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**Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy** **Date:** April 2022

|   |  |
|---|--|
| <b>Appropriation/Budget Activity</b><br>1319: <i>Research, Development, Test &amp; Evaluation, Navy / BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i> | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |
|---|--|

| COST (\$ in Millions)                         | Prior Years | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | FY 2024 | FY 2025 | FY 2026 | FY 2027 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element                         | 205.004     | 37.754  | 79.947  | 106.347      | -           | 106.347       | 82.023  | 25.661  | 22.967  | 22.996  | Continuing       | Continuing |
| 2482: <i>Small Unmanned Undersea Vehicles</i> | 0.000       | 4.509   | 11.152  | 7.380        | -           | 7.380         | 8.442   | 0.430   | 0.204   | 0.201   | Continuing       | Continuing |
| 2483: <i>Medusa</i>                           | 0.000       | 0.000   | 1.877   | 28.563       | -           | 28.563        | 32.360  | 0.722   | 0.707   | 0.676   | Continuing       | Continuing |
| 3123: <i>SMCM UUV</i>                         | 37.917      | 19.875  | 20.909  | 19.788       | -           | 19.788        | 8.530   | 1.849   | 1.817   | 1.676   | Continuing       | Continuing |
| 3785: <i>Razorback</i>                        | 9.397       | 13.370  | 33.922  | 36.513       | -           | 36.513        | 19.164  | 11.529  | 9.295   | 9.290   | Continuing       | Continuing |
| 4023: <i>Expeditionary Underwater Systems</i> | 157.690     | 0.000   | 12.087  | 14.103       | -           | 14.103        | 13.527  | 11.131  | 10.944  | 11.153  | Continuing       | Continuing |

**Note**

Razorback Project 3785 realigned from PE 0604218N starting in FY 2020. SAFECAP realigned from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning in FY20.

Lionfish Project 2482 (SUUV) programs realigned from PE 0603654N to PE0604028N beginning in FY21.

MK 18 UUV Family of Systems and Viperfish (Medium MEMUUV) Project 4023 realigned from PE 0603654N to PE0604028N beginning in FY22.

**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.

Small 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.

Funding supports the development of unmanned systems for the Navy's expeditionary unmanned underwater Explosive Ordnance Disposal (EOD) and Mine Countermeasures (MCM) capability. Specifically, it provides for development of affordable expeditionary, unmanned underwater systems to support Navy Expeditionary forces including EOD, Mobile Diving and Salvage, Underwater Construction Teams (UCT), Very Shallow Water (VSW), and Expeditionary Mine Countermeasures (ExMCM) mission operations. The equipment must be highly portable in order to support the Navy EOD technician to safely approach, render safe, recover, exploit, and dispose of underwater explosive threats to include sea mines, limpet mines, and unexploded ordnance. Provides support for the Navy's high priority missions of Maritime Homeland Defense and MCM, including clandestine reconnaissance and mine clearance in support of amphibious operations. Development of Expeditionary

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| <b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2023 Navy   |  | <b>Date:</b> April 2022 |
| <b>Appropriation/Budget Activity</b><br>1319: <i>Research, Development, Test &amp; Evaluation, Navy I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |                         |
| <p>UUV systems to support localization render-safe and detailed intelligence gathering of unexploded ordnance (UXO) including Underwater Improvised Explosive Devices (IEDs).</p> <p>FY23 will continue the development and testing of advanced technologies that will allow warfighters to detect, classify, and localize high priority threats in meeting mine warfare missions. MK 18 Mod 2 Increment II upgrade will provide improved Automated Target Recognition (ATR) algorithms, more advanced autonomy architecture and continue to enhance electro-optic sensor performance. Increment II development and testing will focus on improving MCM performance and reducing the tactical timeline through development of a Reacquire, Identify and Mark capability.</p> <p>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.</p> <p>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 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 FY21. Development of requirements and submarine integration efforts commenced in FY 2019 for the torpedo tube launch and recover (TTL&amp;R) variant, which will be competitively sourced to industry by FY22.</p> <p>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.</p> <p>MEDUSA is a medium class UUV capable of offensive mining capabilities deployed from a submarine. MEDUSA features torpedo tube launch capability, long range, high payload placement accuracy, and can handle heavy payloads. A prototype system was developed and tested in FY2021 using dummy payloads using a land-based launch facility and surface launched in-water demonstrations. 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&amp;R) variant. MEDUSA is approximately 21 inches in diameter, impulse launched from the torpedo tube, and expendable once the payloads are deployed. Razorback TTL&amp;R is expected to be less than 15 inches in diameter, swim out launch and recover from the torpedo tube, and be capable of swappable payloads to conduct a variety of missions.</p> |  |                         |

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| <b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2023 Navy | <b>Date:</b> April 2022 |
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| <b>Appropriation/Budget Activity</b><br>1319: <i>Research, Development, Test &amp; Evaluation, Navy / BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i> | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |
|---|--|

| <b>B. Program Change Summary (\$ in Millions)</b> | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget                       | 38.968         | 84.676         | 0.000               | -                  | 0.000                |
| Current President's Budget                        | 37.754         | 79.947         | 106.347             | -                  | 106.347              |
| Total Adjustments                                 | -1.214         | -4.729         | 106.347             | -                  | 106.347              |
| • Congressional General Reductions                | -              | -              |                     |                    |                      |
| • Congressional Directed Reductions               | -              | -4.729         |                     |                    |                      |
| • Congressional Rescissions                       | -              | -              |                     |                    |                      |
| • Congressional Adds                              | -              | -              |                     |                    |                      |
| • Congressional Directed Transfers                | -              | -              |                     |                    |                      |
| • Reprogrammings                                  | -              | -              |                     |                    |                      |
| • SBIR/STTR Transfer                              | -1.214         | 0.000          |                     |                    |                      |
| • Program Adjustments                             | 0.000          | 0.000          | 0.000               | -                  | 0.000                |
| • Rate/Misc Adjustments                           | 0.000          | 0.000          | 0.000               | -                  | 0.000                |
| • Adjustments to Budget Year                      | -              | -              | 106.347             | -                  | 106.347              |

**Change Summary Explanation**

Program Changes:

Technical: Not applicable.

Schedule: Not applicable.

Cost:

FY 2021: -\$1,214K Small Business Innovative Research

FY 2022: No Change

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FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

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|--|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|-------------------------|-------------------------|-------------------|
| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |                    |                |                |                     |  |                      |                |                |  | <b>Date:</b> April 2022 |                         |                   |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   |                    |                |                |                     | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |                      |                |                | <b>Project (Number/Name)</b><br>2482 / <i>Small Unmanned Undersea Vehicles</i> |                         |                         |                   |
| <b>COST (\$ in Millions)</b>                                       | <b>Prior Years</b> | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b>   | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b>   | <b>FY 2027</b>          | <b>Cost To Complete</b> | <b>Total Cost</b> |
| 2482: <i>Small Unmanned Undersea Vehicles</i>                      | 0.000              | 4.509          | 11.152         | 7.380               | -  | 7.380                | 8.442          | 0.430          | 0.204  | 0.201                   | Continuing              | Continuing        |
| Quantity of RDT&E Articles   |                    | -              | -              | -                   | -  | -                    | -              | -              | -  | -                       |                         |                   |

**Note**

The FY 2023 funding request was reduced by \$0.563M to account for the availability of prior year execution balances.

**A. Mission Description and Budget Item Justification**

As part of the Expeditionary UUV Family of Systems (FoS) the LIONFISH UUV Program of Record develops advanced SUUVs to support myriad missions across warfare domains. The missions include: expeditionary mine countermeasures, expeditionary data collection and surveillance, and intelligence preparation of the environment (IPOE). Equipment includes vehicles and associated systems support equipment. Planned block upgrades include increased detection range capability, communications upgrades, automated target recognition, cybersecurity, 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)**

|  | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <b>Title:</b> SMALL UNMANNED UNDERWATER VEHICLES   | 4.509          | 11.152         | 7.380               | 0.000              | 7.380                |
| <b>Articles:</b>   | -              | -              | -                   | -                  | -                    |
| <b>FY 2022 Plans:</b><br>FY22 efforts will include the transition of DIU prototype and development of production representative articles which are critical to the continued development and integration of key capabilities. Capabilities include cyber security, autonomy, Automated Target Recognition (ATR), and Forward Look Sonar (FLS). OTA contract for 6 production representative articles will be awarded in FY22. These systems will also support test and evaluation efforts to demonstrate operational effectiveness and suitability against CNO approved Top Level Requirements (TLRs). These efforts will provide the Objective Quality Evidence (OQE) to initiate low-rate initial production beginning in FY23 to support the mandate to deliver 24 systems to the fleet by the end of FY24. |                |                |                     |                    |                      |
| <b>FY 2023 Base Plans:</b><br>FY23 efforts include the continued development and integration of cyber security, autonomy, Automated Target Recognition (ATR), and both Forward Look Sonar (FLS) and Synthetic Aperture Sonar (SAS) sensors. Increased testing of FLS and SAS sensors will provide data used for the development of ATR algorithms as well as OQE for future increments. Authority to Operate (ATO) is planned to occur making this the first SUUV to meet Security Classification Guide (SCG) requirements critical to meeting the multiple warfare communities UUV requirements.  |                |                |                     |                    |                      |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022  |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2482 / <i>Small Unmanned Undersea Vehicles</i> |

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>  | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Autonomy efforts will include the tuning of autonomous software to support FLS and SAS sensors. Results of these efforts will culminate in a low-rate initial production vehicle delivered to the government for government acceptance testing.<br><br><b>FY 2023 OCO Plans:</b><br>N/A<br><br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Decrease of \$3.772 from FY 2022 to FY 2023 due to Production Representative Articles (PRA) acquisition completing in FY22. |                |                |                     |                    |                      |
| <b>Accomplishments/Planned Programs Subtotals</b>  | 4.509          | 11.152         | 7.380               | 0.000              | 7.380                |

| <b>C. Other Program Funding Summary (\$ in Millions)</b> |                |                |                     |                    |                      |                |                |                |                |                         |                   |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u>   | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023 Base</u> | <u>FY 2023 OCO</u> | <u>FY 2023 Total</u> | <u>FY 2024</u> | <u>FY 2025</u> | <u>FY 2026</u> | <u>FY 2027</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • 8128: <i>Lionfish</i>                                  | 0.000          | 0.000          | 18.354              | -                  | 18.354               | 9.494          | 17.612         | 16.183         | 17.861         | 0.000                   | 79.504            |

**Remarks**

**D. Acquisition Strategy**

The LIONFISH (SUUV) Program is completing its OTA and entering production negotiations under a FAR based contract.

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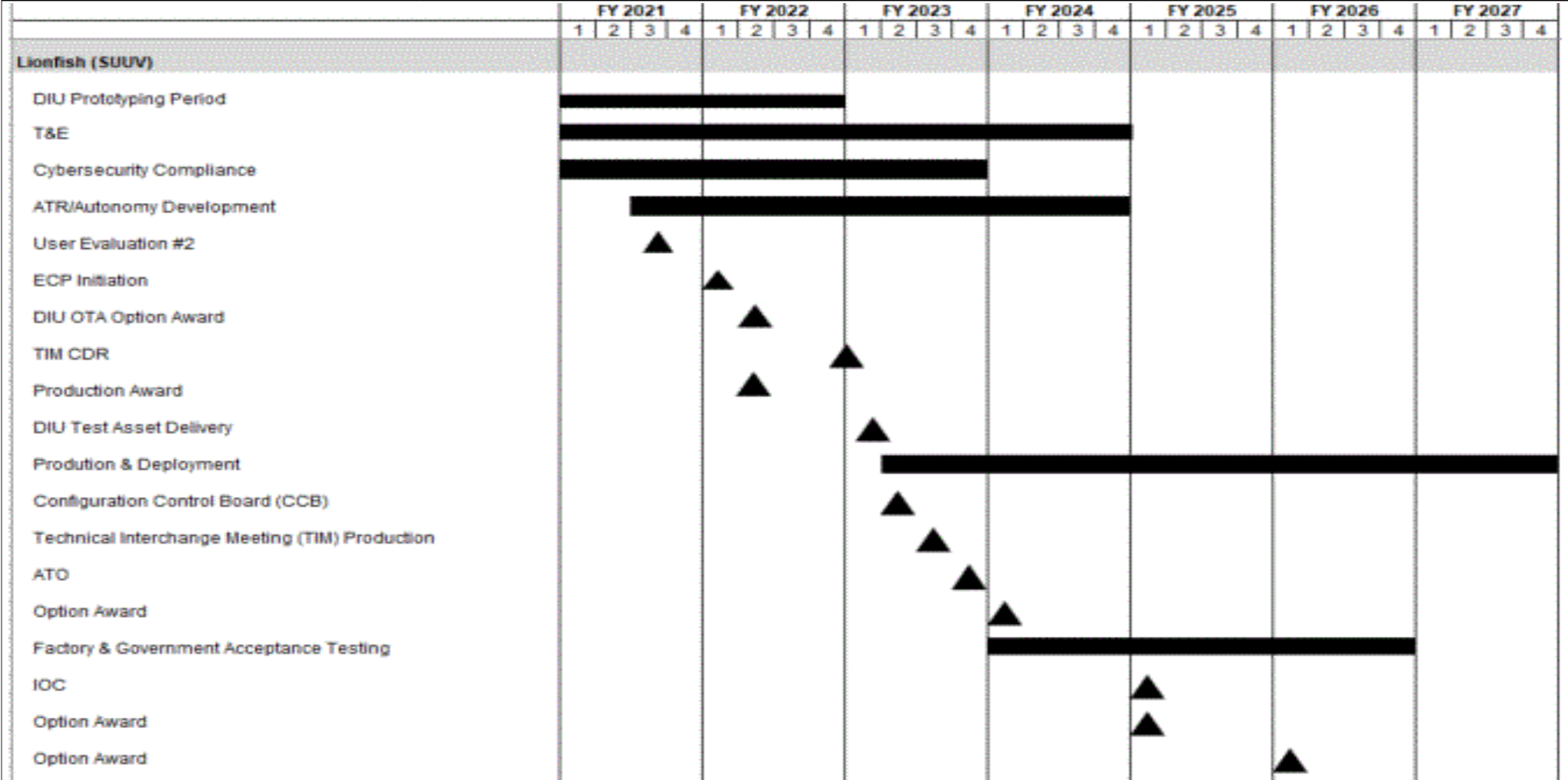
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy |                        |                                |             |   |            |         |            |              |            |   |            | Date: April 2022 |                  |            |                          |
|--|------------------------|--------------------------------|-------------|---|------------|---------|------------|--------------|------------|---|------------|------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity                          |                        |                                |             | R-1 Program Element (Number/Name)                     |            |         |            |              |            | Project (Number/Name)                   |            |                  |                  |            |                          |
| 1319 / 4   |                        |                                |             | PE 0604028N / Small/Medium Unmanned Undersea Vehicles |            |         |            |              |            | 2482 / Small Unmanned Undersea Vehicles |            |                  |                  |            |                          |
| <b>Product Development (\$ in Millions)</b>            |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO                             |            | FY 2023 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 |
| Primary Hardware Development                           | C/CPFF                 | TBD : TBD                      | 0.000       | 1.892   | Nov 2020   | 6.693   | Nov 2021   | 3.048        | Nov 2022   | -                                       |            | 3.048            | Continuing       | Continuing | Continuing               |
| Systems Engineering                                    | C/CPFF                 | NSWC, Activities : Various     | 0.000       | 0.490   | Nov 2020   | 1.010   | Nov 2021   | 0.726        | Nov 2022   | -                                       |            | 0.726            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |                                | 0.000       | 2.382   |            | 7.703   |            | 3.774        |            | -                                       |            | 3.774            | Continuing       | Continuing | N/A                      |
| <b>Support (\$ in Millions)</b>                        |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO                             |            | FY 2023 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 |
| Technical Support                                      | C/CPFF                 | Various : TBD                  | 0.000       | 0.144   | Nov 2020   | 0.388   | Nov 2021   | 0.184        | Nov 2022   | -                                       |            | 0.184            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |                                | 0.000       | 0.144   |            | 0.388   |            | 0.184        |            | -                                       |            | 0.184            | Continuing       | Continuing | N/A                      |
| <b>Test and Evaluation (\$ in Millions)</b>            |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO                             |            | FY 2023 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 |
| Developmental Test & Evaluation                        | WR                     | NIWC : San Diego               | 0.000       | 1.101   | Nov 2020   | 1.498   | Nov 2021   | 2.201        | Nov 2022   | -                                       |            | 2.201            | Continuing       | Continuing | Continuing               |
| Developmental Test & Evaluation                        | WR                     | NUWC : Newport                 | 0.000       | 0.766   | Nov 2020   | 1.174   | Nov 2021   | 1.034        | Nov 2022   | -                                       |            | 1.034            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |                                | 0.000       | 1.867   |            | 2.672   |            | 3.235        |            | -                                       |            | 3.235            | Continuing       | Continuing | N/A                      |
| <b>Management Services (\$ in Millions)</b>            |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO                             |            | FY 2023 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 |
| Program Management Support                             | WR                     | NSWC IHEODTD : Indian Head, MD | 0.000       | 0.116   | Nov 2020   | 0.389   | Nov 2021   | 0.187        | Nov 2022   | -                                       |            | 0.187            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |                                | 0.000       | 0.116   |            | 0.389   |            | 0.187        |            | -                                       |            | 0.187            | Continuing       | Continuing | N/A                      |



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**Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy** **Date:** April 2022

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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2482 / <i>Small Unmanned Undersea Vehicles</i> |
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| <b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2023 Navy |  | <b>Date:</b> April 2022  |
| <b>Appropriation/Budget Activity</b><br>1319 / 4              | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2482 / <i>Small Unmanned Undersea Vehicles</i> |

Schedule Details

| Events by Sub Project  | Start   |      | End     |      |
|--|---------|------|---------|------|
|  | Quarter | Year | Quarter | Year |
| <b>Proj 2482</b>   |         |      |         |      |
| SMALL CLASS MEMUUV: DIU Prototyping Period                         | 1       | 2021 | 4       | 2022 |
| SMALL CLASS MEMUUV: T&E  | 1       | 2021 | 4       | 2024 |
| SMALL CLASS MEMUUV: Cybersecurity Compliance                       | 1       | 2021 | 4       | 2023 |
| SMALL CLASS MEMUUV: User Evaluation #2                             | 3       | 2021 | 3       | 2021 |
| SMALL CLASS MEMUUV: ECP Initiation                                 | 1       | 2022 | 1       | 2022 |
| SMALL CLASS MEMUUV: DIU OTA Option Award                           | 2       | 2022 | 2       | 2022 |
| SMALL CLASS MEMUUV: TIM CDR  | 1       | 2023 | 1       | 2023 |
| SMALL CLASS MEMUUV: Production Award                               | 2       | 2022 | 2       | 2022 |
| SMALL CLASS MEMUUV: DIU Test Asset Delivery                        | 1       | 2023 | 1       | 2023 |
| SMALL CLASS MEMUUV: Production & Deployment                        | 2       | 2023 | 4       | 2027 |
| SMALL CLASS MEMUUV: Configuration Control Board (CCB)              | 2       | 2023 | 2       | 2023 |
| SMALL CLASS MEMUUV: Technical Interchange Meeting (TIM) Production | 4       | 2023 | 4       | 2023 |
| SMALL CLASS MEMUUV: ATO  | 4       | 2023 | 4       | 2023 |
| SMALL CLASS MEMUUV: Option 1 Procurement Award                     | 1       | 2024 | 1       | 2024 |
| SMALL CLASS MEMUUV: Factory & Government Acceptance Testing        | 1       | 2024 | 4       | 2026 |
| SMALL CLASS MEMUUV: Option 2 Procurement Award                     | 1       | 2025 | 1       | 2025 |
| SMALL CLASS MEMUUV: Option 3 Procurement Award                     | 1       | 2026 | 1       | 2026 |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |                    |                |                |                     |  |                      |                |                |  | <b>Date:</b> April 2022 |                         |                   |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   |                    |                |                |                     | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |                      |                |                | <b>Project (Number/Name)</b><br>2483 / <i>Medusa</i> |                         |                         |                   |
| <b>COST (\$ in Millions)</b>                                       | <b>Prior Years</b> | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b>   | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b>                                       | <b>FY 2027</b>          | <b>Cost To Complete</b> | <b>Total Cost</b> |
| 2483: <i>Medusa</i>  | 0.000              | 0.000          | 1.877          | 28.563              | -  | 28.563               | 32.360         | 0.722          | 0.707  | 0.676                   | Continuing              | Continuing        |
| 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. MEDUSA features torpedo tube launch capability, long range, high payload placement accuracy, and can handle heavy payloads. A prototype system was developed and tested in FY2021 using dummy payloads using a land-based launch facility and surface launched in-water demonstrations. Lessons learned from the prototype and demonstration is informing a program start in FY2022 and competitive award to Industry in FY2023 to develop and produce tactical prototype systems. The MEDUSA prototype and Industry system differ from the Razorback Torpedo Tube Launch and Recovery (TTL&R) variant. MEDUSA is approximately 21 inches in diameter, impulse launched from the torpedo tube, and expendable once the payloads are deployed. Razorback TTL&R is expected to be less than 15 inches in diameter, swim out and launch and recover from the torpedo tube, and be capable of swappable payloads to conduct a variety of missions.

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

|   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <b>Title:</b> MEDUSA Product Development  | 0.000          | 1.417          | 25.959              | 0.000              | 25.959               |
| <b>Articles:</b>  | -              | -              | -                   | -                  | -                    |
| <b>FY 2022 Plans:</b><br>Incorporate technical lessons learned from previous demonstrations into Program of Record documentation. Develop Top Level Requirements (TLR). Prepare competitive Request for Proposal (RFP) and release in Q4 to Industry. |                |                |                     |                    |                      |
| <b>FY 2023 Base Plans:</b><br>Award prototyping contract to industry designing MEDUSA. Initiate risk reduction and preliminary design.  |                |                |                     |                    |                      |
| <b>FY 2023 OCO Plans:</b><br>N/A  |                |                |                     |                    |                      |
| <b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Increase due to MEDUSA contract award in FY2023.  |                |                |                     |                    |                      |
| <b>Title:</b> MEDUSA Support  | 0.000          | 0.250          | 2.150               | 0.000              | 2.150                |
| <b>Articles:</b>  | -              | -              | -                   | -                  | -                    |
| <b>FY 2022 Plans:</b>   |                |                |                     |                    |                      |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                              |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2483 / <i>Medusa</i> |

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Provide acquisition and engineering support for RFP development, initiate source selection management activities, and initiate submarine integration efforts.<br><br><b>FY 2023 Base Plans:</b><br>Provide acquisition and engineering support for source selection, contract management activities, and initiate submarine integration efforts, including TEMPALT development and battery certification efforts.<br><br><b>FY 2023 OCO Plans:</b><br>N/A<br><br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Increase due to MEDUSA contract award in FY2023.                 |                |                |                     |                    |                      |
| <b>Title:</b> MEDUSA Management Services<br><br><b>Articles:</b>  | 0.000<br>-     | 0.210<br>-     | 0.454<br>-          | 0.000<br>-         | 0.454<br>-           |
| <b>FY 2022 Plans:</b><br>Provide technical guidance, project planning, program management, financial and contracting management, and travel for contract administration and submarine integration efforts.<br><br><b>FY 2023 Base Plans:</b><br>Provide technical guidance, project planning, program management, financial and contracting management, and travel for contract administration and submarine integration efforts.<br><br><b>FY 2023 OCO Plans:</b><br>N/A<br><br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Increase due to MEDUSA contract award in FY2023. |                |                |                     |                    |                      |
| <b>Accomplishments/Planned Programs Subtotals</b>   | 0.000          | 1.877          | 28.563              | 0.000              | 28.563               |

| <b>C. Other Program Funding Summary (\$ in Millions)</b> |                |                |                     |                    |                      |                |                |                |                |                         |                   |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <b>Line Item</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b> | <b>FY 2027</b> | <b>Cost To Complete</b> | <b>Total Cost</b> |
| • OPN/1611: <i>Small &amp; Medium UUV</i>                | 0.000          | 0.000          | 0.000               | -                  | 0.000                | 0.000          | 10.757         | 21.510         | 21.931         | Continuing              | Continuing        |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                              |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2483 / <i>Medusa</i> |

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

| <u>Line Item</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u><br><u>Base</u> | <u>FY 2023</u><br><u>OCO</u> | <u>FY 2023</u><br><u>Total</u> | <u>FY 2024</u> | <u>FY 2025</u> | <u>FY 2026</u> | <u>FY 2027</u> | <u>Cost To</u><br><u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

**Remarks**

The above OPN funding line accounts for several programs. Only the Medusa funding is displayed above.

**D. Acquisition Strategy**

In FY2017, development of a single MEDUSA prototype system was initiated using Navy RDT&E funding to execute a demonstration from a host submarine as a proof of concept. The prototype system was developed and tested in FY2021 using dummy payloads using a land based launch facility and surface launched in-water demonstrations. Lessons learned from the prototype and demonstration is informing a UUV program start in FY2022. Detailed acquisition planning and requirements generation commenced in FY2022, with the target to competitively award a contract to Industry in FY2023 for the fabrication of tactical prototype systems.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy |                        |                                |             |   |            |         |            |              |            |                       |            | Date: April 2022 |                  |            |                          |
|--|------------------------|--------------------------------|-------------|---|------------|---------|------------|--------------|------------|-----------------------|------------|------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity                          |                        |                                |             | R-1 Program Element (Number/Name)                     |            |         |            |              |            | Project (Number/Name) |            |                  |                  |            |                          |
| 1319 / 4   |                        |                                |             | PE 0604028N / Small/Medium Unmanned Undersea Vehicles |            |         |            |              |            | 2483 / Medusa         |            |                  |                  |            |                          |
| Product Development (\$ in Millions)                   |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO           |            | FY 2023 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 |
| MEDUSA Product Development                             | WR                     | NSWC PCD : Panama City, FL     | 0.000       | 0.000   |            | 0.944   | Apr 2022   | 2.446        | Nov 2022   | -                     |            | 2.446            | Continuing       | Continuing | Continuing               |
| MEDUSA Product Development                             | WR                     | NUWC NPT : Newport, RI         | 0.000       | 0.000   |            | 0.314   | Apr 2022   | 1.013        | Nov 2022   | -                     |            | 1.013            | Continuing       | Continuing | Continuing               |
| MEDUSA Prototype Contract                              | WR                     | Various : Various              | 0.000       | 0.000   |            | 0.159   | Apr 2022   | 1.100        | Nov 2022   | -                     |            | 1.100            | Continuing       | Continuing | Continuing               |
| MEDUSA Prototype Contract                              | C/FPIF                 | TBD : TBD                      | 0.000       | 0.000   |            | 0.000   |            | 21.400       | Jun 2023   | -                     |            | 21.400           | 0.000            | 21.400     | -                        |
| <b>Subtotal</b>  |                        |                                | 0.000       | 0.000   |            | 1.417   |            | 25.959       |            | -                     |            | 25.959           | Continuing       | Continuing | N/A                      |
| Support (\$ in Millions)                               |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO           |            | FY 2023 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 |
| MEDUSA Engineering Support                             | WR                     | NSWC PD : Panama City, FL      | 0.000       | 0.000   |            | 0.125   | Apr 2022   | 1.433        | Nov 2022   | -                     |            | 1.433            | Continuing       | Continuing | Continuing               |
| MEDUSA Engineering Support                             | WR                     | Various : Various              | 0.000       | 0.000   |            | 0.125   | Apr 2022   | 0.717        | Nov 2022   | -                     |            | 0.717            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |                                | 0.000       | 0.000   |            | 0.250   |            | 2.150        |            | -                     |            | 2.150            | Continuing       | Continuing | N/A                      |
| Management Services (\$ in Millions)                   |                        |                                |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO           |            | FY 2023 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 |
| MEDUSA Travel  | Various                | NAVSEA : Washington, DC        | 0.000       | 0.000   |            | 0.010   | Apr 2022   | 0.050        | Nov 2022   | -                     |            | 0.050            | Continuing       | Continuing | Continuing               |
| MEDUSA Management                                      | Various                | Various : Various              | 0.000       | 0.000   |            | 0.200   | Apr 2022   | 0.404        | Nov 2022   | -                     |            | 0.404            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |                                | 0.000       | 0.000   |            | 0.210   |            | 0.454        |            | -                     |            | 0.454            | Continuing       | Continuing | N/A                      |

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|---|--------------------|----------------|----------------|--|---------------------|--------------------|----------------------|--|-------------------|---------------------------------|--|
| <b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2023 Navy</b> |                    |                |                |  |                     |                    |                      | <b>Date: April 2022</b>                              |                   |                                 |  |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                  |                    |                |                | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |                     |                    |                      | <b>Project (Number/Name)</b><br>2483 / <i>Medusa</i> |                   |                                 |  |
|   | <b>Prior Years</b> | <b>FY 2021</b> | <b>FY 2022</b> |  | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> | <b>Cost To Complete</b>                              | <b>Total Cost</b> | <b>Target Value of Contract</b> |  |
| <b>Project Cost Totals</b>  | 0.000              | 0.000          | 1.877          |  | 28.563              | -                  | 28.563               | Continuing   | Continuing        | N/A                             |  |

**Remarks**

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**Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy** **Date:** April 2022

|  |  |  |
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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2483 / <i>Medusa</i> |
|--|--|--|

| MEDUSA                                   | FY 2021 |    |    |                | FY 2022 |    |                  |    | FY 2023 |    |                  |                                   | FY 2024 |    |          |                 | FY 2025 |    |          |                  | FY 2026 |    |    |    | FY 2027 |    |    |    |
|--|---------|----|----|----------------|---------|----|------------------|----|---------|----|------------------|-----------------------------------|---------|----|----------|-----------------|---------|----|----------|------------------|---------|----|----|----|---------|----|----|----|
|  | 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 |
|  |         |    |    | New Start<br>◆ |         |    |                  |    |         |    |                  |                                   |         |    |          |                 |         |    |          |                  |         |    |    |    |         |    |    |    |
| <b>MEDUSA Development</b>                |         |    |    | TLR            |         |    |                  |    |         |    |                  |                                   |         |    |          |                 |         |    |          |                  |         |    |    |    |         |    |    |    |
| Top Level Requirements (TLR) Development |         |    |    | TLR            |         |    |                  |    |         |    |                  |                                   |         |    |          |                 |         |    |          |                  |         |    |    |    |         |    |    |    |
| Development Contract                     |         |    |    |                |         |    | RFP Release<br>▲ |    |         |    | Source Selection |                                   |         |    |          |                 |         |    |          |                  |         |    |    |    |         |    |    |    |
|  |         |    |    |                |         |    |                  |    |         |    | Award<br>▲       |                                   |         |    | PDR<br>▲ |                 |         |    | CDR<br>▲ |                  |         |    |    |    |         |    |    |    |
|  |         |    |    |                |         |    |                  |    |         |    |                  | Risk Reduction, Design, Fab, Test |         |    |          |                 |         |    |          |                  |         |    |    |    |         |    |    |    |
|  |         |    |    |                |         |    |                  |    |         |    |                  |                                   |         |    |          |                 |         |    |          | Follow on Builds |         |    |    |    |         |    |    |    |
| Submarine Integration                    |         |    |    |                |         |    |                  |    |         |    |                  | TEMPALT                           |         |    |          |                 |         |    |          |                  |         |    |    |    |         |    |    |    |
|  |         |    |    |                |         |    |                  |    |         |    |                  |                                   |         |    |          | Sub Integration |         |    |          |                  |         |    |    |    |         |    |    |    |

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| <b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                              |
| <b>Appropriation/Budget Activity</b><br>1319 / 4              | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>2483 / <i>Medusa</i> |

Schedule Details

| Events by Sub Project   | Start   |      | End     |      |
|---|---------|------|---------|------|
|   | Quarter | Year | Quarter | Year |
| <b>MEDUSA</b>   |         |      |         |      |
| .   | 1       | 2022 | 1       | 2022 |
| MEDUSA Development: Top Level Requirements (TLR) Development:                         | 1       | 2022 | 2       | 2022 |
| MEDUSA Development: Development Contract: RFP   | 4       | 2022 | 4       | 2022 |
| MEDUSA Development: Development Contract: Source Selection                            | 4       | 2022 | 3       | 2023 |
| MEDUSA Development: Development Contract: Contract Award                              | 3       | 2023 | 3       | 2023 |
| MEDUSA Development: Development Contract: Preliminary Design Review                   | 3       | 2024 | 3       | 2024 |
| MEDUSA Development: Development Contract: Critical Design Review                      | 3       | 2025 | 3       | 2025 |
| MEDUSA Development: Development Contract: Risk Reduction, Design, Fabricate, and Test | 3       | 2023 | 4       | 2027 |
| MEDUSA Development: Development Contract: Follow on Builds                            | 4       | 2025 | 4       | 2027 |
| MEDUSA Development: Submarine Integration: TEMPALT                                    | 3       | 2023 | 1       | 2027 |
| MEDUSA Development: Submarine Integration: Submarine Integration                      | 3       | 2024 | 1       | 2027 |

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|--|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|-------------------------|-------------------------|-------------------|
| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |                    |                |                |                     |  |                      |                |                |  | <b>Date:</b> April 2022 |                         |                   |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   |                    |                |                |                     | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |                      |                |                | <b>Project (Number/Name)</b><br>3123 / <i>SMCM UUV</i> |                         |                         |                   |
| <b>COST (\$ in Millions)</b>                                       | <b>Prior Years</b> | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b>   | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b>   | <b>FY 2027</b>          | <b>Cost To Complete</b> | <b>Total Cost</b> |
| 3123: <i>SMCM UUV</i>  | 37.917             | 19.875         | 20.909         | 19.788              | -  | 19.788               | 8.530          | 1.849          | 1.817  | 1.676                   | Continuing              | Continuing        |
| Quantity of RDT&E Articles   |                    | -              | -              | -                   | -  | -                    | -              | -              | -  | -                       |                         |                   |

**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 Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV) Program, also referred to as Knifefish, develops advanced medium class UUVs to support clandestine mine detection capability against volume, bottom, and buried mines, in high clutter environments. Equipment includes UUVs and associated system support equipment. The program achieved Milestone C in FY 2019 and entered into Low-Rate Initial Production (LRIP) for five (5) Block 0 systems in FY 2019. The prime contractor for Knifefish is General Dynamics Mission Systems (GDMS) located in Quincy, MA.

In FY 2021, GDMS was awarded a contract to retrofit the LRIP systems with Block 1 capabilities and upgrade a number of performance characteristics to meet Navy bottom and buried minehunting requirements. The Navy will validate these capabilities during Initial Operation Testing and Evaluation (IOT&E) to occur Q4 FY 2023, with a declaration of Initial Operating Capability in FY 2024.

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

|  | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <b>Title:</b> Knifefish Development  | 13.408         | 15.727         | 12.204              | 0.000              | 12.204               |
| <b>Articles:</b>   | -              | -              | -                   | -                  | -                    |
| <b>FY 2022 Plans:</b>  |                |                |                     |                    |                      |
| <ul style="list-style-type: none"> <li>- Continue development efforts of Block 1.</li> <li>- Conduct Block 1 Data Collection.</li> <li>- Integrate PMA updates for expanded operational environments.</li> <li>- Support MCM MP Independence variant IOT&amp;E with an LRIP Block 0 System.</li> <li>- Initiate design of Knifefish Operations and Maintenance Part Task Trainer.</li> </ul> |                |                |                     |                    |                      |
| <b>FY 2023 Base Plans:</b>   |                |                |                     |                    |                      |
| <ul style="list-style-type: none"> <li>- Complete Block 1 development.</li> <li>- Conduct Knifefish Block 1 IOT&amp;E</li> <li>- Execute tasking to ensure the Knifefish Block 1 system maintains Cybersecurity compliance</li> <li>- Correct any material deficiencies occurring during or as a result of MCM MP IOT&amp;E during a find-fix-repair effort.</li> </ul>                      |                |                |                     |                    |                      |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                                |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3123 / <i>SMCM UUV</i> |

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>- Initiate transition of technologies from Science and Technology offices (Office of Naval Research, University Affiliated Research Centers, etc.) that will increase the minehunting capabilities of the system to align with Block 2 warfighting requirements.</p> <p><b>FY 2023 OCO Plans:</b><br/>N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br/>FY 2022 to FY 2023 decrease reflects the completion of Block 1 initial development in FY 2022.</p>   |                |                |                     |                    |                      |
| <p><b>Title:</b> Knifefish Support</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2022 Plans:</b></p> <ul style="list-style-type: none"> <li>- Provide engineering support for Block 1 retrofit.</li> <li>- Update logistic documentation to reflect Block 1 capabilities.</li> <li>- Conduct sailor operator and maintenance training to support test events.</li> </ul> <p><b>FY 2023 Base Plans:</b></p> <ul style="list-style-type: none"> <li>- Conduct a find-fix-repair effort to resolve issues that occurred during Block 1 testing. The prime contractor will update the Technical Data Package via Engineering Change Proposals to reflect changes to the baseline, and update the configuration of the delivered systems Block 1 systems.</li> <li>- Support development of Performance Specification and Request for Proposal for new Block 1 Full Rate Production competitive contract in FY 2024.</li> <li>- Conduct sailor operator and maintenance training to support test events.</li> </ul> <p><b>FY 2023 OCO Plans:</b><br/>N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br/>FY 2022 to FY 2023 decrease reflects the completion of initial Block 1 development efforts and transition test &amp; evaluation.</p> | 4.212          | 2.805          | 2.514               | 0.000              | 2.514                |
|   | -              | -              | -                   | -                  | -                    |
| <p><b>Title:</b> Knifefish Test and Evaluation</p> <p align="right"><b>Articles:</b></p> <p><b>FY 2022 Plans:</b></p>   | 1.384          | 1.527          | 4.210               | 0.000              | 4.210                |
|   | -              | -              | -                   | -                  | -                    |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy | <b>Date:</b> April 2022 |
|--|-------------------------|

|  |  |  |
|--|--|--|
| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3123 / <i>SMCM UUV</i> |
|--|--|--|

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total |
|---|---------|---------|--------------|-------------|---------------|
| - Participate and provide Knifefish system-level support for MCM MP IOT&E on the LCS Independence variant.<br><b>FY 2023 Base Plans:</b><br>- Select and prepare mine target fields and test support vessels for Knifefish DT and IOT&E.<br>- Complete execution of government-led Block 1 Developmental Testing.<br>- Complete planning and execute Knifefish Block 1 IOT&E to support Knifefish system Initial Operating Capability (IOC).<br><b>FY 2023 OCO Plans:</b><br>N/A<br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Increase between FY 2022 and FY 2023 is required for government testing of Knifefish Block 1 systems. |         |         |              |             |               |
| <b>Title:</b> Knifefish Management Services<br><br><b>FY 2022 Plans:</b><br>- Conduct acquisition and management of retrofit contract to implement Block 1 ECPs in support of government acceptance testing.<br><b>FY 2023 Base Plans:</b><br>- Preparing for Knifefish IOC and FRP Decisions. Execute tasking and prepare artifacts for the basis of authorization to transition the program from Low Rate Initial Production to Full-Rate Production.<br><b>FY 2023 OCO Plans:</b><br>N/A<br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>FY 2023 maintains a similar funding profile from FY 2022.                                  | 0.871   | 0.850   | 0.860        | 0.000       | 0.860         |
| <b>Articles:</b>  | -       | -       | -            | -           | -             |
| <b>Accomplishments/Planned Programs Subtotals</b>   | 19.875  | 20.909  | 19.788       | 0.000       | 19.788        |

| <b>C. Other Program Funding Summary (\$ in Millions)</b> |                |                |                     |                    |                      |                |                |                |                |                         |                   |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u>   | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023 Base</u> | <u>FY 2023 OCO</u> | <u>FY 2023 Total</u> | <u>FY 2024</u> | <u>FY 2025</u> | <u>FY 2026</u> | <u>FY 2027</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • OPN/1601: <i>LCS MCM Mission Modules</i>               | 189.397        | 30.119         | 94.987              | -                  | 94.987               | 165.038        | 180.874        | 163.658        | 121.516        | 1,484.842               | 2,843.192         |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                                |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3123 / <i>SMCM UUV</i> |

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

| <u>Line Item</u>                          | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u><br><u>Base</u> | <u>FY 2023</u><br><u>OCO</u> | <u>FY 2023</u><br><u>Total</u> | <u>FY 2024</u> | <u>FY 2025</u> | <u>FY 2026</u> | <u>FY 2027</u> | <u>Cost To</u><br><u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • OPN/1611: <i>Small &amp; Medium UUV</i> | 40.531         | 44.534         | 49.763                        | -                            | 49.763                         | 76.291         | 82.486         | 94.486         | 96.330         | 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 FY11 and competitively sourced to General Dynamics Mission Systems (GDMS), develops Surface Mine Countermeasures Unmanned Undersea Vehicles (SMCM UUVs) equipped with advanced Low Frequency Broadband (LFBB) sonar to provide volume, bottom, and buried mine detection capability, in high clutter environments, 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 (5) Knifefish systems. Initial integration testing with the LCS was completed prior to MS C. The MS C decision included direction to retrofit Block I changes onto the LRIP Block 0 systems and test, prior to delivery to the Fleet. A Block 1 retrofit contract was awarded in Q3FY21 to develop the Engineering Change Proposals (ECPs) to address additional Block 1 requirements, and to deliver Block 0 to Block 1 retrofit kits for the 5 Block 0 LRIP systems. Following completion of Block 1 development, the Navy will conduct Developmental and Operational Testing with Block 1. After Block 1 IOT&E in FY23, a full and open competitive production contract will be awarded. The overall approach is to deliver systems through incrementally increasing capability via two 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 2023 Navy |                        |   |             |   |            |         |            |              |                       |             |            | Date: April 2022 |                  |            |                          |
|--|------------------------|---|-------------|---|------------|---------|------------|--------------|-----------------------|-------------|------------|------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity                          |                        |   |             | R-1 Program Element (Number/Name)                     |            |         |            |              | Project (Number/Name) |             |            |                  |                  |            |                          |
| 1319 / 4   |                        |   |             | PE 0604028N / Small/Medium Unmanned Undersea Vehicles |            |         |            |              | 3123 / SMCM UUV       |             |            |                  |                  |            |                          |
| Product Development (\$ in Millions)                   |                        |   |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |                       | FY 2023 OCO |            | FY 2023 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 |
| Knifefish Development & Engineering Support            | C/CPIF                 | General Dynamics AIS : McLeansville, NC | 10.723      | 0.000   |            | 0.000   |            | 0.000        |                       | -           |            | 0.000            | Continuing       | Continuing | Continuing               |
| Knifefish Block 1 Development Contractor               | C/CPIF                 | GDMS : McLeansville, NC                 | 13.578      | 11.681  | Dec 2020   | 14.775  | Nov 2021   | 10.452       | Nov 2022              | -           |            | 10.452           | Continuing       | Continuing | Continuing               |
| Knifefish Block 1 Development                          | TBD                    | Various : Various                       | 1.700       | 1.727   | Dec 2020   | 0.952   | Nov 2021   | 0.971        | Nov 2022              | -           |            | 0.971            | 0.000            | 5.350      | -                        |
| Knifefish Block 2 Tech Transition                      | WR                     | NRL : Washington DC                     | 0.000       | 0.000   |            | 0.000   |            | 0.781        | Nov 2022              | -           |            | 0.781            | 0.000            | 0.781      | -                        |
| <b>Subtotal</b>  |                        |   | 26.001      | 13.408  |            | 15.727  |            | 12.204       |                       | -           |            | 12.204           | Continuing       | Continuing | N/A                      |
| Support (\$ in Millions)                               |                        |   |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |                       | FY 2023 OCO |            | FY 2023 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                                    | WR                     | NSWC, PC : Panama City, FL              | 3.661       | 1.788   | Dec 2020   | 1.210   | Dec 2021   | 1.734        | Nov 2022              | -           |            | 1.734            | Continuing       | Continuing | Continuing               |
| Engineering Support                                    | WR                     | NUWC, Newport : Newport, RI             | 1.824       | 1.081   | Nov 2020   | 0.745   | Nov 2021   | 0.530        | Nov 2022              | -           |            | 0.530            | Continuing       | Continuing | Continuing               |
| Engineering Support                                    | WR                     | Various : Various                       | 1.428       | 1.343   | Nov 2020   | 0.850   | Nov 2021   | 0.250        | Nov 2022              | -           |            | 0.250            | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>  |                        |   | 6.913       | 4.212   |            | 2.805   |            | 2.514        |                       | -           |            | 2.514            | Continuing       | Continuing | N/A                      |
| Test and Evaluation (\$ in Millions)                   |                        |   |             | FY 2021   |            | FY 2022 |            | FY 2023 Base |                       | FY 2023 OCO |            | FY 2023 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 |
| Government T&E Support                                 | WR                     | Various : Various                       | 0.145       | 0.267   | Dec 2020   | 0.325   | Dec 2021   | 0.850        | Dec 2022              | -           |            | 0.850            | 0.000            | 1.587      | -                        |
| Test and Evaluation                                    | WR                     | COMOPTEVFOR : Norfolk, VA               | 0.530       | 0.400   | Nov 2020   | 0.400   | Nov 2021   | 0.408        | Nov 2022              | -           |            | 0.408            | 0.000            | 1.738      | -                        |
| Government T&E Support                                 | WR                     | NSWC, PC : Panama City, FL              | 2.585       | 0.717   | Nov 2020   | 0.802   | Nov 2021   | 2.952        | Nov 2022              | -           |            | 2.952            | 0.000            | 7.056      | -                        |





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**Exhibit R-4A, RDT&E Schedule Details: PB 2023 Navy** **Date:** April 2022

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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3123 / <i>SMCM UUV</i> |
|--|--|--|

Schedule Details

| Events by Sub Project   | Start   |      | End     |      |
|---|---------|------|---------|------|
|   | Quarter | Year | Quarter | Year |
| <b><i>Knifefish</i></b>   |         |      |         |      |
| Knifefish Acquisition Program: Milestones: Deliver Block 1 Retrofits for Test (QTY 2) | 1       | 2023 | 1       | 2023 |
| Knifefish Acquisition Program: Milestones: Block 1 Initial Operational Capability     | 1       | 2024 | 1       | 2024 |
| Knifefish Acquisition Program: Milestones: Knifefish Full Rate Production Decision    | 1       | 2024 | 1       | 2024 |
| Knifefish Acquisition Program: Test Events: LCS Independence MCM MP T&E               | 3       | 2022 | 4       | 2022 |
| Knifefish Acquisition Program: Test Events: Block 0 LCS Integration Testing           | 1       | 2022 | 1       | 2022 |
| Knifefish Acquisition Program: Test Events: Block 1 Data Collection                   | 3       | 2022 | 4       | 2022 |
| Knifefish Acquisition Program: Test Events: Block 1 Testing (DT)                      | 2       | 2023 | 2       | 2023 |
| Knifefish Acquisition Program: Test Events: Block 1 IOT&E                             | 4       | 2023 | 4       | 2023 |
| Knifefish Acquisition Program: Test Events: Block 1 IOC                               | 2       | 2024 | 2       | 2024 |
| Knifefish Acquisition Program: Test Events: Post Test Find-Fix-Repair                 | 1       | 2024 | 2       | 2024 |
| Knifefish Block Upgrade: Block 2 Technology Transition                                | 4       | 2022 | 4       | 2023 |
| Knifefish Block Upgrade: Block 2 Development  | 1       | 2025 | 4       | 2027 |
| Knifefish Block Upgrade: Battery Tech Refresh   | 3       | 2024 | 4       | 2026 |
| Knifefish Production: LRIP Block 0: BLK 0 LRIP  | 1       | 2021 | 4       | 2021 |
| Knifefish Production: LRIP Block 1: Retrofit Contract Award                           | 3       | 2021 | 3       | 2021 |
| Knifefish Production: LRIP Block 1: Retrofit Five LRIP Systems to Block 1             | 3       | 2021 | 1       | 2024 |
| Knifefish Production: Follow-on Production: Production Contract Award                 | 2       | 2024 | 2       | 2024 |
| Knifefish Production: Follow-on Production: Production                                | 2       | 2024 | 4       | 2027 |

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**Exhibit R-2A, RDT&E Project Justification:** PB 2023 Navy **Date:** April 2022

|  |  |   |
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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |
|--|--|---|

| COST (\$ in Millions)      | Prior Years | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | FY 2024 | FY 2025 | FY 2026 | FY 2027 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 3785: <i>Razorback</i>     | 9.397       | 13.370  | 33.922  | 36.513       | -           | 36.513        | 19.164  | 11.529  | 9.295   | 9.290   | Continuing       | Continuing |
| Quantity of RDT&E Articles |             | -       | -       | -            | -           | -             | -       | -       | -       | -       |                  |            |

**Note**

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 FY2017 with Fleet operational deployments planned for FY21-FY25. Development of requirements and submarine integration efforts commenced in FY2019 for the torpedo tube launch and recover (TTL&R) variant, which will be competitively sourced to industry in FY2022. 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 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total |
|---|---------|---------|--------------|-------------|---------------|
| <b>Title:</b> Product Development - Razorback   | 7.240   | 27.501  | 24.941       | 0.000       | 24.941        |
| <b>Articles:</b>  | -       | -       | -            | -           | -             |
| <b>FY 2022 Plans:</b>   |         |         |              |             |               |
| Manage up to two industry teams designing Razorback TTL&R. Conduct System Requirements Review (SRR) and System Functional Review (SFR). Initiate preliminary design. Continue data products development and |         |         |              |             |               |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                                 |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| analysis for submarine integration including Temporary Alteration (TEMPALT) and Li-ion battery certification efforts.<br><b>FY 2023 Base Plans:</b><br>Complete Preliminary Design. Conduct Preliminary Design Review (PDR). Conduct detailed design and Critical Design Review (CDR). Initiate EDM fabrication. Continue data products development and analysis for submarine integration including Temporary Alteration (TEMPALT) and Li-ion battery certification efforts.<br><b>FY 2023 OCO Plans:</b><br>N/A<br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Decrease from FY22 to FY23 due to prior year underexecution.             |                |                |                     |                    |                      |
| <b>Title:</b> Product Development - SAFECAP<br><b>Articles:</b>   | 3.473<br>-     | 3.435<br>-     | 8.448<br>-          | 0.000<br>-         | 8.448<br>-           |
| <b>FY 2022 Plans:</b><br>Continued integration testing of next generation sensors (Inventus Power) Continued Early Fault Detection efforts. Leveraged Shock Test VACL. Continued Capsule Production.<br><b>FY 2023 Base Plans:</b><br>Leverage Shock Test VACL. Continue Capsule Production increased levels<br><b>FY 2023 OCO Plans:</b><br>N/A<br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>Increased funding in the amount of 5.013 is for the procurement and support of long lead items, construction, and integration of capsules. Also funding will support demonstration testing which will include workups and post reporting. |                |                |                     |                    |                      |
| <b>Title:</b> Support<br><b>Articles:</b>   | 2.100<br>-     | 2.198<br>-     | 2.264<br>-          | 0.000<br>-         | 2.264<br>-           |
| <b>FY 2022 Plans:</b>   |                |                |                     |                    |                      |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022                                 |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Provided acquisition and engineering support for contract management activities and submarine integration efforts, including TEMPALT development and technical reviews, and Li-ion battery certification efforts.<br><br><b>FY 2023 Base Plans:</b><br>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.<br><br><b>FY 2023 OCO Plans:</b><br>N/A<br><br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>No significant change. |                |                |                     |                    |                      |
| <b>Title:</b> Management Services<br><br><div style="text-align: right;"><b>Articles:</b></div>   | 0.557<br>-     | 0.788<br>-     | 0.860<br>-          | 0.000<br>-         | 0.860<br>-           |
| <b>FY 2022 Plans:</b><br>Provided technical guidance, project planning, program management, financial and contracting management, and travel for contract administration and submarine integration efforts.<br><br><b>FY 2023 Base Plans:</b><br>Provide technical guidance, project planning, program management, financial and contracting management, and travel for contract administration and submarine integration efforts.<br><br><b>FY 2023 OCO Plans:</b><br>N/A<br><br><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br>No significant change.                                      |                |                |                     |                    |                      |
| <b>Accomplishments/Planned Programs Subtotals</b>   | 13.370         | 33.922         | 36.513              | 0.000              | 36.513               |

| <b>C. Other Program Funding Summary (\$ in Millions)</b> |                |                |                     |                    |                      |                |                |                |                |                         |                   |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <b>Line Item</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b> | <b>FY 2027</b> | <b>Cost To Complete</b> | <b>Total Cost</b> |
| • OPN 1611: <i>Small &amp; Medium UUV</i>                | 7.981          | 5.725          | 10.306              | -                  | 10.306               | 36.811         | 36.478         | 37.192         | 37.928         | Continuing              | Continuing        |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy | <b>Date:</b> April 2022 |
|--|-------------------------|

|  |  |   |
|--|--|---|
| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |
|--|--|---|

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

| <u>Line Item</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u><br><u>Base</u> | <u>FY 2023</u><br><u>OCO</u> | <u>FY 2023</u><br><u>Total</u> | <u>FY 2024</u> | <u>FY 2025</u> | <u>FY 2026</u> | <u>FY 2027</u> | <u>Cost To</u><br><u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

**Remarks**  
The above OPN funding line accounts for several programs. Only the RAZORBACK funding is displayed above.

**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 Viperfish 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 recovery under UUV Core Technology PE 0604029N, Project 4053 UxS Platform efforts, the Mine Countermeasures Urgent Operational Need (MCM UON), 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 FY2019, followed by Request for Proposal (RFP) release to industry in FY2020, and a planned award in FY2022 for the Medium UUV contract (for both the Razorback TTL&R and Viperfish). Both the Razorback TTL&R and Viperfish will utilize a Government-designed Forward Section, featuring highly capable sensor, sonar, and communications technologies developed by the University of Texas Applied Research Laboratory. Initial forward sections for testing will be Government furnished, followed by transition to Industry production. SAFECAP development and submarine integration efforts will continue in parallel 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 2023 Navy** **Date:** April 2022

|  |  |   |
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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |
|--|--|---|

| <b>Product Development (\$ in Millions)</b> |                        |                                |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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          |                  |            |                          |
| RAZORBACK Product Development -             | WR                     | NUWC NPT : Newport, RI         | 4.539       | 0.378   | Nov 2020   | 2.841   | Nov 2021   | 2.900        | Nov 2022   | -           |            | 2.900         | 0.000            | 10.658     | -                        |
| RAZORBACK EDM Contract                      | C/CPIF                 | TBD : TBD                      | 0.000       | 1.997   | May 2022   | 18.157  | May 2022   | 16.791       | Nov 2022   | -           |            | 16.791        | 0.000            | 36.945     | -                        |
| RAZORBACK Product Development               | C/CPFF                 | ARL/UT : Austin, TX            | 0.000       | 4.276   | Nov 2020   | 4.599   | Nov 2021   | 3.250        | Nov 2022   | -           |            | 3.250         | 0.000            | 12.125     | -                        |
| RAZORBACK Product Development               | WR                     | Various : Various              | 0.000       | 0.589   | Nov 2020   | 1.904   | Nov 2021   | 2.000        | Nov 2022   | -           |            | 2.000         | 0.000            | 4.493      | -                        |
| Product Development - SAFECAP               | WR                     | NUWC NPT : Newport, RI         | 0.700       | 0.650   | Nov 2020   | 0.980   | Nov 2021   | 4.876        | Nov 2022   | -           |            | 4.876         | Continuing       | Continuing | Continuing               |
| Product Development - SAFECAP               | C/CPFF                 | Inventus Power : Woodridge, IL | 0.750       | 1.500   | Nov 2020   | 0.900   | Dec 2021   | 0.664        | Dec 2022   | -           |            | 0.664         | Continuing       | Continuing | Continuing               |
| Product Development - SAFECAP               | WR                     | NSWC CD : West Bethesda, MD    | 0.150       | 0.175   | Nov 2020   | 0.260   | Nov 2021   | 0.829        | Nov 2022   | -           |            | 0.829         | Continuing       | Continuing | Continuing               |
| Product Development - SAFECAP               | WR                     | NSWC Crane : Crane, Indiana    | 0.150       | 0.175   | Nov 2020   | 0.196   | Nov 2021   | 1.597        | Nov 2022   | -           |            | 1.597         | Continuing       | Continuing | Continuing               |
| Product Development - SAFECAP               | C/CPAF                 | HII Undersea : TBD             | 0.254       | 0.373   | Nov 2020   | 0.369   | Dec 2021   | 0.374        | Dec 2022   | -           |            | 0.374         | 0.000            | 1.370      | -                        |
| Product Development - SAFECAP               | C/CPAF                 | HII (Advex) : Norfolk, VA      | 0.000       | 0.600   | Nov 2020   | 0.730   | Dec 2021   | 0.108        | Dec 2022   | -           |            | 0.108         | 0.000            | 1.438      | -                        |
| <b>Subtotal</b>                             |                        |                                | 6.543       | 10.713  |            | 30.936  |            | 33.389       |            | -           |            | 33.389        | Continuing       | Continuing | N/A                      |

| <b>Support (\$ in Millions)</b> |                        |                                |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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 - RAZORBACK | WR                     | NUWC Newport : Newport, RI     | 2.250       | 2.100   | Nov 2020   | 2.198   | Nov 2021   | 2.264        | Nov 2022   | -           |            | 2.264         | 0.000            | 8.812      | -                        |
| <b>Subtotal</b>                 |                        |                                | 2.250       | 2.100   |            | 2.198   |            | 2.264        |            | -           |            | 2.264         | 0.000            | 8.812      | N/A                      |

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy** **Date:** April 2022

|  |  |   |
|--|--|---|
| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |
|--|--|---|

| <b>Management Services (\$ in Millions)</b> |                        |                                |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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          |                  |            |                          |
| Management - SAFECAP                        | Various                | Varios : Washington DC         | 0.146       | 0.147   | Nov 2020   | 0.383   | Nov 2021   | 0.395        | Nov 2022   | -           |            | 0.395         | Continuing       | Continuing | Continuing               |
| Travel - RAZORBACK                          | Various                | NAVSEA HQ : Washington DC      | 0.050       | 0.010   | Oct 2020   | 0.005   | Nov 2021   | 0.050        | Nov 2022   | -           |            | 0.050         | 0.000            | 0.115      | -                        |
| Management - RAZORBACK                      | Various                | Various : Various              | 0.408       | 0.400   | Dec 2020   | 0.400   | Nov 2021   | 0.415        | Nov 2022   | -           |            | 0.415         | 0.000            | 1.623      | -                        |
| <b>Subtotal</b>                             |                        |                                | 0.604       | 0.557   |            | 0.788   |            | 0.860        |            | -           |            | 0.860         | Continuing       | Continuing | N/A                      |

|                            | Prior Years | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | Cost To Complete | Total Cost | Target Value of Contract |            |     |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|------------|-----|
| <b>Project Cost Totals</b> |             | 9.397   | 13.370  | 33.922       | 36.513      | -             |                  | 36.513     | 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 2023 Navy**

**Date: April 2022**

**Appropriation/Budget Activity**  
1319 / 4

**R-1 Program Element (Number/Name)**  
PE 0604028N / *Small/Medium Unmanned Undersea Vehicles*

**Project (Number/Name)**  
3785 / *Razorback*

| Proj 3785                       | FY 2021                                  |    |    |    | FY 2022                          |    |    |    | FY 2023                 |    |    |    | FY 2024               |    |    |    | FY 2025         |    |    |    | FY 2026          |    |    |    | FY 2027 |    |    |    |
|---------------------------------|--|----|----|----|----------------------------------|----|----|----|-------------------------|----|----|----|-----------------------|----|----|----|-----------------|----|----|----|------------------|----|----|----|---------|----|----|----|
|                                 | 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 |
| <b>RAZORBACK Development</b>    |  |    |    |    |                                  |    |    |    |                         |    |    |    |                       |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
| Razorback Development Contract  | Source Selection                         |    |    |    | ▲                                |    |    |    | ▲                       |    |    |    | ▲                     |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
|                                 |  |    |    |    | Design, Fab and Test (1st Units) |    |    |    |                         |    |    |    |                       |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
| RAZORBACK Integration           |  |    |    |    |                                  |    |    |    |                         |    |    |    | Submarine Integration |    |    |    |                 |    |    |    | Follow-on Builds |    |    |    |         |    |    |    |
|                                 |  |    |    |    |                                  |    |    |    | TEMPALT                 |    |    |    |                       |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
| Battery Monitoring System       | Early Fault Detection System Development |    |    |    |                                  |    |    |    |                         |    |    |    |                       |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
| SAFECAP Integration and Testing |  |    |    |    |                                  |    |    |    | Integration and Testing |    |    |    |                       |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
| SAFECAP Mission TEMPALT         |  |    |    |    |                                  |    |    |    | Support Efforts         |    |    |    |                       |    |    |    |                 |    |    |    |                  |    |    |    |         |    |    |    |
|                                 |  |    |    |    |                                  |    |    |    |                         |    |    |    |                       |    |    |    | SAFECAP TEMPALT |    |    |    |                  |    |    |    |         |    |    |    |

2023PB - 0604028N - 3785

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2023 Navy **Date:** April 2022

|  |  |   |
|--|--|---|
| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>3785 / <i>Razorback</i> |
|--|--|---|

Schedule Details

| Events by Sub Project  | Start   |      | End     |      |
|--|---------|------|---------|------|
|  | Quarter | Year | Quarter | Year |
| <b>Proj 3785</b>   |         |      |         |      |
| RAZORBACK Development: Razorback Development Contract: Source Selection                    | 1       | 2021 | 2       | 2022 |
| RAZORBACK Development: Razorback Development Contract: Contract Award                      | 3       | 2022 | 3       | 2022 |
| RAZORBACK Development: Razorback Development Contract: Preliminary Design Review           | 1       | 2023 | 1       | 2023 |
| RAZORBACK Development: Razorback Development Contract: Critical Design Review              | 3       | 2023 | 3       | 2023 |
| RAZORBACK Development: Razorback Development Contract: Design, Fabricate, and Test         | 3       | 2022 | 3       | 2025 |
| RAZORBACK Development: RAZORBACK Integration: Submarine Integration                        | 2       | 2023 | 3       | 2024 |
| RAZORBACK Development: RAZORBACK Integration: Follow-on Builds                             | 3       | 2025 | 4       | 2027 |
| RAZORBACK Development: RAZORBACK Integration: TEMPALT                                      | 3       | 2022 | 3       | 2024 |
| RAZORBACK Development: Battery Monitoring System: Early Fault Detection System Development | 1       | 2021 | 4       | 2022 |
| RAZORBACK Development: SAFECAP Integration and Testing: Procurement and Integration        | 2       | 2021 | 2       | 2024 |
| RAZORBACK Development: SAFECAP Integration and Testing: System Shakedown Testing           | 1       | 2023 | 2       | 2024 |
| RAZORBACK Development: SAFECAP Mission TEMPALT: TEMPALT Support Efforts                    | 4       | 2022 | 4       | 2024 |
| RAZORBACK Development: SAFECAP Mission TEMPALT: TEMPALT                                    | 2       | 2024 | 4       | 2024 |

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|  |                    |                |                |                     |  |                      |                |                |  |                         |                         |                   |
|--|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|-------------------------|-------------------------|-------------------|
| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |                    |                |                |                     |  |                      |                |                |  | <b>Date:</b> April 2022 |                         |                   |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   |                    |                |                |                     | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> |                      |                |                | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |                         |                         |                   |
| <b>COST (\$ in Millions)</b>                                       | <b>Prior Years</b> | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b>   | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b>   | <b>FY 2027</b>          | <b>Cost To Complete</b> | <b>Total Cost</b> |
| 4023: <i>Expeditionary Underwater Systems</i>                      | 157.690            | 0.000          | 12.087         | 14.103              | -  | 14.103               | 13.527         | 11.131         | 10.944   | 11.153                  | Continuing              | Continuing        |
| Quantity of RDT&E Articles   |                    | -              | -              | -                   | -  | -                    | -              | -              | -  | -                       |                         |                   |

**Note**

The FY 2023 funding request was reduced by \$0.982M to account for the availability of prior year execution balances.

**A. Mission Description and Budget Item Justification**

Funding supports the development of unmanned systems for the Navy's expeditionary unmanned underwater Explosive Ordnance Disposal (EOD) and Mine Countermeasures (MCM) capability. Specifically, it provides for development of affordable expeditionary, unmanned underwater systems to support Navy Expeditionary forces including EOD, Mobile Diving and Salvage, Underwater Construction Teams (UCT), Very Shallow Water (VSW), and Expeditionary Mine Countermeasures (ExMCM) mission operations. The equipment must be highly portable in order to support the Navy EOD technician to safely approach, render safe, recover, exploit, and dispose of underwater explosive threats to include sea mines, limpet mines, and unexploded ordnance. Provides support for the Navy's high priority missions of Maritime Homeland Defense and MCM, including reconnaissance and mine clearance in support of amphibious operations. Development of Expeditionary UUV systems to support localization render-safe and detailed intelligence gathering of unexploded ordnance (UXO) including Underwater Improvised Explosive Devices (IEDs). This project directly supports the requirements defined by the Maritime Expeditionary MCM UUV (MEMUUV) CDD.

MK 18 Mod 2 Increment II upgrade will provide improved Automated Target Recognition (ATR) algorithms, more advanced autonomy architecture and continue to enhance electro-optic sensor performance. Increment II development and testing will focus on improving MCM performance and reducing the tactical timeline through development of a Reacquire, Identify and Mark capability.

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

|  | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <b>Title:</b> Expeditionary UUV Family of Systems  | 0.000          | 12.087         | 14.103              | 0.000              | 14.103               |
| <b>Articles:</b>   | -              | -              | -                   | -                  | -                    |
| <b>Description:</b> This program supports MK18 FOS and Viperfish development, testing and Fleet approval for evolving generations of affordable, expeditionary Unmanned Underwater Vehicle (UUVs) systems to address validated requirements in support of Expeditionary SW and VSW UMCM mission areas defined by the Maritime Expeditionary MCM UUV (MEMUUV) Capability Development Document (CDD) approved in September 2017. |                |                |                     |                    |                      |
| <b>FY 2022 Plans:</b>  |                |                |                     |                    |                      |

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|--|--|--|
| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Navy |  | <b>Date:</b> April 2022  |
| <b>Appropriation/Budget Activity</b><br>1319 / 4                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |

| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>FY22 development of MEMUUVs will focus on maturing the technology. Additionally, FY22 efforts will begin the transition of mature technology candidates that result from ONR investments in Future Naval Capabilities (FNC) programs (e.g., Automated Target Recognition (ATR) enhancements including active learning and automated performance estimation and sensor enhancements including Acoustic Communications (ACOMMS)). The technologies developed and transitioned will enable Viperfish and future increments of MEMUUVs to take full advantage of improved computing power, batteries, and hardware/software architecture. Test and evaluation events in FY22 will focus on demonstrating performance of the Mk 18 UUV Family of Systems and sensors (including Advanced Sensor Packages) in operationally realistic environments with significant fleet user engagement. Additionally, environmental and system acceptance testing will commence to demonstrate compliance with the system performance specification requirements.</p> <p><b>FY 2023 Base Plans:</b><br/>FY23 efforts will include delivery of the Viperfish Engineering Development Models (EDMs) and conduct of a Critical Design Review (CDR) leading to fabrication, testing, and integration. FY23 will also complete the development and testing of the MK 18 Mod 2 Increment II leading to achieving Initial Operational Capability (IOC). ATR investments will continue to enable the transition of Artificial Intelligence/Machine Learning (AI/ML) capabilities into fleet systems. Investments in data warehousing and data pipeline development will continue in FY23 leading to more responsive and agile ATR during GPC scenarios.</p> <p><b>FY 2023 OCO Plans:</b><br/>N/A</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b><br/>Increase of \$2.016M from FY2022 to FY 2023 reflects the increased testing and evaluation of the UUV prototypes.</p> |                |                |                     |                    |                      |
| <b>Accomplishments/Planned Programs Subtotals</b>   | 0.000          | 12.087         | 14.103              | 0.000              | 14.103               |

| <b>C. Other Program Funding Summary (\$ in Millions)</b> |                |                |                     |                    |                      |                |                |                |                |                         |                   |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <b>Line Item</b>   | <b>FY 2021</b> | <b>FY 2022</b> | <b>FY 2023 Base</b> | <b>FY 2023 OCO</b> | <b>FY 2023 Total</b> | <b>FY 2024</b> | <b>FY 2025</b> | <b>FY 2026</b> | <b>FY 2027</b> | <b>Cost To Complete</b> | <b>Total Cost</b> |
| • 1611: <i>Maritime Expeditionary MCM UUV</i>            | 0.000          | 0.000          | 0.000               | -                  | 0.000                | 0.000          | 0.000          | 2.341          | 5.850          | 0.000                   | 8.191             |
| <b>Remarks</b>   |                |                |                     |                    |                      |                |                |                |                |                         |                   |

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|---|---|---|
| Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy |   | Date: April 2022  |
| Appropriation/Budget Activity<br>1319 / 4               | R-1 Program Element (Number/Name)<br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | Project (Number/Name)<br>4023 / <i>Expeditionary Underwater Systems</i> |

**D. Acquisition Strategy**

Analysis of Alternatives (AOA) studies are conducted prior to the initiation of new sub-projects. The AOA addresses and emphasizes acquisitions strategies of the most cost-effective solution over the sub-projects' life -cycle. The acquisition strategies observe the following hierarchy of alternatives: commercial item (including modifications), non-developmental item (including modifications), and lastly, developmental programs. Contracting for RDT&E, if required is competitive and when feasible, production options are included. This ongoing program capitalizes on a User Operational Evaluation System (UOES) effort involving Fleet operators engaged in tactical experimentation with prototype UUVs prior to fielding baseline systems and capability improvement package increments.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy** **Date:** April 2022

|  |  |  |
|--|--|--|
| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |
|--|--|--|

| <b>Product Development (\$ in Millions)</b> |                        |                                     |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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                | WR                     | Multiple Activities : Not Specified | 30.450      | 0.000   |            | 2.820   | Nov 2021   | 3.325        | Nov 2022   | -           |            | 3.325         | Continuing       | Continuing | Continuing               |
| Primary Hardware Development                | WR                     | NSWC IH EODTD : Indian, Head, MD    | 16.238      | 0.000   |            | 0.000   |            | 0.000        |            | -           |            | 0.000         | 0.000            | 16.238     | -                        |
| Systems Engineering                         | WR                     | NSWC Activities : Not Specified     | 49.027      | 0.000   |            | 3.482   | Nov 2021   | 4.068        | Nov 2022   | -           |            | 4.068         | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>                             |                        |                                     | 95.715      | 0.000   |            | 6.302   |            | 7.393        |            | -           |            | 7.393         | Continuing       | Continuing | N/A                      |

**Remarks**  
PU 4023 funding transitioned into PE 0604028N from PE 0603654N in PB-22

| <b>Support (\$ in Millions)</b> |                        |                                |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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                 | PERATON : Not Specified        | 7.417       | 0.000   |            | 0.416   | Nov 2021   | 0.563        | Nov 2022   | -           |            | 0.563         | Continuing       | Continuing | Continuing               |
| <b>Subtotal</b>                 |                        |                                | 7.417       | 0.000   |            | 0.416   |            | 0.563        |            | -           |            | 0.563         | Continuing       | Continuing | N/A                      |

**Remarks**  
PU 4023 funding transitioned into PE 0604028N from PE 0603654N in PB-22

| <b>Test and Evaluation (\$ in Millions)</b> |                        |                                 |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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          | WR                     | NSWC Activities : Not Specified | 37.194      | 0.000   |            | 3.004   | Nov 2021   | 3.469        | Nov 2022   | -           |            | 3.469         | Continuing       | Continuing | Continuing               |
| Independent T&E                             | WR                     | NSWC IHEODTD : Indian Head, MD  | 1.424       | 0.000   |            | 0.000   | Nov 2021   | 0.000        | Nov 2022   | -           |            | 0.000         | 0.000            | 1.424      | -                        |
| Independent T&E                             | WR                     | NSWC Activities : Not Specified | 7.859       | 0.000   |            | 2.264   | Nov 2021   | 2.553        | Nov 2022   | -           |            | 2.553         | Continuing       | Continuing | Continuing               |

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy** **Date:** April 2022

|  |  |  |
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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |
|--|--|--|

| <b>Test and Evaluation (\$ in Millions)</b> |                        |                                |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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          |                  |            |                          |
| <b>Subtotal</b>                             |                        |                                | 46.477      | 0.000   |            | 5.268   |            | 6.022        |            | -           |            | 6.022         | Continuing       | Continuing | N/A                      |

**Remarks**  
PU 4023 funding transitioned into PE 0604028N from PE 0603654N in PB-22

| <b>Management Services (\$ in Millions)</b> |                        |                                 |             | FY 2021 |            | FY 2022 |            | FY 2023 Base |            | FY 2023 OCO |            | FY 2023 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                     | NSWCIHEODTD : Indian Head, MD   | 5.350       | 0.000   |            | 0.000   |            | 0.000        |            | -           |            | 0.000         | 0.000            | 5.350      | -                        |
| Miscellaneous                               | WR                     | NSWC Activities : Not Specified | 2.713       | 0.000   |            | 0.101   | Nov 2021   | 0.125        | Nov 2022   | -           |            | 0.125         | Continuing       | Continuing | Continuing               |
| DAWDF                                       | WR                     | Not Specified : Not Specified   | 0.018       | 0.000   |            | 0.000   |            | 0.000        |            | -           |            | 0.000         | 0.000            | 0.018      | -                        |
| <b>Subtotal</b>                             |                        |                                 | 8.081       | 0.000   |            | 0.101   |            | 0.125        |            | -           |            | 0.125         | Continuing       | Continuing | N/A                      |

**Remarks**  
PU 4023 funding transitioned into PE 0604028N from PE 0603654N in PB-22

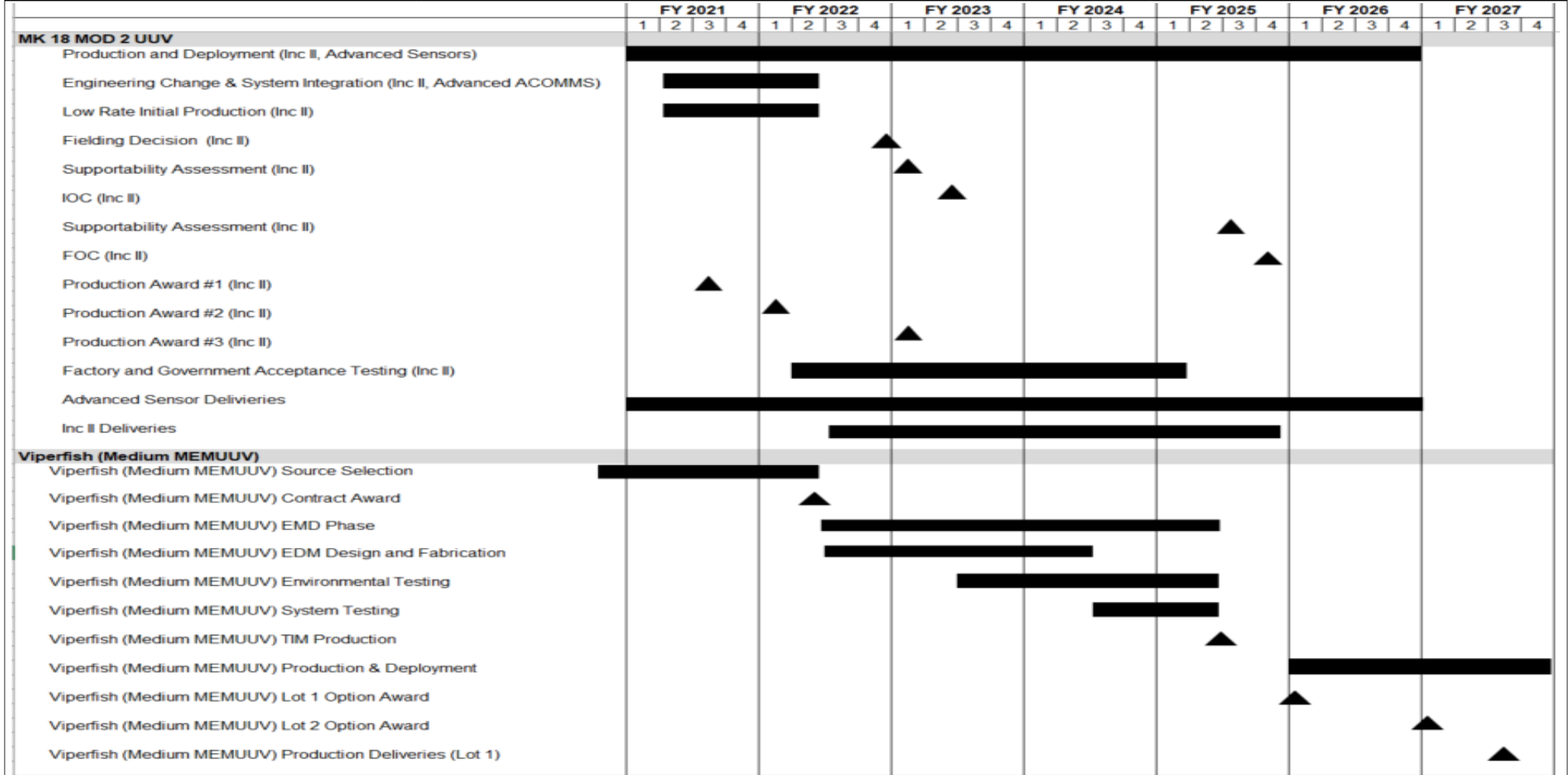
|                            | Prior Years | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| <b>Project Cost Totals</b> | 157.690     | 0.000   | 12.087  | 14.103       | -           | 14.103        | Continuing       | Continuing | N/A                      |

**Remarks**

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**Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy** **Date:** April 2022

|  |  |  |
|--|--|--|
| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |
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| <b>Exhibit R-4A, RDT&amp;E Schedule Details: PB 2023 Navy</b> |  | <b>Date: April 2022</b>  |
| <b>Appropriation/Budget Activity</b><br>1319 / 4              | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |

Schedule Details

| Events by Sub Project   | Start   |      | End     |      |
|---|---------|------|---------|------|
|   | Quarter | Year | Quarter | Year |
| <b>Proj 4023</b>  |         |      |         |      |
| MK18 MOD 2 UUV: Production and Deployment (Inc II, Advanced Sensors)              | 1       | 2021 | 4       | 2026 |
| MK18 MOD 2 UUV: Engineering Change & System Integration (Inc II, Advanced ACOMMS) | 2       | 2021 | 2       | 2023 |
| MK18 MOD 2 UUV: Low Rate Initial Production (Inc II)                              | 2       | 2021 | 2       | 2023 |
| MK18 MOD 2 UUV: Fielding Decision (Inc II)  | 4       | 2022 | 4       | 2022 |
| MK18 MOD 2 UUV: Supportability Assessment (Inc II) - IOC                          | 1       | 2022 | 1       | 2022 |
| MK18 MOD 2 UUV: IOC (Inc II)  | 2       | 2022 | 2       | 2022 |
| MK18 MOD 2 UUV: Supportability Assessment (Inc II) - FOC                          | 3       | 2025 | 3       | 2025 |
| MK18 MOD 2 UUV: FOC (Inc II)  | 4       | 2025 | 4       | 2025 |
| MK18 MOD 2 UUV: Production Award #1 (Inc II)                                      | 3       | 2021 | 3       | 2021 |
| MK18 MOD 2 UUV: Production Award #2 (Inc II)                                      | 1       | 2022 | 1       | 2022 |
| MK18 MOD 2 UUV: Production Award #3 (Inc II)                                      | 1       | 2023 | 1       | 2023 |
| MK18 MOD 2 UUV: Factory and Government Acceptance Testing (Inc II)                | 2       | 2022 | 1       | 2025 |
| MK18 MOD 2 UUV: Advanced Sensor Deliveries  | 1       | 2021 | 4       | 2026 |
| MK18 MOD 2 UUV: Inc II Deliveries   | 3       | 2022 | 4       | 2025 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Source Selection               | 1       | 2021 | 3       | 2022 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV): Contract Award                | 3       | 2022 | 3       | 2022 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV): EMD Phase                     | 3       | 2022 | 3       | 2025 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) EDM Design and Fabrication     | 3       | 2022 | 3       | 2024 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Environmental Testing          | 3       | 2023 | 3       | 2025 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) System Testing                 | 3       | 2024 | 3       | 2025 |

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2023 Navy **Date:** April 2022

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| <b>Appropriation/Budget Activity</b><br>1319 / 4 | <b>R-1 Program Element (Number/Name)</b><br>PE 0604028N / <i>Small/Medium Unmanned Undersea Vehicles</i> | <b>Project (Number/Name)</b><br>4023 / <i>Expeditionary Underwater Systems</i> |
|--|--|--|

| Events by Sub Project   | Start   |      | End     |      |
|---|---------|------|---------|------|
|   | Quarter | Year | Quarter | Year |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Technical Interchange Meeting (TIM) Production | 3       | 2025 | 3       | 2025 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Production & Deployment                        | 1       | 2026 | 4       | 2027 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Lot 1 Option Award                             | 1       | 2026 | 1       | 2026 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Lot 2 Option Award                             | 1       | 2027 | 1       | 2027 |
| VIPERFISH Medium MEMUUV: Viperfish (Medium MEMUUV) Production Deliveries (Lot 1)                  | 3       | 2027 | 3       | 2027 |