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

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>
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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	196.425	74.793	37.758	60.793	-	60.793	62.032	62.788	52.885	54.320	Continuing	Continuing
0267: <i>Mine Improvements</i>	188.142	48.694	16.784	30.468	-	30.468	12.741	13.717	11.597	9.389	Continuing	Continuing
2993: <i>Encapsulated Effector</i>	8.283	26.099	20.974	30.325	-	30.325	49.291	49.071	41.288	44.931	Continuing	Continuing

A. Mission Description and Budget Item Justification

FY 2023 reflects a net increase of \$20.035 million. Funding adjustments are associated with Quickstrike-ER beginning flight certification testing and C-ENCAP new explosive section development effort as reflected in Project 0267 and funding associated with Encapsulated Effector (Hammerhead) critical design and prototype articles as reflected in Project 2993.

The Mines Improvement PE provides resources to develop naval mine systems used to establish and maintain control of essential sea areas. Naval mines are used to deny sea area or inflict damage on adversary shipping to hinder, disrupt, and deny adversary operations. Naval mining is employed to reduce the adversary's threat to friendly forces and preserve access. Mining complements and performs an essential part of other warfare areas; particularly strike, anti-submarine, and anti-surface warfare.

Resources are utilized for developing and deploying improvements to the portfolio of naval mines. Different lines of effort are focused on specific aspects of the mission sequence, to enable offensive, defensive, and protective maritime mining across all water depths and phases of conflict. Major lines of effort include:

- 1) Development of maritime mines to enable safe standoff distances, including integration with airborne and undersea unmanned systems
- 2) Adding command and control of deployed minefields
- 3) Improving target detection against modern threat vessels
- 4) Updating minefield planning tools to enable required operational timelines

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B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	84.793	76.027	0.000	-	0.000
Current President's Budget	74.793	37.758	60.793	-	60.793
Total Adjustments	-10.000	-38.269	60.793	-	60.793
• Congressional General Reductions	-	-0.186			
• Congressional Directed Reductions	-	-38.083			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-7.000	0.000			
• SBIR/STTR Transfer	-3.000	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	-	-	60.793	-	60.793

Change Summary Explanation

FY 2021 reflects a net decrease of \$10 million including \$3 million for SBIR assessments and \$7 million in reprogrammings.

FY 2022 reflects a net decrease of \$38.267 million associated with a Congressional Directed Reduction of \$18.72 million in Project 0267 for Quickstrike-ER contract award delays, a Congressional Directed Reduction of \$19.363 million in Project 2993 for Encapsulated Effector contract delays, and a Congressional General Reduction of \$186K.

FY 2023: No adjustments.

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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Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>				Project (Number/Name) 0267 / <i>Mine Improvements</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
0267: <i>Mine Improvements</i>	188.142	48.694	16.784	30.468	-	30.468	12.741	13.717	11.597	9.389	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

FY 2023 reflects a net decrease of \$5.222 million associated with the completion of QS-ER and QS MOD 3 design efforts in FY 2022.

Naval mines are used to deter or control adversary movements, including surface ships and submarines. Funding supports the capability to maintain effectiveness of mines facing new threat targets with increasing emphasis on major regional conflicts and great power competition. The four major project areas are:

1) Aerial delivery improvements support capabilities required by a Joint Emergent Operational Needs Statement (JEONS). This includes adding GPS-guidance and glide flight gear to the Quickstrike (QS) series to reduce risk to delivery aircraft by introducing precision placement and standoff range. This effort will include the development and execution of the Quickstrike Extended Range (QS-ER) capabilities.

2) Clandestine Delivered Mine (CDM Increment 1) provides a required capability by converting legacy mining systems for delivery by Extra Large Unmanned Undersea Vehicles (XLUUV) and/or surface platform in support of a JEONS. This capability allows access to contested environments and reduces risk by using unmanned platforms. Pre-planned product improvements to CDM incorporates the programmable TDD MK-71, adds remote control arming (Increment 2), and reversible arming functions through future upgrades for increased operational flexibility and safety for emplaced minefields. Additional efforts include transitioning an explosive section design into the CDM program that is in development under the C-ENCAP effort that is managed by the Office of Naval Research (ONR).

3) Quickstrike Mod 3 improves effectiveness of existing mines against modern threats by using a programmable target detection device (TDD) MK-71. Quickstrike Mod 3 utilizes modeling and analysis to improve target detection and response by developing optimized mine settings and firing algorithms.

4) Minefield planning improvements include new targeting algorithms, mine settings, and corresponding damage data for weapon/target pairs into existing minefield planning software. Also included are upgrades to the software tool to optimize minefield planning to account for new precision placement capabilities inherent to the CDM and GPS-guided Joint Direct Attack Munition (JDAM) equipped Quickstrike mines.

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Product Development	35.957	10.786	21.889	0.000	21.889
Articles:	-	-	-	-	-
FY 2022 Plans: Quickstrike-ER: - Complete OFP and Wing Kit TDP.					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>CDM:</p> <ul style="list-style-type: none"> - Gain concurrence from Weapons Systems Explosives Safety Review Board (WSESRB) on Increment 1 - Complete development of buoy system in support of CDM remote arming (Increment 2). - Introduce Increment 2 to WSESRB. - Continue development of safe and arming device in support of CDM reversible arming (Increment 3). - Continue new explosive section development. - Continue acoustic communications (ACOMMS) systems development (Increment 2). <p>Quickstrike Mod 3:</p> <ul style="list-style-type: none"> - Continue modeling and generating operational data, based on updated fleet priority targets. - Establish improved target detecting device requirements documents, to include additional sensing modalities and improved performance. <p>Minefield Planning:</p> <ul style="list-style-type: none"> - Development of minefield planning software for precise placement capabilities such as CDM and Quickstrike-ER. <p>FY 2023 Base Plans:</p> <p>CDM:</p> <ul style="list-style-type: none"> - Continue development of safe and arming device in support of CDM reversible arming. - Provide support for explosive section design (C-ENCAP FNC). - Complete ACOMMS systems development. <p>Quickstrike Mod 3:</p> <ul style="list-style-type: none"> - Continue modeling and generating operational data for target detection algorithm, based on updated fleet priority targets. - Continue Development of MK 75 Safe and Arming Device. - Begin B-1 certification testing. <p>Quickstrike-ER:</p> <ul style="list-style-type: none"> - Complete Universal Load Adapter Test Articles - Complete Glide Kit Test Articles - Complete Wing Kit Validation 					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Minefield Planning: - Continue development of minefield planning software for precise placement capabilities such as CDM and Quickstrike-ER. FY 2023 OCO Plans: N/A FY 2022 to FY 2023 Increase/Decrease Statement: FY 2022 to FY 2023 increase is associated with the completion of QS-Mod 3 and QS-ER product development in FY 2022.					
Title: Support <div style="text-align: right;">Articles:</div>	0.800	0.000	0.000	0.000	0.000
FY 2022 Plans: N/A FY 2023 Base Plans: N/A FY 2023 OCO Plans: N/A FY 2022 to FY 2023 Increase/Decrease Statement: N/A	-	-	-	-	-
Title: Management: <div style="text-align: right;">Articles:</div>	1.427	1.029	0.872	0.000	0.872
FY 2022 Plans: - Continue to provide programmatic and financial support across the QS-ER, QS Mod 3, and CDM programs. FY 2023 Base Plans: - Continue to provide programmatic and financial support across the QS-ER, QS Mod 3, and CDM programs. FY 2023 OCO Plans: N/A FY 2022 to FY 2023 Increase/Decrease Statement:	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
FY 2022 to FY 2023 decrease is associated with the completion of QS-Mod 3 and QS-ER product development in FY 2022.					
<p>Title: Test and Evaluation</p> <p align="right">Articles:</p> <p>FY 2022 Plans: CDM: - Complete systems verification review for CDM Increment 1.</p> <p>Quickstrike Mod 3: - Continue Quickstrike MK 62/63 Flight Certification on F/A-18, B-52, and B-1 aircraft. - Continue MK 65 Target Detection Algorithm testing and evaluation. - Conduct Explosive Ordnance Disposal Render Safe Test (EOD RST) for Air Cushion Vehicle (ACV).</p> <p>Quickstrike-ER: - Complete Operational Demonstrations (OD) 3. - Continue mine component qualification, safety and operational flight-testing for certification aboard B-52. - Continue all required testing for a fielding determination to satisfy requirements of a JEONS. - Continue mine component reliability testing.</p> <p>FY 2023 Base Plans: CDM: - Begin CDM Increment 2 test and evaluation.</p> <p>Quickstrike Mod 3: - Continue MK 65 Target Detection Algorithm testing and evaluation. - Begin Quickstrike Target Delta B-1 Certification.</p> <p>Quickstrike-ER: - Continue mine component qualification, safety and operational flight-testing for certification aboard B-52.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>	10.510	4.969	7.707	0.000	7.707
	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
FY 2022 to FY 2023 decrease associated with the completion of the QS MK 62/63 Flight Certifications in FY 2022.					
Accomplishments/Planned Programs Subtotals	48.694	16.784	30.468	0.000	30.468

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

Line Item	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
• WPN 3231: <i>Maritime Mines</i>	5.832	8.567	9.282	-	9.282	45.229	46.551	47.479	48.330	0.000	292.340

Remarks

D. Acquisition Strategy

In order to meet accelerated timelines, the QS-ER glide kit is being developed under a sole source contract with Boeing. QS-ER leak resistant bomb bodies are being developed and will be procured through an active NAVAIR contract vehicle. QS MOD 3 and CDM mine kits, including target detecting devices, adapters, and other hardware components are procured via various small contract vehicles or developed internally by the Government. All QS and CDM software is developed and maintained by Government activities.

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

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Product Development (\$ in Millions)				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	NSWC PC : NSWC PC	120.523	4.102	Oct 2020	1.290	Oct 2021	4.770	Oct 2022	-		4.770	Continuing	Continuing	Continuing
Ancillary Hardware Development	Various	Various : Various	6.555	2.401	Oct 2020	1.185	Oct 2021	2.139	Oct 2022	-		2.139	Continuing	Continuing	Continuing
Software Development	WR	NSWC PC : Panama City, FL	26.870	3.496	Oct 2020	1.734	Oct 2021	1.200	Oct 2022	-		1.200	Continuing	Continuing	Continuing
Primary Hardware Development	WR	NSWC IH : Indian Head, MD	14.248	2.420	Oct 2020	0.130	Oct 2021	4.328	Oct 2022	-		4.328	Continuing	Continuing	Continuing
Primary Hardware Development	C/CPFF	JHU/APL : Baltimore, MD	9.689	0.520	Nov 2020	0.260	Nov 2021	0.500	Nov 2022	-		0.500	Continuing	Continuing	Continuing
System Safety	WR	NUWC NPT : Newport, RI	0.263	0.286	Oct 2020	0.410	Oct 2021	0.100	Oct 2022	-		0.100	Continuing	Continuing	Continuing
Quickstrike Extended Range	WR	NSWC IH : Indian Head, MD	1.647	4.384	Oct 2020	0.420	Oct 2021	0.000		-		0.000	0.000	6.451	-
Quickstrike-Extended Range	WR	NSWC PC : Panama City, FL	0.000	4.078	Oct 2020	4.747	Oct 2021	0.000		-		0.000	0.000	8.825	-
Quickstrike Extended Range	C/CPFF	Boeing : St. Charles, MO	0.000	9.780	Oct 2020	0.000		7.267	Oct 2022	-		7.267	Continuing	Continuing	Continuing
Quickstrike Extended Range	WR	Eglin AFB : Okaloosa, FL	0.000	1.250	Oct 2020	0.200	Oct 2021	0.440	Oct 2022	-		0.440	Continuing	Continuing	Continuing
Quickstrike Extended Range	WR	NUWC NPT : Newport, RI	0.000	0.240	Oct 2020	0.200	Oct 2021	0.164	Oct 2022	-		0.164	Continuing	Continuing	Continuing
Quickstrike Extended Range	C/CPAF	NAVAIR : Pax River, MD	0.000	3.000	Oct 2020	0.210	Oct 2021	0.981	Oct 2022	-		0.981	Continuing	Continuing	Continuing
Subtotal			179.795	35.957		10.786		21.889		-		21.889	Continuing	Continuing	N/A

Support (\$ in Millions)				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	C/CPFF	JHU/APL : Baltimore, MD	0.060	0.800	Oct 2020	0.000	Oct 2021	0.000		-		0.000	0.000	0.860	-
Subtotal			0.060	0.800		0.000		0.000		-		0.000	0.000	0.860	N/A

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Test and Evaluation (\$ in Millions)				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			
Development Test & Evaluation	WR	NSWC PC : Panama City, FL	6.074	4.793	Oct 2020	1.294	Oct 2021	1.700	Oct 2022	-		1.700	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC IH : Indian Head, MD	0.786	2.373	Oct 2020	2.619	Oct 2021	1.900	Oct 2022	-		1.900	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	Eglin, AFB : Eglin AFB, FL	0.000	1.344	Oct 2020	0.528	Oct 2021	2.667	Oct 2022	-		2.667	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	Tinker AFB : Oklahoma City, OK	0.000	2.000	Oct 2020	0.528	Oct 2021	1.440	Oct 2022	-		1.440	0.000	3.968	-
Subtotal			6.860	10.510		4.969		7.707		-		7.707	Continuing	Continuing	N/A

Management Services (\$ in Millions)				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	C/CPAF	Various : Various	1.427	1.158	Oct 2020	0.760	Oct 2021	0.641	Oct 2022	-		0.641	Continuing	Continuing	Continuing
Program Management Support	WR	NSWC CD : West Bethesda, MD	0.000	0.269	Oct 2020	0.269	Oct 2021	0.231	Oct 2022	-		0.231	Continuing	Continuing	Continuing
Subtotal			1.427	1.427		1.029		0.872		-		0.872	Continuing	Continuing	N/A

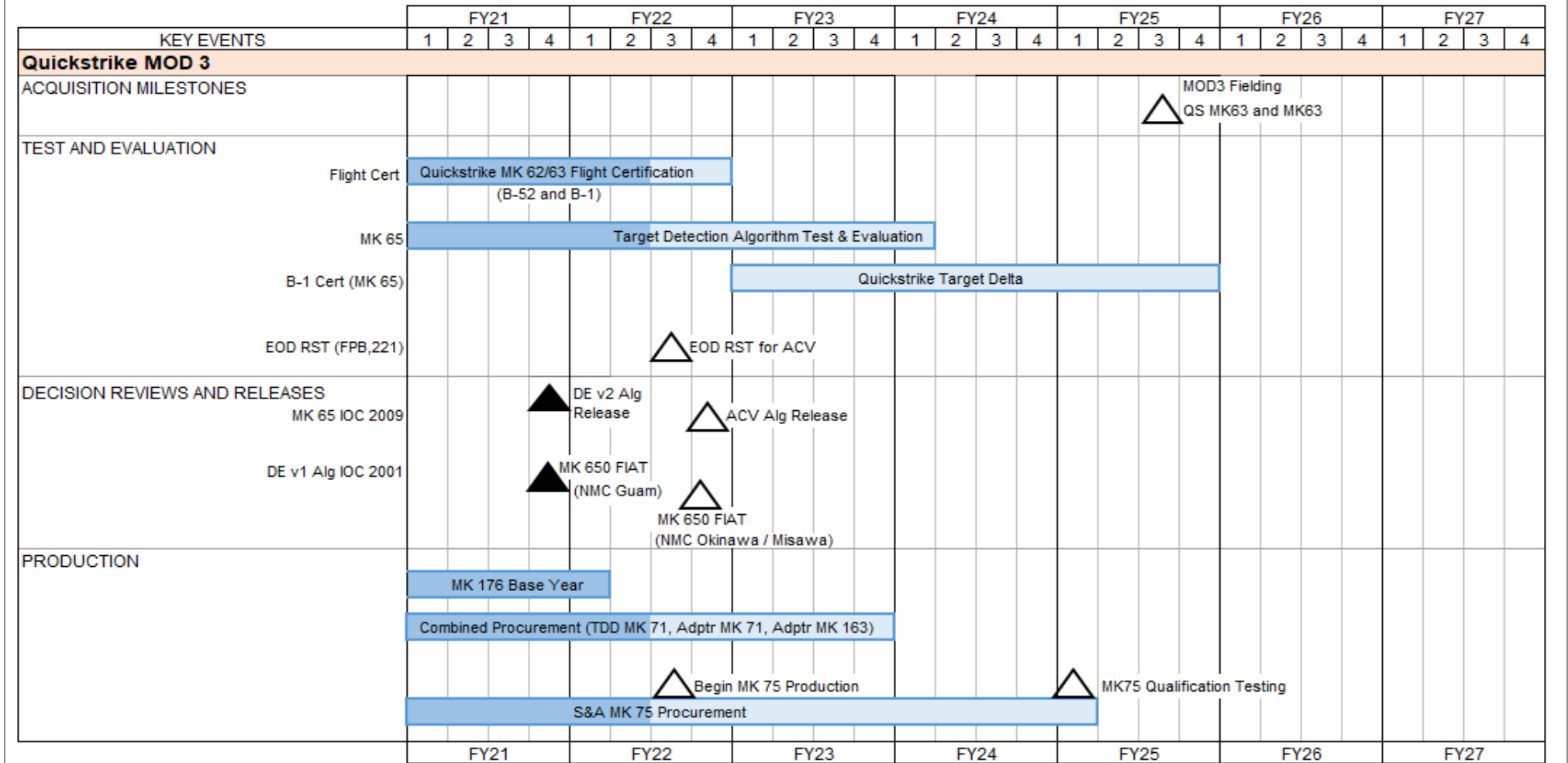
			Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			188.142	48.694	16.784	30.468	-	30.468	Continuing	Continuing	N/A

Remarks

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

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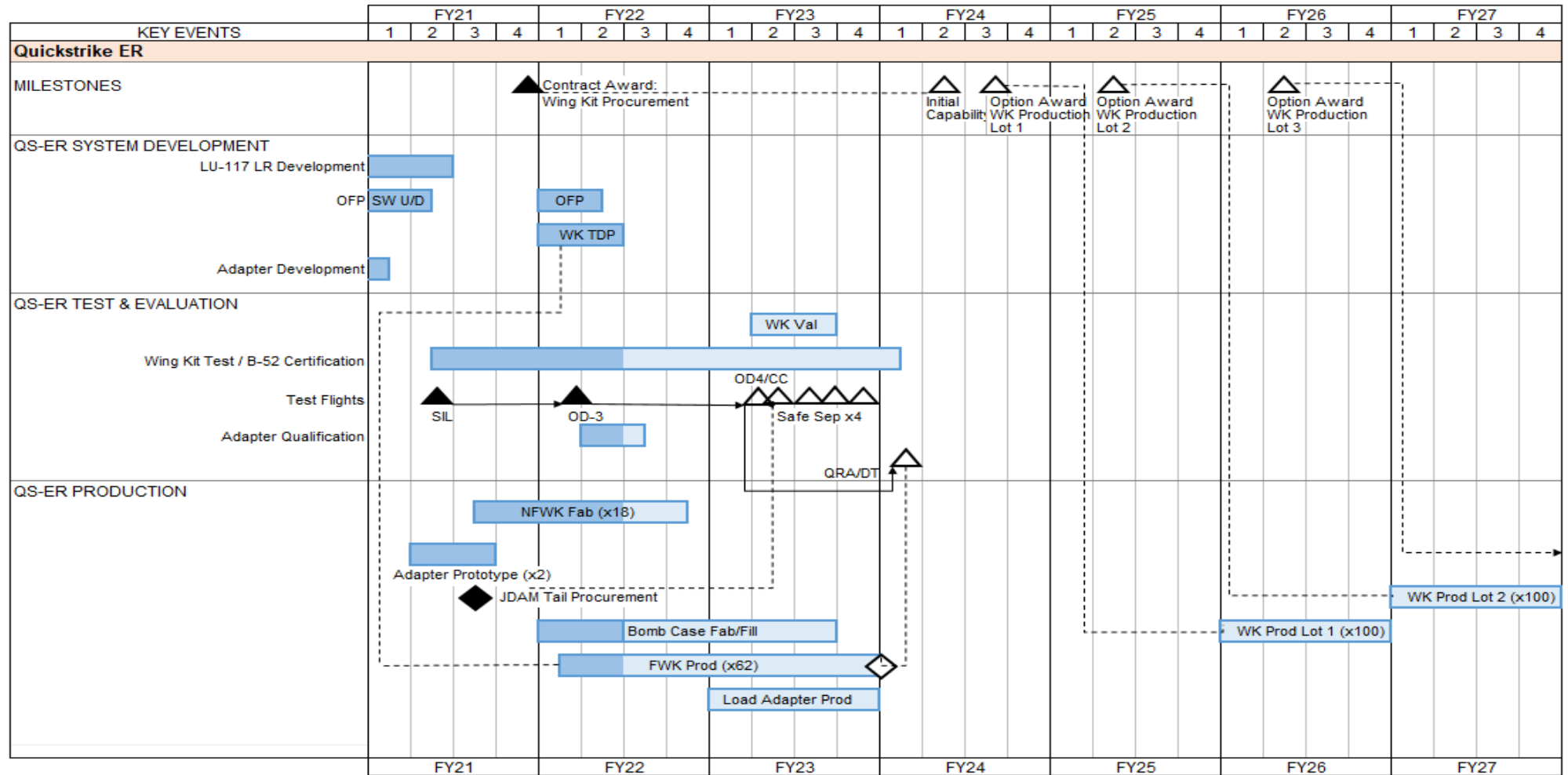
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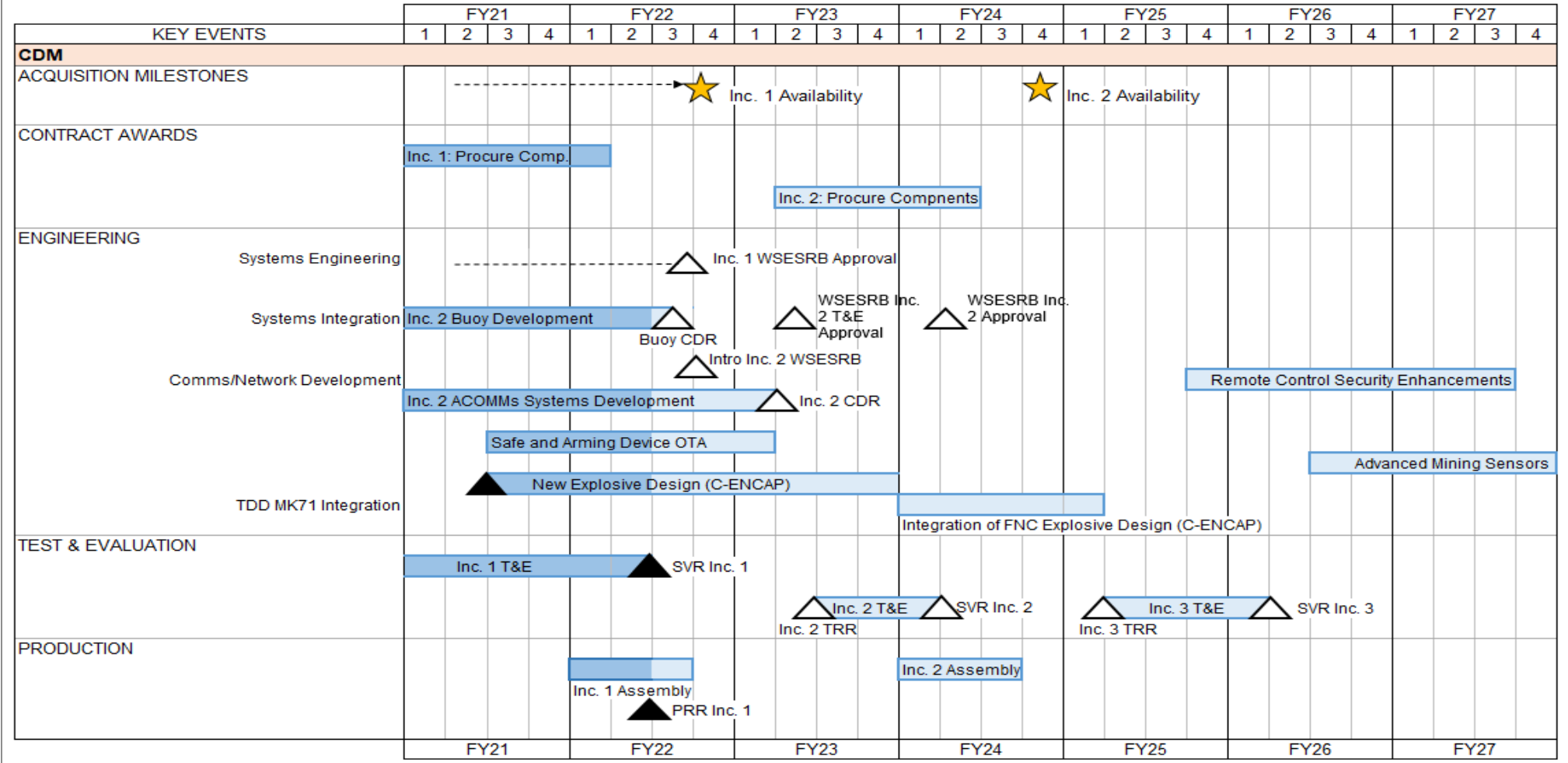
Project (Number/Name)
0267 / *Mine Improvements*



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

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Quickstrike				
Acquisition: Quickstrike Mod 3: MK 176 Base Year	1	2021	1	2022
Acquisition: Quickstrike Mod 3: TDD MK 71, Adptr MK 71, Adptr MK 163 Procurement	1	2021	4	2023
Acquisition: Quickstrike Mod 3: Begin MK 75 Production	3	2022	3	2022
Acquisition: Quickstrike Mod 3: MK 75 Qualification Testing	1	2025	1	2025
Acquisition: Quickstrike Mod 3: S&A MK 75 Procurement	1	2021	1	2025
Acquisition: Quickstrike Extended Range: WK TDP	1	2022	2	2022
Acquisition: Quickstrike Extended Range: WK Procurement Contract Award	4	2021	4	2021
Acquisition: Quickstrike Extended Range: Initial Capability	2	2024	2	2024
Acquisition: Quickstrike Extended Range: Non-Functional Wing Kit Fabrication	3	2021	4	2022
Acquisition: Quickstrike Extended Range: Adapter Prototype	2	2021	3	2021
Acquisition: Quickstrike Extended Range: JDAM Tail Procurement	3	2021	3	2021
Acquisition: Quickstrike Extended Range: Bomb Fabrication/Fill	1	2022	3	2023
Acquisition: Quickstrike Extended Range: Functional Wing Kit Fabrication	1	2022	4	2023
Acquisition: Quickstrike Extended Range: Load Adapter Fabrication	1	2023	4	2023
Acquisition: Quickstrike Extended Range: Incremental WK Production Lots	1	2026	4	2027
System Development: Quickstrike Mod 3: Incremental Algorithm Releases	1	2021	2	2022
System Development: Quickstrike Extended Range: QS-ER System Development Events	1	2021	2	2022
Testing & Evaluation: Quickstrike Mod 3: Flight Certification	1	2021	4	2022
Testing & Evaluation: Quickstrike Mod 3: Target Detection Algorithm Test & Evaluation	1	2021	1	2024
Testing & Evaluation: Quickstrike Mod 3: Target Delta B-1 Certification	1	2023	4	2025
Testing & Evaluation: Quickstrike Mod 3: EOD RST for Air Cushion Vehicle	3	2022	3	2022

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

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Testing & Evaluation: Quickstrike Extended Range: Wing Kit Validation	2	2023	3	2023
Testing & Evaluation: Quickstrike Extended Range: Wing Kit Test / B-52 Certification	2	2021	1	2024
Testing & Evaluation: Quickstrike Extended Range: Incremental Test Flight Events	2	2021	4	2023
Testing & Evaluation: Quickstrike Extended Range: Adapter Qualification	2	2022	3	2022
Testing & Evaluation: Quickstrike Extended Range: Quick Reaction Assessment	1	2024	1	2024
<i>Clandestine Mining</i>				
Acquisition Milestones: Clandestine Mining: Increment 1 Availability	4	2022	4	2022
Acquisition Milestones: Clandestine Mining: Increment 2 Availability	4	2024	4	2024
Acquisition Milestones: Procure Increment 1 Components	1	2021	1	2022
Acquisition Milestones: Procure Increment 2 Components	2	2023	2	2024
Acquisition Milestones: Increment 1 PRR	2	2022	2	2022
Acquisition Milestones: Increment 1 Assembly	1	2022	3	2022
Acquisition Milestones: Increment 2 Assembly	1	2024	3	2024
System Development: Inc. 1 WSESRB Approval	3	2022	3	2022
System Development: Remote Control Security Enhancements	4	2025	3	2027
System Development: Increment 2 ACOMMs Systems Development	1	2021	2	2023
System Development: Buoy CDR	3	2022	3	2022
System Development: WSESRB Inc. 2 T&E Approval	2	2023	2	2023
System Development: WSESRB Inc. 2 Approval	2	2024	2	2024
System Development: Safe & Arming Device OTA	3	2021	1	2023
System Development: Intro Inc. 2 WSESRB	4	2022	4	2022
System Development: Future Naval Capability Kick Off	2	2021	2	2021
System Development: New Explosive Design (C-ENCAP)	3	2021	4	2023
System Development: Integration of FNC Explosive Design (C-ENCAP)	1	2024	1	2025
System Development: Advanced Mining Sensors	3	2026	4	2027
Testing & Evaluation: Clandestine Mining: Testing Increment 1	1	2021	2	2022

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

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Testing & Evaluation: Systems Verification Review Increment 1	2	2022	2	2022
Testing & Evaluation: Clandestine Mining Testing Increment 2	2	2023	1	2024
Testing & Evaluation: Systems Verification Review Increment 2	2	2024	2	2024
Testing & Evaluation: Clandestine Mining: Testing Increment 3	2	2025	1	2026
Testing & Evaluation: Systems Verification Review Increment 3	2	2026	2	2026
<i>Mine Improvements</i>				
System Development: Minefield Planning Tactical Decision Aid Improvements: Target	1	2021	4	2023
System Development: Target Detection Algorithms / Operational Data & Technology Refresh	2	2022	4	2024
System Development: Minefield Planning Tactical Decision Aid Improvements: Technology	3	2023	4	2025
Testing & Evaluation: Target Detection Improvement Test	1	2021	4	2023
Testing & Evaluation: Target Detection: Quickstrike Target Data	1	2023	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>				Project (Number/Name) 2993 / <i>Encapsulated Effector</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
2993: <i>Encapsulated Effector</i>	8.283	26.099	20.974	30.325	-	30.325	49.291	49.071	41.288	44.931	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

FY 2023 reflects a net decrease of \$10.012M due to a realignment of funding and developmental testings commencing in FY 2024 instead of FY 2023.

The Encapsulated Effector, aka Hammerhead, program complements existing shallow-water mines by providing maritime mining capability in deeper water depths. Based on the urgency of the requirement, the Hammerhead program utilizes Section 804 authority to streamline acquisition of an initial capability. The system uses existing kinetic payloads to engage enemy targets, and provides a wide area of coverage per each weapon. The program uses a self-contained, propelled weapon to engage the target when a target is detected. The system uses modern sensing and processing technology to enable accurate targeting at increased range and maintains minefield resilience even as weapons are expended against targets. The result is expanded operating areas to restrict or deny adversary access to the intended area while using fewer weapons than traditional mines to ensure the system can be deployed by an XLUUV or surface vessel. Additional efforts include transitioning an encapsulation system with different end effectors under the Compact Encapsulated Effector (C-ENCAP) future naval capability (FNC) that is managed by the Office of Naval Research (ONR).

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Product Development	22.752	17.538	25.972	0.000	25.972
Articles:	-	-	-	-	-
FY 2022 Plans:					
- Continue development of the Hammerhead mine to establish the allocated baseline and initial product baseline.					
- Continue torpedo software and hardware updates to enable underwater launch.					
- Continue pre-planned product improvement to increase lethality, expand target sets, and optimize system performance.					
- Conduct Preliminary Design Review.					
FY 2023 Base Plans:					
- Conduct Critical Design Review establishing the initial product baseline.					
- Begin fabrication of the Hammerhead prototypes in support of contractor and developmental testing.					
- Continue torpedo software and hardware updates to enable underwater launch.					
- Begin surface launch development and integration.					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy	Date: April 2022
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Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 2993 / <i>Encapsulated Effector</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Continue pre-planned product improvement to increase lethality, expand target sets, and optimize system performance.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY 2022 to 2023 increase is associated with critical design and fabrication of prototype articles.</p>					
<p>Title: Support</p> <p align="right">Articles:</p> <p>FY 2022 Plans: - Continue engineering support of Hammerhead mine design and development.</p> <p>FY 2023 Base Plans: - Continue engineering support of Hammerhead mine design and development.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: N/A</p>	0.100 -	0.100 -	0.100 -	0.000 -	0.100 -
<p>Title: Management</p> <p align="right">Articles:</p> <p>FY 2022 Plans: - Continue to provide programmatic and financial support.</p> <p>FY 2023 Base Plans: - Continue to provide programmatic and financial support.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY 2022 to 2023 increase is associated with Hammerhead contract management costs.</p>	0.196 -	0.250 -	0.387 -	0.000 -	0.387 -
<p>Title: Test and Evaluation</p> <p align="right">Articles:</p>	3.051 -	3.086 -	3.866 -	0.000 -	3.866 -

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 2993 / <i>Encapsulated Effector</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p><i>FY 2022 Plans:</i></p> <ul style="list-style-type: none"> - Continue weapon software and hardware testing to support underwater launch. Effort includes test assets and range support to verify weapon modifications. - Complete MK 54 Operational Software test event <p><i>FY 2023 Base Plans:</i></p> <ul style="list-style-type: none"> - Continue weapon software and hardware testing to support underwater launch. Effort includes test assets and range support to verify weapon modifications. - Conduct subsystem and system-level lab testing. - Conduct contractor testing. <p><i>FY 2023 OCO Plans:</i> N/A</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> FY 2022 to FY 2023 increase associated with contractor testing support as well as continued MK 54 testing.</p>					
Accomplishments/Planned Programs Subtotals	26.099	20.974	30.325	0.000	30.325

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

N/A

Remarks

D. Acquisition Strategy

The Hammerhead program leveraged Navy warfare center expertise to perform requirements analysis and engineering architecture design to develop system requirements. The system requirements and interface requirements documents will be used by a prime contractor to develop, test, integrate, and produce Hammerhead mines. The contractor will be responsible for the final design to optimize producibility, manufacture engineering design models to be used during testing, and test planning and execution to gather the required data to support a production decision. Hammerhead will utilize existing lightweight torpedo inventory and incorporate modification to enable underwater launch. The program follows an evolutionary acquisition approach by providing incremental performance updates to the system.

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

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 2993 / <i>Encapsulated Effector</i>
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Product Development (\$ in Millions)				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	NSWC PC : Panama City, FL	3.105	5.901	Oct 2020	4.502	Oct 2021	5.542	Oct 2022	-		5.542	Continuing	Continuing	Continuing
Weapon Interfaces & Modifications	WR	NUWC NPT : Newport, RI	3.661	1.311	Oct 2020	1.611	Oct 2021	1.052	Oct 2022	-		1.052	Continuing	Continuing	Continuing
System Safety	WR	NUWC NPT : Newport, RI	0.573	0.150	Oct 2020	0.150	Oct 2021	0.150	Oct 2022	-		0.150	0.000	1.023	-
System Development & Integration	C/CPFF	GDMS : Various	0.000	15.390	Jun 2021	11.275	Jan 2022	19.228	Jan 2023	-		19.228	Continuing	Continuing	Continuing
Subtotal			7.339	22.752		17.538		25.972		-		25.972	Continuing	Continuing	N/A

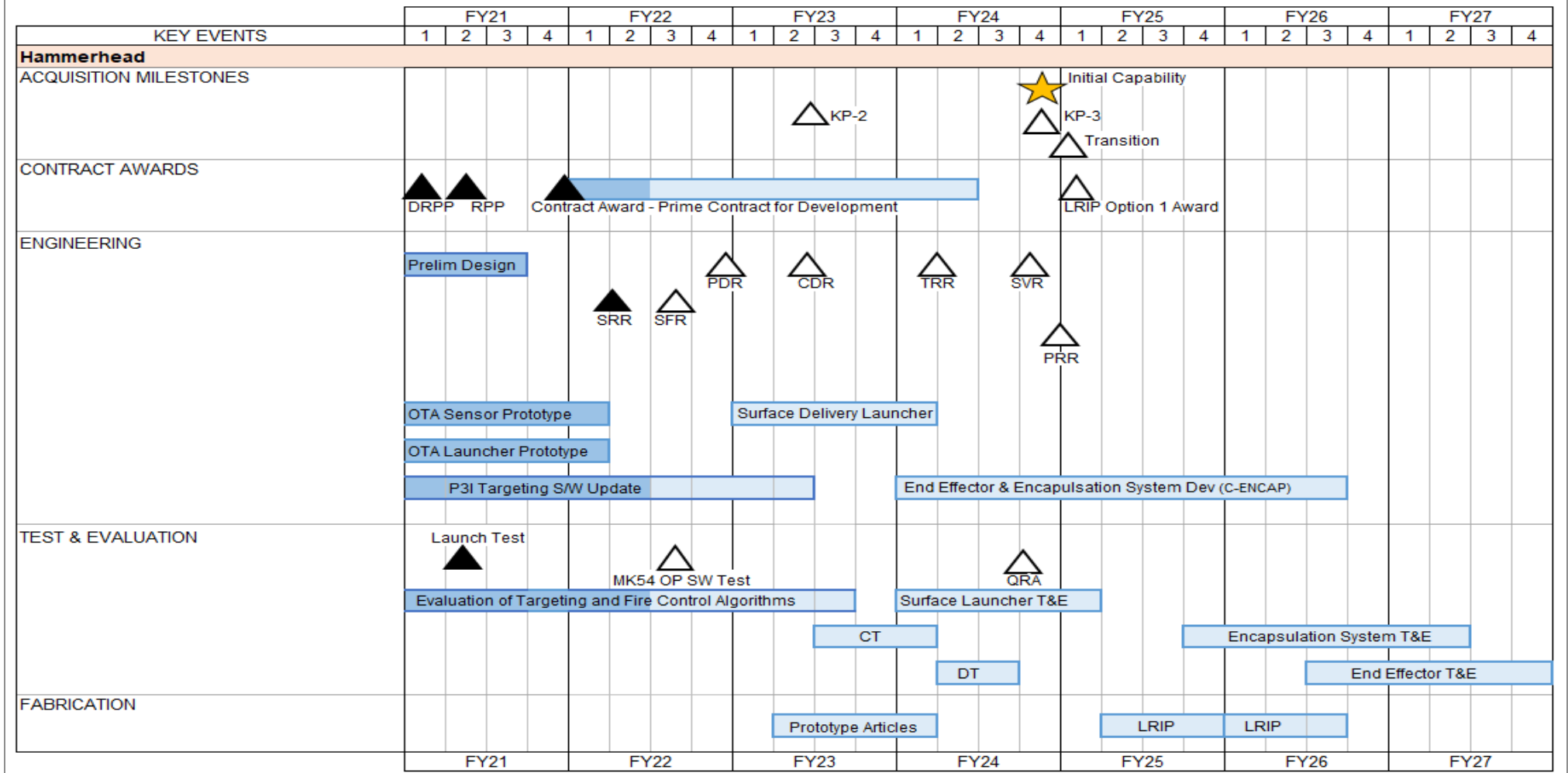
Support (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Systems Engineering Support	TBD	ISPA Technology : Panama City, FL	0.070	0.100	Nov 2020	0.100	Nov 2021	0.100	Nov 2022	-		0.100	Continuing	Continuing	Continuing
Subtotal			0.070	0.100		0.100		0.100		-		0.100	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				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			
Government Test and Evaluation	WR	NSWC PC : Panama City, FL	0.774	1.856	Oct 2020	1.816	Oct 2021	1.564	Oct 2022	-		1.564	Continuing	Continuing	Continuing
Government Test and Evaluation	WR	NUWC NPT : Newport, RI	0.000	0.145	Oct 2020	0.170	Oct 2021	0.170	Oct 2022	-		0.170	0.000	0.485	-
Government Test and Evaluation	WR	NUWC KPT : Keyport, WA	0.000	1.050	Oct 2020	1.100	Oct 2021	2.132	Oct 2022	-		2.132	0.000	4.282	-
Subtotal			0.774	3.051		3.086		3.866		-		3.866	Continuing	Continuing	N/A

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

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 2993 / <i>Encapsulated Effector</i>
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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 2993 / <i>Encapsulated Effector</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Encapsulated Effector</i>				
Acquisition Milestones: Contract Award	4	2021	4	2021
Acquisition Milestones: Knowledge Point 2	2	2023	2	2023
Acquisition Milestones: Knowledge Point 3	4	2024	4	2024
Acquisition Milestones: Initial Capability	4	2024	4	2024
Acquisition Milestones: Transition	1	2025	1	2025
Acquisition Milestones: Draft Request for Prototyping Proposal	1	2021	1	2021
Acquisition Milestones: Request for Prototyping Proposal	2	2021	2	2021
Engineering: Preliminary Design Engineering	1	2021	3	2021
Engineering: Surface Delivery Launch	1	2023	1	2024
Engineering: Preliminary Design Review	4	2022	4	2022
Engineering: TRR	1	2024	1	2024
Engineering: SVR	4	2024	4	2024
Engineering: SRR	2	2022	2	2022
Engineering: SFR	3	2022	3	2022
Engineering: PRR	4	2024	4	2024
Engineering: Critical Design Review	2	2023	2	2023
Engineering: P3I - Targeting SW Update	1	2021	2	2023
Engineering: OTA Sensor Prototype	1	2021	1	2022
Engineering: OTA Launcher Prototype	1	2021	1	2022
Engineering: End Effector & Encapsulation System Development	1	2024	3	2026
Test and Evaluation: MK54 OP SW Test	3	2022	3	2022
Test and Evaluation: Evaluation of Targeting and Fire Control Algorithms	1	2021	3	2023

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

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 2993 / <i>Encapsulated Effector</i>
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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Test and Evaluation: Contractor Testing (CT)	3	2023	1	2024
Test and Evaluation: Surface Launcher Testing	1	2024	1	2025
Test and Evaluation: Developmental Testing (DT)	2	2024	3	2024
Test and Evaluation: Quick Reaction Assessment	3	2024	3	2024
Test and Evaluation: Encapsulation System Testing	4	2025	2	2027
Test and Evaluation: End Effector System Testing	3	2026	4	2027
Fabrication: Prototype Articles	2	2023	1	2024
Fabrication: LRIP	2	2025	4	2025