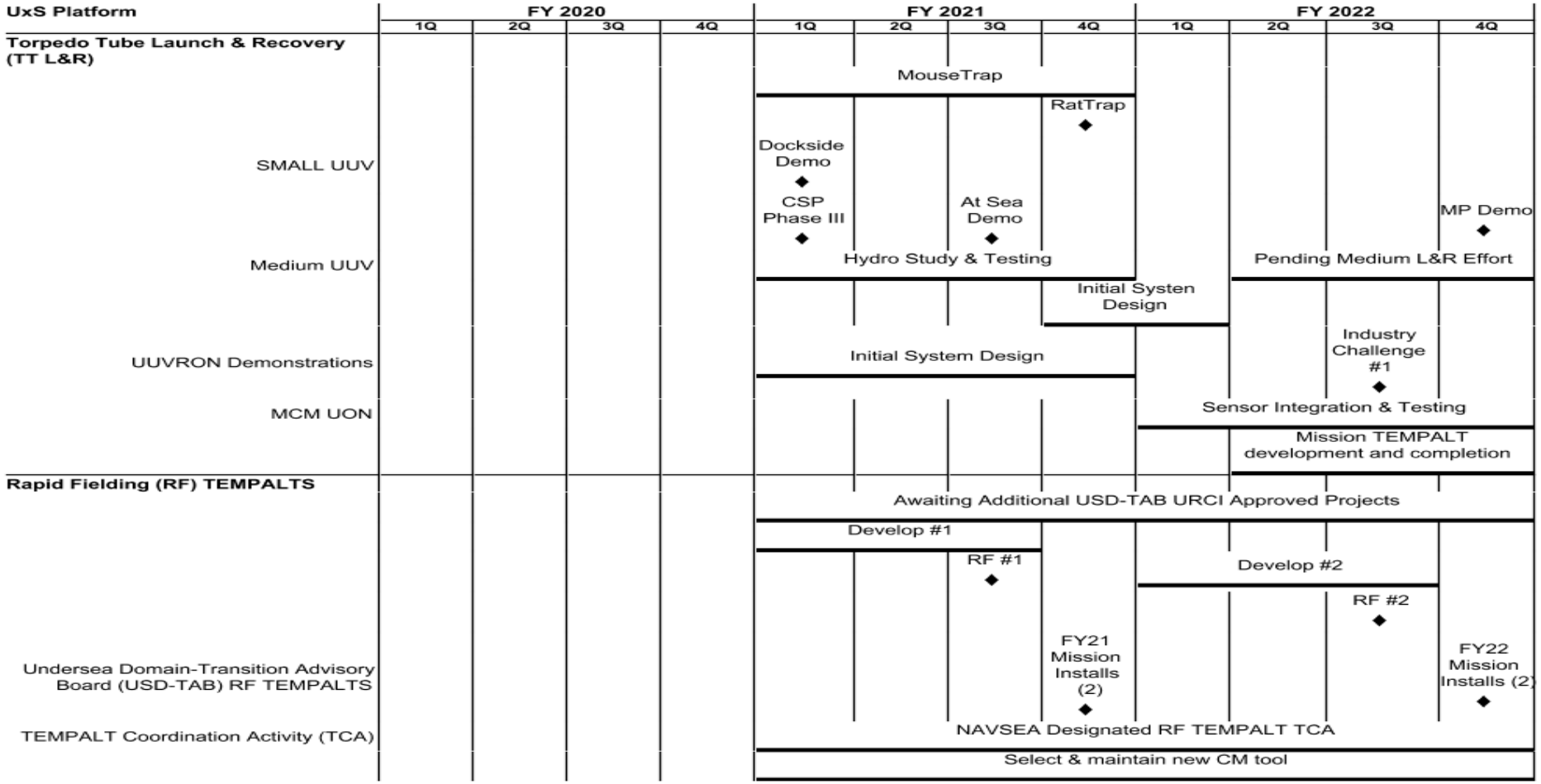

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

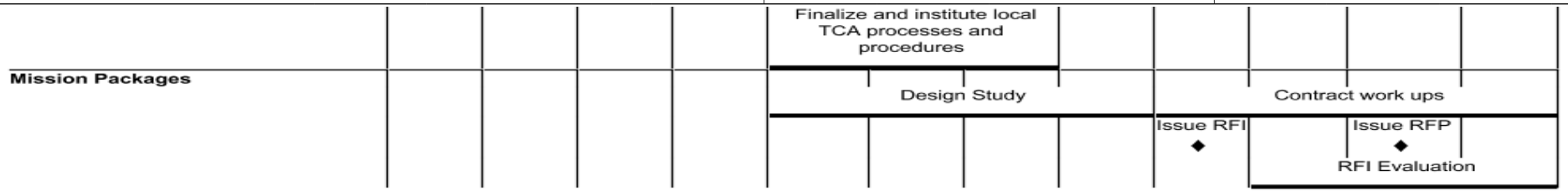

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *UUV Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

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	4	2022
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): MCM UON: Sensor Integration & Testing	1	2022	4	2022
Torpedo Tube Launch & Recovery (TT L&R): MCM UON: Mission TEMPALT development and completion	2	2022	4	2022
Rapid Fielding (RF) TEMPALTS: Awaiting Additional USD-TAB URCI Approved Projects	1	2021	4	2022
Rapid Fielding (RF) TEMPALTS: Development #1	1	2021	3	2021
Rapid Fielding (RF) TEMPALTS: RF Approval #1	3	2021	3	2021
Rapid Fielding (RF) TEMPALTS: Development #2	1	2022	3	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 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 #2	3	2022	3	2022
Rapid Fielding (RF) TEMPALTS: Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY21 Mission Installations (2)	4	2021	4	2021
Rapid Fielding (RF) TEMPALTS: Undersea Domain-Transition Advisory Board (USD-TAB) RF TEMPALTS: FY22 Mission Installations (2)	4	2022	4	2022
Rapid Fielding (RF) TEMPALTS: TEMPALT Coordination Activity (TCA): NAVSEA Designated RF TEMPALT TCA w/ limited technical authority	1	2021	4	2022
Rapid Fielding (RF) TEMPALTS: TEMPALT Coordination Activity (TCA): Select and maintain new Configuration Management (CM) tool	1	2021	4	2022
Rapid Fielding (RF) TEMPALTS: 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
Mission Packages: Issue RFP	3	2022	3	2022
Mission Packages: RFI Evaluation	2	2022	4	2022