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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	16.062	47.261	53.942	-	53.942	51.503	97.987	62.975	17.316	Continuing	Continuing
2482: <i>Small Unmanned Undersea Vehicles</i>	0.000	0.000	0.000	4.597	-	4.597	7.597	7.897	7.998	0.000	0.000	28.089
2483: <i>Medusa</i>	0.000	0.000	0.000	0.000	-	0.000	1.900	28.039	31.653	0.000	0.000	61.592
3123: <i>SMCM UUV</i>	0.000	16.062	22.747	20.656	-	20.656	16.397	20.133	8.860	2.561	Continuing	Continuing
3785: <i>Razorback</i>	0.000	0.000	9.780	28.689	-	28.689	25.609	41.918	14.464	14.755	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	0.000	14.734	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.734

Note
Razorback FY19 and prior funding in PE 0604218N. Project 3785 Razorback realigned from PE 0604218N starting in FY 2020. SAFECAP realigned from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning in FY20.
Small UUV programs realigned from PE to PE0604028N Project 2482 beginning in FY21.

A. Mission Description and Budget Item Justification

Small and Medium Unmanned Undersea Vehicles (UUVs) are a segment of the Navy's Family of UUVs defined as having a diameter between 3 inches and 10 inches for small UUVs and a diameter of 10 inches to 21 inches for medium UUVs. The UUVs can be launched by submarines, surface ships, or larger UUVs, and can be recovered by surface ships and submarines. This class of UUVs can have one or more types of sensors to perform multiple missions including Intelligence Preparation of the Operational Environment (IPOE), battlespace awareness, and mine warfare.

Multi Mission Small UUV Program - This Small Class Unmanned Undersea Vehicle program will field a light-weight, highly portable and mission configurable UUV for use by the Navy Explosive Ordnance Disposal (EOD), Naval Special Warfare (NSW), Submarine UUV Squadron (UUVRON), the Naval Oceanographic Community (NMOC), and United States Marine Corps operators. The program will deliver a baseline UUV capability and implement an incremental development approach, including phases for prototyping, integration, demonstration and fielding of Small Diameter UUVs to integrate with mission packages from each community.

Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV) - The Knifefish program develops advanced medium class UUVs to support clandestine mine detection capability against volume, bottom, and buried mines. Equipment includes vehicles and associated systems support equipment. In parallel, Block Upgrade design efforts aligned to Fleet needs are ongoing to support insertion of incremental capability when the technology is ready. Planned Block Upgrade candidates being considered include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, command and control improvements, increased operational depth, and other smaller tasks, as well as future payloads as required.

Littoral Battlespace Sensing - Autonomous Undersea Vehicle Submarine Variant (LBS-AUV(S)), also known as Razorback, is a medium class UUV capable of persistent, autonomous, ocean sensing and data collection in support of Navy Intelligence Preparation of the Operational Environment (IPOE) mission. Razorback is

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Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>
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deployed from host submarines in two variants: from the Dry Deck Shelter (DDS) or from the torpedo tube. The DDS deployed Razorback variant has been procured beginning in FY17 with Fleet operational deployments beginning in FY20. Development of requirements and submarine integration efforts commenced in FY 2019 for the torpedo tube launch and recover (TTL&R) variant, which will be competitively sourced to industry by FY21.

In order to deploy Razorback, or other small or medium class UUVs from a host submarine platform with sufficient endurance to perform a desired mission, high energy density sources such as lithium ion batteries are used. Consequently, safety is paramount and mitigation systems must be in place to prevent or stop a high energy casualty event. SAFECAP is being developed as an active mitigation strategy that includes a shock qualified capsule that aides in the launch and recovery of small and medium sized vehicles through the torpedo tube. It also contains a Battery Casualty Detection System that constantly monitors battery health and status, providing early warning signs of a battery short via an alarm. In the event of a casualty, the capsule and vehicle portion of SAFECAP are flooded via the fire hose connections and the event is extinguished.

MEDUSA is a medium class UUV capable of offensive mining capabilities deployed from a submarine. It may potentially carry other advanced payloads in the future to meet additional mission needs. MEDUSA features torpedo tube launch capability, long range, high payload placement accuracy, and can handle heavy payloads. A prototype system will be demonstrated in FY20 using dummy payloads via an in-water launch from a host submarine. Lessons learned from the prototype and demonstration will inform a competitive award to Industry in FY23 to develop and produce tactical systems. The MEDUSA prototype and Industry variant differ from the Razorback Torpedo Tube Launch and Recovery (TTL&R) variant in size (MEDUSA is approximately 21 inches in diameter, impulsed from the torpedo tube, and expendable once the payload is deployed). Razorback TTL&R is expected to be less than 15 inches in diameter, launch and recover from the torpedo tube, and be capable of swappable payloads to conduct a variety of missions.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	16.717	32.527	53.991	-	53.991
Current President's Budget	16.062	47.261	53.942	-	53.942
Total Adjustments	-0.655	14.734	-0.049	-	-0.049
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	14.734			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.655	0.000			
• Program Adjustments	0.000	0.000	0.000	-	0.000
• Rate/Misc Adjustments	0.000	0.000	-0.049	-	-0.049

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 9999: *Congressional Adds*

	FY 2019	FY 2020

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Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)

Congressional Add: *MCM UUV UON*

Congressional Add Subtotals for Project: 9999

Congressional Add Totals for all Projects

	FY 2019	FY 2020
	0.000	14.734
	0.000	14.734
	0.000	14.734

Change Summary Explanation

Program Changes:

FY 2019 - -\$655K Small Business Innovation Research (SBIR)

FY 2020 - +\$14,734K Congressional action: Navy requested transfer from OPN line 30 for MCM UUV UON

FY 2021 - -\$49K Miscellaneous reductions

Technical: Not applicable.

Schedule: Not applicable.

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>				Project (Number/Name) 2482 / <i>Small Unmanned Undersea Vehicles</i>			
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
2482: <i>Small Unmanned Undersea Vehicles</i>	0.000	0.000	0.000	4.597	-	4.597	7.597	7.897	7.998	0.000	0.000	28.089
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

As part of the UUV Family of Systems (FoS) the Small UUV Program of Record (SUPOR) develops advanced small class UUVs to support myriad missions across warfare domains. The missions include: Expeditionary Mine Countermeasures, Expeditionary data collection and surveillance, Intelligence Preparation of the Environment (IPOE). Equipment includes vehicles and associated systems support equipment. In order to meet a wide range of mission areas with a common platform, this effort maximizes Modular Open Systems Architecture to enable rapid development of a range of sensors and tools and for fleet operators to easily change configurations to meet dynamic threat environments and missions. Planned block upgrades include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, autonomy and command and control improvements, additional launch and recovery abilities, increased operational depth, and payloads as required.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: SMALL UNMANNED UNDERWATER VEHICLES	0.000	0.000	4.597	0.000	4.597
Articles:	-	-	-	-	-
FY 2020 Plans: N/A					
FY 2021 Base Plans: FY 2021 funding formally initiates the Small UUV Program of Record (PoR). Efforts include delivery of initial Small UUV prototypes and initiation of developmental testing and evaluation with participation of Fleet stakeholders.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Increase from FY 2020 to FY 2021 will allow for development, test and evaluation of the next generation small UUV. This effort will leverage advances in commercial technologies to provide a common baseline small UUV that will fulfill capability needs of several Navy user communities through an open architecture approach in a competitive selection process.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.597	0.000	4.597

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Small UUV Program is planned to be implemented and executed as a Middle Tier Acquisition Program in accordance with (IAW) Middle Tier Acquisition and Agility Interim Guidance approved by the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN RDA) on 24 April 2018 and the most recent update provided on 19 January 2019. Industry solicitations will be released based on on-going market research and technology investment efforts to determine best-in-class small UUV prototypes which will then be tested and evaluated against approved requirements to demonstrate operation effectiveness and suitability.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy **Date:** February 2020

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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Primary Hardware Development	C/CPFF	TBD : TBD	0.000	0.000		0.000		1.925	Nov 2020	-		1.925	0.000	1.925	-
Systems Engineering	C/CPFF	NSWC, Activities : Various	0.000	0.000		0.000		0.490	Nov 2020	-		0.490	0.000	0.490	-
Subtotal			0.000	0.000		0.000		2.415		-		2.415	0.000	2.415	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Technical Support	C/CPFF	Various : TBD	0.000	0.000		0.000		0.144	Nov 2020	-		0.144	0.000	0.144	-
Subtotal			0.000	0.000		0.000		0.144		-		0.144	0.000	0.144	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental Test & Evaluation	WR	NIWC : San Diego	0.000	0.000		0.000		1.135	Nov 2020	-		1.135	0.000	1.135	-
Developmental Test & Evaluation	WR	NUWC : Newport	0.000	0.000		0.000		0.787	Nov 2020	-		0.787	0.000	0.787	-
Subtotal			0.000	0.000		0.000		1.922		-		1.922	0.000	1.922	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support	WR	NSWCIEHODTD : Indian Head, MD	0.000	0.000		0.000		0.116	Nov 2020	-		0.116	0.000	0.116	-
Subtotal			0.000	0.000		0.000		0.116		-		0.116	0.000	0.116	N/A

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>				Project (Number/Name) 2482 / <i>Small Unmanned Undersea Vehicles</i>			
	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		4.597	-	4.597	0.000	4.597	N/A

Remarks

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 2482 / <i>Small Unmanned Undersea Vehicles</i>
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Proj 2482	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025												
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q									
SMALL UNMANNED UNDERWATER VEHICLE																																					
									Small UUV Prototype Deliveries	Small UUV Test & Evaluation																											
																						Small UUV MCM Production Deliveries															
																						Block Upgrades for Unique Mission Package Integration															

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 2482 / <i>Small Unmanned Undersea Vehicles</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 2482				
SMALL UNMANNED UNDERWATER VEHICLE: Small UUV Prototype Deliveries	2	2021	2	2021
SMALL UNMANNED UNDERWATER VEHICLE: Small UUV Test & Evaluation	3	2021	4	2023
SMALL UNMANNED UNDERWATER VEHICLE: Small UUV MCM Production Deliveries	3	2023	4	2025
SMALL UNMANNED UNDERWATER VEHICLE: Block Upgrades for Unique Mission Package Integration	1	2024	4	2025

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 2483 / <i>Medusa</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2483: <i>Medusa</i>	0.000	0.000	0.000	0.000	-	0.000	1.900	28.039	31.653	0.000	0.000	61.592
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

MEDUSA is a medium class UUV capable of offensive mining capabilities deployed from a submarine. It may potentially carry other advanced payloads in the future to meet additional mission needs. MEDUSA features torpedo tube launch capability, long range, high payload placement accuracy, and can handle heavy payloads. A prototype system will be demonstrated in FY20 using dummy payloads via an in-water launch from a host submarine. Lessons learned from the prototype and demonstration will inform a competitive award to Industry in FY23 to develop and produce tactical systems. The MEDUSA prototype and Industry variant differ from the Razorback TTL&R in size (MEDUSA is approximately 21 inches in diameter, impulse from the torpedo tube, and expendable once the payload is deployed. Razorback TTL&R is expected to be less than 15 inches in diameter, launch and recover from the torpedo tube, and be capable of swappable payloads to conduct a variety of missions).

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>				Project (Number/Name) 3123 / <i>SMCM UUV</i>			
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
3123: <i>SMCM UUV</i>	0.000	16.062	22.747	20.656	-	20.656	16.397	20.133	8.860	2.561	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Prior year funding in PE 0603502N.

A. Mission Description and Budget Item Justification

As part of the UUV Family of Systems (FoS) and in support of the Mine Countermeasures (MCM) Mission Package (MP), the Knifefish Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV) program develops advanced medium class UUVs to support clandestine mine detection capability against volume, bottom, and buried mines. Equipment includes vehicles and associated systems support equipment. In parallel, Block Upgrade design efforts aligned to Fleet needs are ongoing to support insertion of incremental capability when the technology is ready. Planned Block Upgrade candidates being considered include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, command and control improvements, increased operational depth, and other smaller tasks, as well as potential future payloads as required.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Knifefish Development	9.072	17.820	14.098	0.000	14.098
Articles:	-	-	-	-	-
FY 2020 Plans: Continue engineering and acquisition efforts for competitive production award. Conduct LCS Independence variant integration testing. Verify and test correction of deficiencies from Developmental Testing/Operational Assessment (DT/OA). Complete development for Block 1 (increased operating depth limit, mine case burial estimation, Net-Centric Sensor Analysis for Mine Warfare (NSAM) interoperability) capability and integrate into the Knifefish system. Begin prototype fuel cell integration and transition from ONR for a future Block Upgrade. Continued maintenance of EDM vehicles and support systems in support of Block upgrade and LCS integration testing.					
FY 2021 Base Plans: Begin development of Block 2 upgrade including integration of modular Skyfish payload to detect and classify deeply buried mines. Conduct initial test of Block 2 systems deep buried mine detection capability and vehicle operations in deep water. Verify NSAM interoperability. Integrate fuel cell onto a Knifefish vehicle for shore based operations. Integrate Knifefish with LCS Freedom variant. Conduct testing of LRIP systems.					
FY 2021 OCO Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decrease in development due to completion of E&MD phase and testing.					
Title: Knifefish Support					
Articles:					
	3.748	3.165	4.212	0.000	4.212
	-	-	-	-	-
FY 2020 Plans: Provide engineering support for Block 1 upgrade development, LCS integration, and prototype fuel cell efforts. Provide acquisition support of competitive procurement activities.					
FY 2021 Base Plans: Provide engineering support for completion of Block 2 upgrade, LCS integration in support of LRIP testing, and integrate prototype fuel cell onto vehicle.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increase due to engineering support for block upgrades and fuel cell integration efforts.					
Title: Knifefish Test and Evaluation					
Articles:					
	2.460	0.800	1.384	0.000	1.384
	-	-	-	-	-
FY 2020 Plans: Complete initial integration testing from the LCS Independence variant. Conduct testing from LCS, and other testing from Vessel of Opportunity (VOO), as required. Conduct testing related to Block Upgrade efforts.					
FY 2021 Base Plans: Conduct testing from LCS, early testing of Block 2 upgrades, test prototype vehicle with fuel cell.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increase due to conducting LRIP testing and block upgrade testing.					
Title: Knifefish Management Services					
Articles:					
	0.782	0.962	0.962	0.000	0.962
	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>FY 2020 Plans: Conduct acquisition and management of development, test, and program activities supporting Block 1 and fuel cell efforts, and competitive procurement activities.</p> <p>FY 2021 Base Plans: Conduct acquisition and management of development, test, and program activities supporting LCS testing, Block 2 upgrades, and fuel cell development.</p> <p>FY 2021 OCO Plans: N/A</p>					
Accomplishments/Planned Programs Subtotals	16.062	22.747	20.656	0.000	20.656

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• OPN/2622: <i>Minesweeping Replacement</i>	32.367	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• OPN/1601: <i>LCS MCM Mission Modules</i>	98.901	64.789	218.822	-	218.822	222.754	234.330	243.187	247.949	1,111.812	2,666.795
• OPN/1611: <i>Small & Medium UUV</i>	0.000	25.601	67.709	2.946	70.655	45.036	30.081	61.422	64.963	Continuing	Continuing

Remarks
OPN 1601 and OPN 1611 funding lines account for several programs, of which the Knifefish program is only a portion.

D. Acquisition Strategy
The Knifefish program, initiated in FY 2011 and competitively sourced to General Dynamics Mission Systems (GDMS), develops SMCM UUVs equipped with advanced Low Frequency Broadband (LFBB) sonar to provide volume, bottom, and buried mine detection capability, when operated from the Littoral Combat Ship (LCS) Mine Countermeasures Mission Package (MCM MP) or Vessel of Opportunity (VOO). An Engineering Development Model (EDM) system was fabricated and tested through Developmental Testing (DT). After incorporating fixes and upgrades discovered during DT and from Fleet operator inputs, an Operational Assessment (OA) was completed from a VOO in order to inform the Milestone C (MS C) decision and Low Rate Initial Production (LRIP) award of five Knifefish systems. Initial integration testing with the LCS was completed prior to MS C. Following Block 1 testing, a full and open competitive production contract will be awarded. The overall approach is to deliver systems through incrementally increasing capability via three Block Upgrades, balancing technology development maturity against a manageable level of risk to the program. New capability Block Upgrades will not transition to the production system until stable requirements are established, demonstrated, and verified for each respective Block. Knifefish is designated as an ACAT II program.

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3123 / <i>SMCM UUV</i>
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Knifefish Development & Engineering Support	C/CPIF	General Dynamics AIS : McLeansville, NC	0.000	8.520	Dec 2018	2.694	Dec 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Hardware/Software Development - Support Equipment	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Knifefish Block 1 Development Contractor	C/CPIF	GDMS : McLeansville, NC	0.000	0.552	Nov 2018	13.326	Nov 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Knifefish Block 1 Development	TBD	Various : Various	0.000	0.000		1.800	Jan 2020	0.000		-		0.000	0.000	1.800	-
Knifefish Block 2 Development Contractor	C/CPIF	GDMS : McLeansville, NC	0.000	0.000		0.000		12.748	Dec 2020	-		12.748	0.000	12.748	-
Knifefish Block 2 Development	TBD	Various : Various	0.000	0.000		0.000		1.350	Dec 2020	-		1.350	0.000	1.350	-
Subtotal			0.000	9.072		17.820		14.098		-		14.098	Continuing	Continuing	N/A

Remarks
FY 2018 and prior funding in Program Element (PE) 0603502N.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support	WR	NSWC, PC : PANAMA CITY, FL	0.000	2.211	Dec 2018	1.450	Dec 2019	1.788	Dec 2020	-		1.788	Continuing	Continuing	Continuing
Engineering Support	WR	NUWC, Newport : NEWPORT, RI	0.000	0.974	Dec 2018	0.850	Dec 2019	1.081	Nov 2020	-		1.081	Continuing	Continuing	Continuing
Engineering Support	WR	Various : Various	0.000	0.563	Dec 2018	0.865	Dec 2019	1.343	Nov 2020	-		1.343	Continuing	Continuing	Continuing
Subtotal			0.000	3.748		3.165		4.212		-		4.212	Continuing	Continuing	N/A

Remarks
FY 2018 and prior funding in Program Element (PE) 0603502N.

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3123 / <i>SMCM UUV</i>
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government T&E Support	WR	Various : Various	0.000	0.145	Jan 2019	0.000		0.267	Dec 2020	-		0.267	0.000	0.412	-
Test and Evaluation	WR	COMOPTEVFOR : NORFOLK, VA	0.000	0.115	Dec 2018	0.415	Dec 2019	0.400	Nov 2020	-		0.400	0.000	0.930	-
Government T&E Support	WR	NSWC, PC : PANAMA CITY, FL	0.000	2.200	Nov 2018	0.385	Dec 2019	0.717	Nov 2020	-		0.717	0.000	3.302	-
Subtotal			0.000	2.460		0.800		1.384		-		1.384	0.000	4.644	N/A

Remarks
FY 2018 and prior funding in Program Element (PE) 0603502N.

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support	C/CPFF	Various : WASHINGTON, DC	0.000	0.682	Feb 2019	0.887	Feb 2020	0.887	Dec 2020	-		0.887	0.000	2.456	-
Travel	WR	NAVSEA : WNY, DC	0.000	0.100	Dec 2018	0.075	Dec 2019	0.075	Nov 2020	-		0.075	0.000	0.250	-
Subtotal			0.000	0.782		0.962		0.962		-		0.962	0.000	2.706	N/A

Remarks
FY 2018 and prior funding in Program Element (PE) 0603502N.

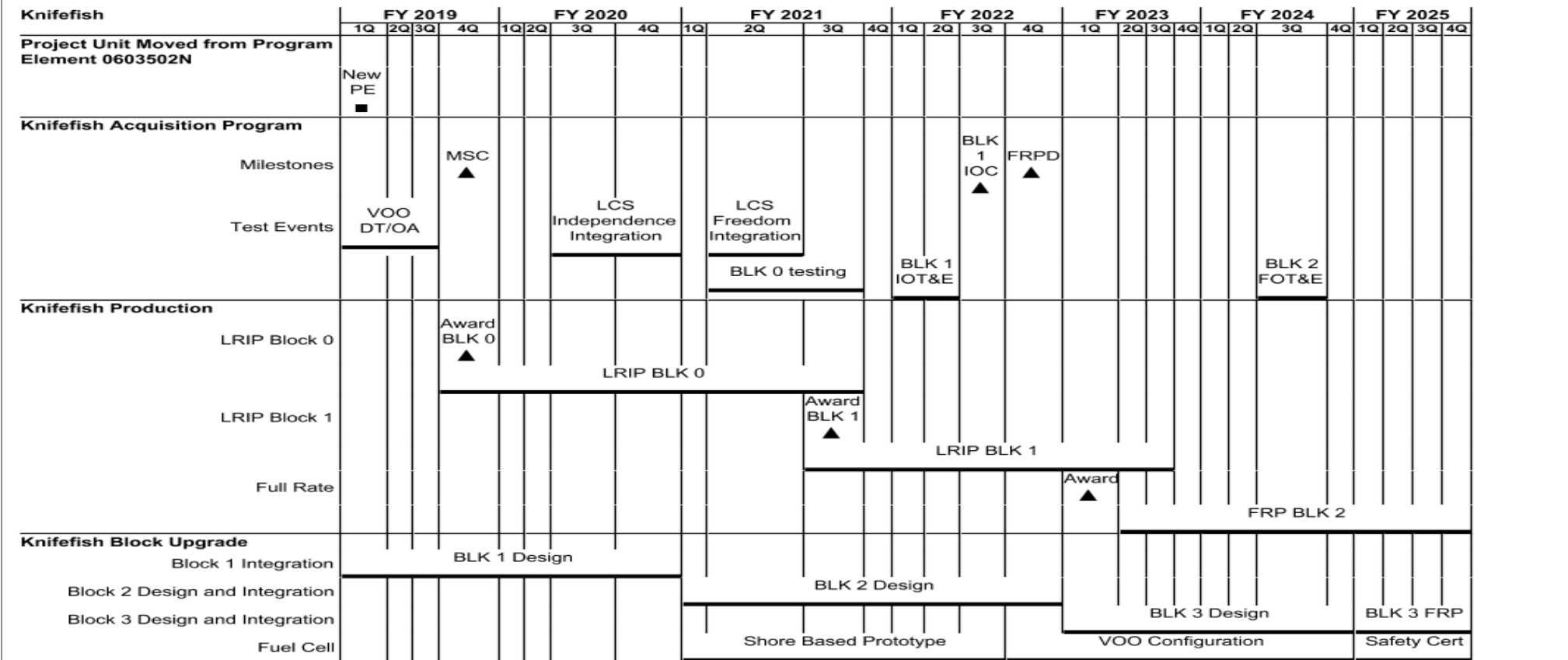
Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract			
Project Cost Totals			0.000	16.062	22.747	20.656	-	20.656	Continuing	Continuing	N/A

Remarks

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3123 / <i>SMCM UUV</i>
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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3123 / <i>SMCM UUV</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Knifefish</i>				
Project Unit Moved from Program Element 0603502N:	1	2019	1	2019
Knifefish Acquisition Program: Milestones: Milestone C	4	2019	4	2019
Knifefish Acquisition Program: Milestones: Block 1 Initial Operational Capability	3	2022	3	2022
Knifefish Acquisition Program: Milestones: Knifefish Full Rate Production Decision	4	2022	4	2022
Knifefish Acquisition Program: Test Events: VOO DT/OA	1	2019	3	2019
Knifefish Acquisition Program: Test Events: LCS Independence Variant Integration	3	2020	4	2020
Knifefish Acquisition Program: Test Events: LCS Freedom Variant Integration	2	2021	2	2021
Knifefish Acquisition Program: Test Events: Block 0 testing	2	2021	3	2021
Knifefish Acquisition Program: Test Events: Block 1 IOT&E	1	2022	2	2022
Knifefish Acquisition Program: Test Events: Block 2 FOT&E	3	2024	3	2024
Knifefish Production: LRIP Block 0: Contract Award	4	2019	4	2019
Knifefish Production: LRIP Block 0: BLK 0 LRIP	4	2019	3	2021
Knifefish Production: LRIP Block 1: Contract Award	3	2021	3	2021
Knifefish Production: LRIP Block 1: BLK 1 LRIP	3	2021	3	2023
Knifefish Production: Full Rate: Contract Award	1	2023	1	2023
Knifefish Production: BLK 2 FRP	2	2023	4	2025
Knifefish Block Upgrade: Block 1 Integration: Design	1	2019	4	2020
Knifefish Block Upgrade: Block 2 Design and Integration: Design	1	2021	4	2022
Knifefish Block Upgrade: Block 3 Design and Integration: Design	1	2023	4	2024
Knifefish Block Upgrade: Block 3 Design and Integration: FRP	1	2025	4	2025
Knifefish Block Upgrade: Fuel Cell: Shore Based Prototype	1	2021	3	2022

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3123 / <i>SMCM UUV</i>
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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Knifefish Block Upgrade: Fuel Cell: VOO Configuration	4	2022	4	2024
Knifefish Block Upgrade: Fuel Cell: Safety Certification	1	2025	4	2025

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3785: <i>Razorback</i>	0.000	0.000	9.780	28.689	-	28.689	25.609	41.918	14.464	14.755	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2019 and prior funding in PE 0604218N. Project 3785 Razorback realigned from PE 0604218N starting in FY 2020.

Shock and Fire Enclosure Capsule (SAFE CAP) is a continuation effort being transferred from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning FY 2020.

A. Mission Description and Budget Item Justification

A part of the Family of UUVs, Littoral Battlespace Sensing - Autonomous Undersea Vehicle, Submarine variant (LBS-AUV(S)) or Razorback is a medium class UUV capable of persistent, autonomous, ocean sensing and data collection in support of Navy Intelligence Preparation of the Operational Environment (IPOE) mission. Razorback is deployed from host submarines in two variants: from the Dry Deck Shelter (DDS) or from the torpedo tube. The DDS deployed Razorback variant has been procured beginning in FY 2017 with Fleet operational deployments planned for FY21. Development of requirements and submarine integration efforts commenced in FY 2019 for the torpedo tube launch and recover (TTL&R) variant, which will be competitively sourced to industry by FY21. Razorback TTL&R leverages risk reduction efforts for torpedo launch and recovery and host submarine integration performed under PE 0604029N UUV Core Technologies.

In order to deploy Razorback or other small or medium class UUVs from a host submarine platform with sufficient endurance to perform a desired mission, high energy density sources such as lithium ion batteries are used. Consequently, safety is paramount and mitigation systems must be in place to prevent or stop a high energy casualty event. Shock and Fire Enclosure Capsule (SAFE CAP) is being developed as an active mitigation strategy that includes a shock qualified capsule that aides in the launch and recovery of small and medium sized UUVs through the torpedo tube, including Razorback. It also contains a Battery Casualty Detection System that constantly monitors battery health and status, providing early warning signs of a battery short. In the event of a casualty, the capsule and vehicle portion of SAFE CAP are flooded via fire hose connections and the event is extinguished.

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 - Razorback	0.000	4.922	22.318	0.000	22.318
Articles:	-	-	-	-	-
FY 2020 Plans: Develop Razorback Request for Proposal (RFP) to industry for the Torpedo Tube Launch & Recovery (TTL&R) variant. Release RFP to Industry and commence source selection activities.					
FY 2021 Base Plans:					

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>		Project (Number/Name) 3785 / <i>Razorback</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
Award Engineering Development Model (EDM) contract. Manage up to two industry teams designing Razorback TTL&R, conduct Preliminary Design Review (PDR) and begin detailed design. Initiate data products development and analysis for submarine integration including Temporary Alteration (TEMPALT) and Li-ion battery certification efforts.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased funding supports the award of EDM Contract(s) and PDR.					
Title: Product Development - SAFECAP					
Articles:					
	0.000	2.004	3.473	0.000	3.473
	-	-	-	-	-
FY 2020 Plans: SAFECAP transitions from Program Element (PE) 0603561N Project 2033. Perform SAFECAP Capstone Test. VIRGINIA CLASS (VACL) Shock Assessment Continue Early Fault Detection Effort.					
FY 2021 Base Plans: Continue integration testing of next gen Sandia National Lab (SNL) Sensors. Continue Early Fault Detection efforts. Commence Shock Test VACL. Commence Capsule Production.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased funding supports SAFECAP test efforts and the commencement of capsule production.					
Title: Support					
Articles:					
	0.000	2.250	2.281	0.000	2.281
	-	-	-	-	-
FY 2020 Plans: Provide acquisition and engineering support for competitive procurement activities and submarine integration efforts, including TEMPALT development and technical reviews, and Li-ion battery certification efforts.					
FY 2021 Base Plans:					

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Provide acquisition and engineering support for contract management activities and submarine integration efforts, including TEMPALT development and technical reviews, and Li-ion battery certification efforts. FY 2021 OCO Plans: N/A FY 2020 to FY 2021 Increase/Decrease Statement: No significant change.					
Title: Management Services Articles:	0.000	0.604	0.617	0.000	0.617
FY 2020 Plans: Provide technical guidance, project planning, program management, financial and contracting management, and travel for RFP release and submarine integration efforts. FY 2021 Base Plans: Provide technical guidance, project planning, program management, financial and contracting management, and travel for contract administration and submarine integration efforts. FY 2021 OCO Plans: N/A FY 2020 to FY 2021 Increase/Decrease Statement: No significant change.	-	-	-	-	-
Accomplishments/Planned Programs Subtotals	0.000	9.780	28.689	0.000	28.689

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• OPN 1611: <i>Small & Medium UUV</i>	0.000	25.601	67.709	2.946	70.655	45.036	30.081	61.422	64.963	Continuing	Continuing
Remarks	The above OPN funding line accounts for several programs, of which the RAZORBACK program is only a portion.										

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>

D. Acquisition Strategy

The Razorback torpedo tube launch and recover (TTL&R) variant will be a competitively sourced Medium class UUV to support missions for the Submarine Force. The Razorback TTL&R acquisition strategy leverages collaboration with the Explosive Ordinance Disposal (EOD) community's Maritime Expeditionary Minehunting UUV (MEMUUV) Medium class UUV for contracting order quantity, training, and sustainment efficiencies. Razorback will leverage lessons learned about mission capabilities and submarine integration from previous science and technology efforts, parallel risk reduction and demonstrations of torpedo tube launch and recover under UUV Core Technology PE 0604029N, Project 4053 UxS Platform efforts, the LBS-AUV systems operated by Naval Oceanographic Command (NAVO), and from the Razorback Dry Deck Shelter variant. Requirements generation and initial submarine integration efforts began in FY19, followed by Request for Proposal (RFP) development and release to industry in FY20. SAFECAP development and submarine integration efforts will continue in parallel to requirements and RFP development in order to provide Li-ion battery casualty mitigations to support Razorback vehicles.

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development - SAFECAP	WR	NUWC NPT : Newport, RI	0.000	0.000		0.700	Oct 2019	0.650	Nov 2020	-		0.650	Continuing	Continuing	Continuing
Product Development - SAFECAP	C/CPFF	Sandia National Labs : Albuquerque, NM	0.000	0.000		0.750	Oct 2019	1.500	Nov 2020	-		1.500	Continuing	Continuing	Continuing
Product Development - SAFECAP	WR	NSWC CD : West Bethesda, MD	0.000	0.000		0.150	Oct 2019	0.175	Nov 2020	-		0.175	Continuing	Continuing	Continuing
Product Development - SAFECAP	WR	NSWC Crane : Crane, Indiana	0.000	0.000		0.150	Oct 2019	0.175	Nov 2020	-		0.175	Continuing	Continuing	Continuing
RAZORBACK Product Development -	WR	NUWC NPT : Newport, RI	0.000	0.000		4.922	Mar 2020	1.500	Oct 2020	-		1.500	0.000	6.422	-
RAZORBACK EDM Contract	C/CPIF	TBD : TBD	0.000	0.000		0.000		20.818	Dec 2020	-		20.818	0.000	20.818	-
Product Development - SAFECAP	C/CPAF	Hyrdooid, Inc : TBD	0.000	0.000		0.254	Nov 2019	0.373	Nov 2020	-		0.373	0.000	0.627	-
Product Development - SAFECAP	C/CPAF	HII (Advex) : Norfolk, VA	0.000	0.000		0.000		0.600	Nov 2020	-		0.600	0.000	0.600	-
Subtotal			0.000	0.000		6.926		25.791		-		25.791	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support - RAZORBACK	WR	NUWC Newport : Newport, RI	0.000	0.000		2.250	Nov 2019	2.281	Nov 2020	-		2.281	0.000	4.531	-
Subtotal			0.000	0.000		2.250		2.281		-		2.281	0.000	4.531	N/A

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Management - SAFECAP	Various	Varios : Washington DC	0.000	0.000		0.146	Oct 2019	0.147	Nov 2020	-		0.147	Continuing	Continuing	Continuing
Travel - RAZORBACK	Various	NAVSEA HQ : Washington DC	0.000	0.000		0.050	Oct 2019	0.060	Oct 2020	-		0.060	0.000	0.110	-
Management - RAZORBACK	Various	Various : Various	0.000	0.000		0.408	Dec 2019	0.410	Dec 2020	-		0.410	0.000	0.818	-
Subtotal			0.000	0.000		0.604		0.617		-		0.617	Continuing	Continuing	N/A

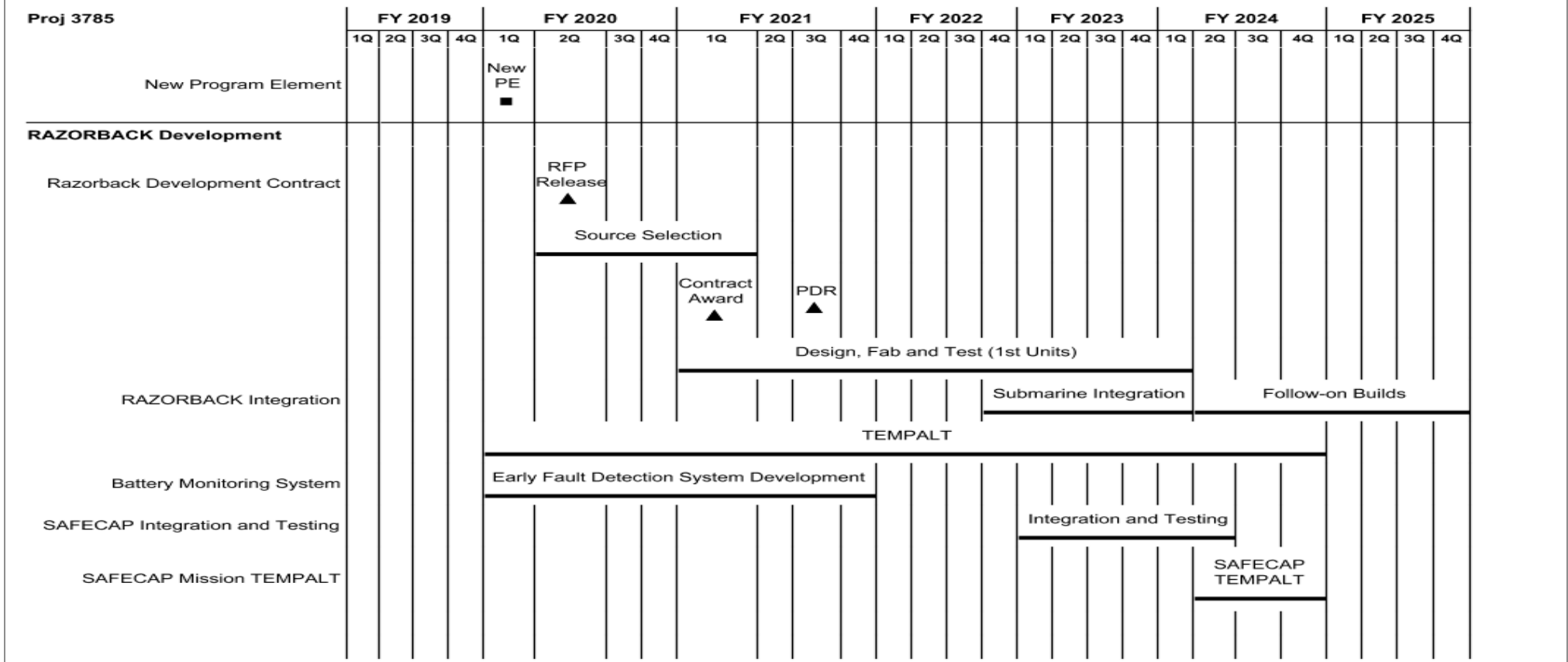
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		0.000	0.000	9.780	28.689	-	28.689	Continuing	Continuing	N/A

Remarks
 Razorback realigned from Program Element (PE) 0604218N Project 2345 to PE 0604028N Project 3785 beginning in FY 2020.
 SAFECAP realigned from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning in FY 2020.

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>
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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 3785 / <i>Razorback</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3785				
New Program Element: Schedule Detail	1	2020	1	2020
RAZORBACK Development: Razorback Development Contract: RFP	2	2020	2	2020
RAZORBACK Development: Razorback Development Contract: Source Selection	2	2020	1	2021
RAZORBACK Development: Razorback Development Contract: Contract Award	1	2021	1	2021
RAZORBACK Development: Razorback Development Contract: Preliminary Design Review	3	2021	3	2021
RAZORBACK Development: Razorback Development Contract: Design, Fabricate, and Test	1	2021	1	2024
RAZORBACK Development: RAZORBACK Integration: Submarine Integration	4	2022	1	2024
RAZORBACK Development: RAZORBACK Integration: Follow-on Builds	2	2024	4	2025
RAZORBACK Development: RAZORBACK Integration: TEMPALT	1	2020	4	2024
RAZORBACK Development: Battery Monitoring System: Early Fault Detection System Development	1	2020	4	2021
RAZORBACK Development: SAFECAP Integration and Testing: System Shakedown Testing	1	2023	2	2024
RAZORBACK Development: SAFECAP Mission TEMPALT: TEMPALT	2	2024	4	2024

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
9999: <i>Congressional Adds</i>	0.000	0.000	14.734	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.734
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

MCM UON funding in PE 0604028N is a Congressional Add Line #75

A. Mission Description and Budget Item Justification

Mine Countermeasures (MCM) Urgent Operational Need (UON) was submitted by US Naval Forces Central Command (NAVCENT) and endorsed by US Fleet Forces Command (USFF) in August of 2018. 12 February 2019, OPNAV N9 issued a SECRET letter 3100 Ser N9/19S13905 "Resolution for Clandestine Mine Detection". This effort will deliver a baseline capability and a streamlined development approach including prototyping, integration, testing, demonstration and fielding of a mission package to answer this UON.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020
Congressional Add: MCM UUV UON	0.000	14.734
FY 2019 Accomplishments: N/A		
FY 2020 Plans: Procure (4) small UUV's and where possible leverage existing medium UUV programs		
- Preliminary design, integration, testing, and demonstration of mission package		
- Initiate integration of launch and recovery technologies		
- Upgrade self-protection autonomy suite		
- Finalize design changes needed for both the vehicle(s) and host platform for launching and/or recovering		
- Initiate Rapid Fielding (RF) TEMPALT design packages and approvals		
Congressional Adds Subtotals	0.000	14.734

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

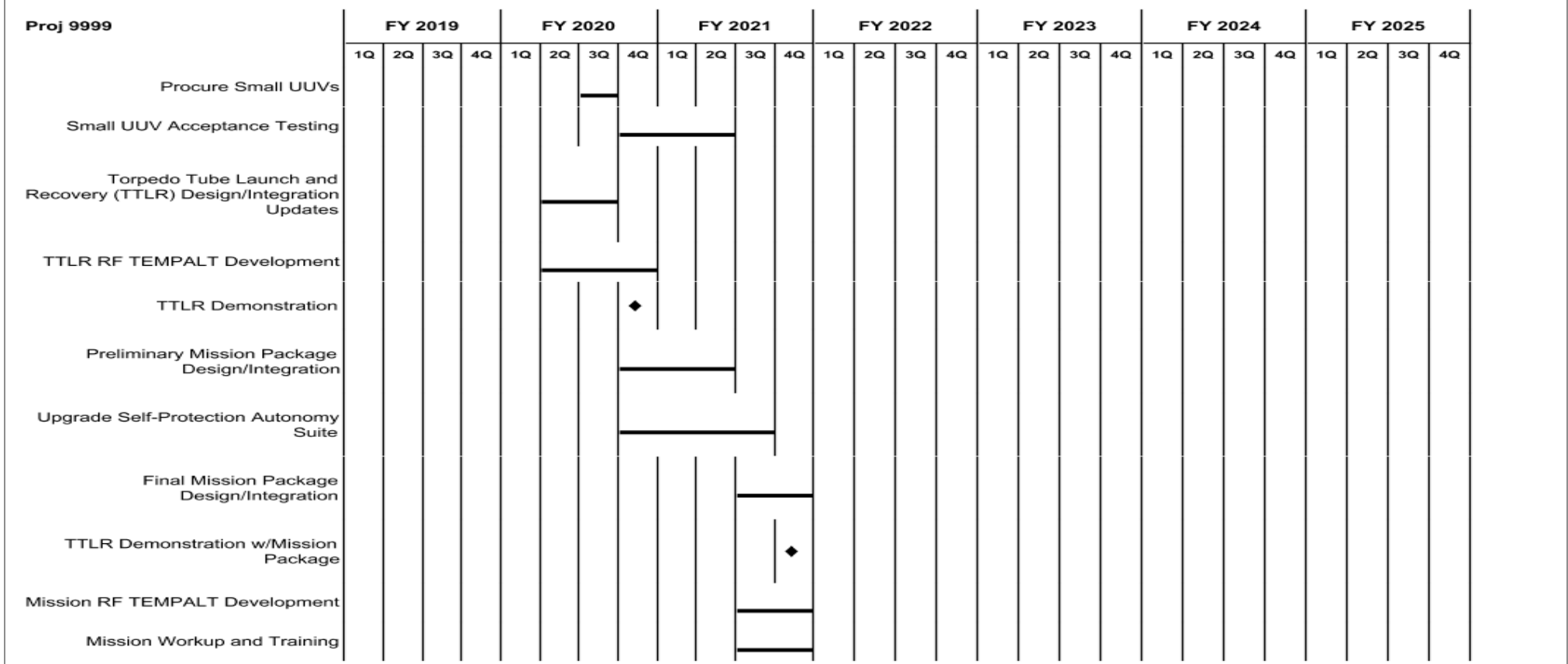
D. Acquisition Strategy

N/A

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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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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 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 9999				
Procure Small UUVs: Procure Small UUVs	3	2020	3	2020
Small UUV Acceptance Testing: Small UUV Acceptance Testing	4	2020	2	2021
Torpedo Tube Launch and Recovery (TTLR) Design/Integration Updates: Torpedo Tube Launch and Recovery (TTLR) Design/Integration Updates	2	2020	3	2020
TTLR RF TEMPALT Development: TTLR RF TEMPALT Development	2	2020	4	2020
TTLR Demonstration: TTLR Demonstration	4	2020	4	2020
Preliminary Mission Package Design/Integration: Preliminary Mission Package Design/Integration	4	2020	2	2021
Upgrade Self-Protection Autonomy Suite: Upgrade Self-Protection Autonomy Suite	4	2020	3	2021
Final Mission Package Design/Integration: Final Mission Package Design/Integration	3	2021	4	2021
TTLR Demonstration w/Mission Package: TTLR Demonstration w/Mission Package	4	2021	4	2021
Mission RF TEMPALT Development: Mission RF TEMPALT Development	3	2021	4	2021
Mission Workup and Training: Mission Workup and Training	3	2021	4	2021