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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy **Date:** May 2021

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	216.173	54.431	84.793	76.027	-	76.027	-	-	-	-	-	-
0267: <i>Mine Improvements</i>	216.088	13.677	57.771	35.690	-	35.690	-	-	-	-	-	-
2993: <i>Encapsulated Effector</i>	0.085	14.224	27.022	40.337	-	40.337	-	-	-	-	-	-
9999: <i>Congressional Adds</i>	0.000	26.530	0.000	0.000	-	0.000	-	-	-	-	-	-

Note
 \$25.284M within this program element (PE) supports JEON PC-0012 Advanced Mining in FY22.

A. Mission Description and Budget Item Justification

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

Increased FY 2022 funding supports mining improvements to increase aerial standoff range and provide precision placement.

Increased funding also supports the development of the Hammerhead mine, which complements existing shallow-water mines by operating in deeper water depths and providing a wide area of coverage per unit.

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B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	56.464	92.607	76.197	-	76.197
Current President's Budget	54.431	84.793	76.027	-	76.027
Total Adjustments	-2.033	-7.814	-0.170	-	-0.170
• Congressional General Reductions	-	-0.412			
• Congressional Directed Reductions	-	-7.402			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.032	0.000			
• Program Adjustments	0.000	0.000	34.100	-	34.100
• Rate/Misc Adjustments	-0.001	0.000	-34.270	-	-34.270

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

Project: 9999: *Congressional Adds*

Congressional Add: *Quick strike joint direct attack munition*

Congressional Add Subtotals for Project: 9999

Congressional Add Totals for all Projects

	FY 2020	FY 2021
	26.530	0.000
	26.530	0.000
	26.530	0.000

Change Summary Explanation

FY20: $-\$2.032$ total adjustment; -2.033 M SBIR reduction, $-\$0.483$ M Mines Improvements (PU0267), $-\$0.580$ M Encapsulated Effector (PU2993), $-\$0.970$ M Congressional Add (PU9999); $\$0.001$ M miscellaneous rate adjustment

FY21: $-\$7.402$ Encapsulated Effector Delay'a

FY22: $-\$0.170$ total adjustment; $+\$31.9$ M programmatic adjustment for Quickstrike Powered wing (PU0267) kit / $-\$31.9$ m reversal and $\$2.2$ M for Hammerhead carriage for integration onto deployment platform (PU2993); $-\$0.607$ M execution adjustment; $-\$0.170$ M misc rate adjustments.

The FY2022 funding request was reduced by $\$0.607$ million to account for the availability of prior year execution balances.

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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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
0267: <i>Mine Improvements</i>	216.088	13.677	57.771	35.690	-	35.690	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-	-	-

Note

The FY20 funding request was increased by \$27.5M for Congressional add to Quickstrike Extended Range (Quickstrike-ER) and established in project line 9999. Quickstrike-ER transitions to the Mine Improvements project line (0267) for FY22 and out. The FY2022 funding request was reduced by \$0.607 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

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 JEONS. This includes adding GPS-guided, powered and glide flight gear to the Quickstrike series to reduce risk to delivery aircraft by introducing precision placement and standoff range. This effort will include the development and execution of the QuickstrikeER and Quickstrike-P capabilities.

2) Clandestine Delivered Mine (CDM) provides a capability required by Joint Emergent Operational Needs Statement (JEONS) by converting legacy mining systems for delivery by Extra Large Unmanned Undersea Vehicles (XLUUV) (Increment 1). 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.

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	10.989	43.957	25.231	0.000	25.231
Articles:	-	-	-	-	-
FY 2021 Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
<p>Quickstrike-ER: Continue development of flight gear and mine components to withstand operationally relevant aircraft environments and high speed water impacts. Build and qualify prototype loading adapters to enable loading on B-52 aircraft. Establish technical baseline for QS-ER capability components. Conduct flight test events to validate changes to the operational flight program software. Continue requirements analysis, including design trade studies, to support development of a long-range, standoff capability.</p> <p>CDM: Continue testing and evaluation of Increment 1 system. Continue development of buoy system in support of enabling CDM remote arming. Award Other Transactions Authorities to accelerate development of a new fuzing system that will enable reversible arming of the CDM.</p> <p>Quickstrike Mod 3: Continue generating operational data, based on updated fleet priority targets. Continue development of target detecting algorithms to optimize targeting against particular target sets. Evaluate target detecting device upgrades to improve detection range and build upon existing sensor technologies</p> <p>Minefield Planning: Evaluate minefield planning system requirements in order to develop an optimized algorithm adapted for precision delivery capabilities such as CDM and Quickstrike-ER, which will allow minefield planners to develop more effective and efficient minefields. Utilize science and technology products developed by the Office of Naval Research under a Future Naval Capability program to inform system requirements and algorithm development</p> <p>FY 2022 Base Plans: Quickstrike-ER: Complete residual software flight testing, validate system modifications to verify performance for operational use. Conduct initial B-52 aircraft carriage qualification events. Contract and begin fabrication of production version of B-52 loading adapters.</p> <p>CDM: Assemble and field Increment 1 CDM systems. Complete development of buoy system in support of CDM remote arming. Continue development of safe and arming device in support of CDM reversible arming.</p>					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
<p>Quickstrike Mod 3: 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> <p>Minefield Planning: Development of minefield planning software for precise placement capabilities such as CDM and Quickstrike-ER</p> <p>FY 2022 OCO Plans: N/A</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Funding in FY 2022 supports continued development of QS Mod 3 and CDM as well as software flight testing and aircraft qualification events</p>					
<p>Title: Support</p> <p align="right">Articles:</p> <p>FY 2021 Plans: Funding for requirements development and trade studies for further increased range standoff mining capability.</p> <p>FY 2022 Base Plans: N/A</p> <p>FY 2022 OCO Plans: N/A</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Decrease due to completion of requirements development.</p>	0.155	0.800	0.000	0.000	0.000
	-	-	-	-	-
<p>Title: Test and Evaluation</p> <p align="right">Articles:</p> <p>FY 2021 Plans: Quickstrike-ER: Complete mine component qualification, safety and operational flight-testing for certification aboard B-52. Complete all required testing for a fielding determination to satisfy requirements of a JEONS.</p> <p>CDM: Complete remaining tests for CDM Increment 1 including packaging, handling, shipping and transportation testing as well as fuze qualification testing.</p>	1.854	11.587	9.430	0.000	9.430
	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
<p>Quickstrike Mod 3: Conduct explosive ordnance disposal (EOD) render safe procedures testing to ensure safe disposal procedures are safe and effective for EOD forces for Mk 62 and Mk 63 variants of Quickstrike Mod 3.</p> <p>FY 2022 Base Plans: CDM: Complete systems verification review for CDM Increment 1. Complete development for buoy for future incremental upgrades. Continue development of Safe and arming device through other transactions authorities</p> <p>FY 2022 OCO Plans: N/A</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 funding primarily supports development for CDM remote control and reversible arming incremental upgrades.</p>					
<p>Title: Management:</p> <p align="right">Articles:</p> <p>FY 2021 Plans: Provide programmatic and financial support across the QS-ER, QS Mod 3, and CDM programs.</p> <p>FY 2022 Base Plans: Continue to provide programmatic and financial support across the QS-ER, QS Mod 3, and CDM programs.</p> <p>FY 2022 OCO Plans: N/A</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: No significant change</p>	0.679	1.427	1.029	0.000	1.029
	-	-	-	-	-
Accomplishments/Planned Programs Subtotals	13.677	57.771	35.690	0.000	35.690

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• WPN 3231: Maritime Mines	5.183	5.832	8.567	-	8.567	-	-	-	-	-	-

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

<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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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 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 development and maintained by Government activities.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy **Date:** May 2021

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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	117.357	3.166	Oct 2019	4.102	Oct 2020	1.290	Oct 2021	-		1.290	-	-	-
Ancillary Hardware Development	Various	Various : Various	4.112	2.443	Oct 2019	2.401	Oct 2020	1.930	Oct 2021	-		1.930	-	-	-
Software Development	WR	NSWC PC : Panama City, FL	24.513	2.357	Oct 2019	3.496	Oct 2020	2.820	Oct 2021	-		2.820	-	-	-
Primary Hardware Development	WR	NSWC IH : Indian Head, MD	12.008	2.240	Oct 2019	2.420	Oct 2020	0.130	Oct 2021	-		0.130	-	-	-
Primary Hardware Development	C/CPFF	JHU/APL : Baltimore, MD	9.169	0.520	Oct 2019	0.520	Nov 2020	0.260	Nov 2021	-		0.260	-	-	-
System Safety	WR	NUWC NPT : Newport, RI	0.000	0.263	Oct 2019	0.286	Oct 2020	0.410	Oct 2021	-		0.410	-	-	-
Quickstrike Extended Range	WR	NSWC IH : Indian Head, MD	1.647	0.000		4.384	Oct 2020	0.000	Oct 2021	-		0.000	-	-	-
Quickstrike-Extended Range	WR	NSWC PC : Panama City, FL	0.000	0.000		4.078	Oct 2020	0.000	Oct 2021	-		0.000	-	-	-
Quickstrike Extended Range	C/CPFF	Boeing : St. Charles, MO	0.000	0.000		17.780	Oct 2020	14.261	Oct 2021	-		14.261	-	-	-
Quickstrike Extended Range	WR	Eglin AFB : Okaloosa, FL	0.000	0.000		1.250	Oct 2020	0.640	Oct 2021	-		0.640	-	-	-
Quickstrike Extended Range	WR	NUWC NPT : Newport, RI	0.000	0.000		0.240	Oct 2020	0.500	Oct 2021	-		0.500	-	-	-
Quickstrike Extended Range	C/CPAF	NAVAIR : Pax River, MD	0.000	0.000		3.000	Oct 2020	2.990	Oct 2021	-		2.990	-	-	-
Subtotal			168.806	10.989		43.957		25.231		-		25.231	-	-	N/A

Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
IA/ILS/Technical	WR	NSWC PC : Panama City, FL	1.017	0.095	Oct 2019	0.000		0.000		-		0.000	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy **Date:** May 2021

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Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	0.000	0.060	Oct 2019	0.800	Oct 2020	0.000	Oct 2021	-		0.000	-	-	-
Subtotal			1.017	0.155		0.800		0.000		-		0.000	-	-	N/A

Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	5.006	1.068	Oct 2019	5.470	Oct 2020	5.635	Oct 2021	-		5.635	-	-	-
Aircraft interface & survivability testing	WR	NSWC PC : Panama City, FL	4.065	0.000		0.000		0.000		-		0.000	-	-	-
Development Test & Evaluation	WR	NSWC IH : Indian Head, MD	0.000	0.786	Oct 2019	2.773	Oct 2020	2.619	Oct 2021	-		2.619	-	-	-
Development Test & Evaluation	WR	Eglin, AFB : Eglin AFB, FL	0.000	0.000		1.344	Oct 2020	0.588	Oct 2021	-		0.588	-	-	-
Development Test & Evaluation	WR	Tinker AFB : Oklahoma City, OK	0.000	0.000		2.000	Oct 2020	0.588	Oct 2021	-		0.588	-	-	-
Subtotal			9.071	1.854		11.587		9.430		-		9.430	-	-	N/A

Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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 Engineering Support	C/CPAF	Various : Various	36.352	0.000		0.000		0.000		-		0.000	-	-	-
Program Management Support	C/CPAF	Various : Various	0.748	0.679	Oct 2019	1.158	Oct 2020	0.760	Oct 2021	-		0.760	-	-	-
Program Management Support	WR	NSWC CD : West Bethesda, MD	0.000	0.000		0.269	Oct 2020	0.269	Oct 2021	-		0.269	-	-	-
Travel	Various	NAVSEA : Washington DC	0.094	0.000	Oct 2019	0.000	Oct 2020	0.000	Oct 2021	-		0.000	-	-	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy **Date: May 2021**

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Quickstrike	FY 2020				FY 2021				FY 2022				
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	
Acquisition Milestones										Quickstrike ER Initial Capability ◆	Quickstrike Powered MS B ◆		
System Development				Quickstrike ER: Contract Award ▼							Quickstrike Powered BLU-1111 with PBXN-136		
											Quickstrike Powered Wing Kit Development		
													Quickstrike Powered PDR ▼
Testing & Evaluation					Quickstrike ER: Flight Certification								
							Quickstrike ER: Qualification Test		Quickstrike ER: Aircraft Integration Test				
									Quickstrike Powered Payload Qualification				

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy **Date: May 2021**

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Clandestine Mining	FY 2020				FY 2021				FY 2022				
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	
Acquisition Milestones					Clandestine Mining: Production & Deployment Decision ◆	Clandestine Mining: Increment 1 Capability ◆							
System Development	Clandestine Mining: Future Upgrades												
	Clandestine Mining: Increment 2												
Testing & Evaluation	Clandestine Mining: Testing Increment 1						Clandestine Mining Testing Increment 2						Clandestine Mining: Future Upgrades

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy **Date:** May 2021

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	FY 2020				FY 2021				FY 2022			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Mine Improvements												
System Development	Minefield Planning Tactical Decision Aid Improvements: Target											
Testing & Evaluation												

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy **Date:** May 2021

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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Quickstrike				
Acquisition Milestones: Quickstrike Extended Range Initial Capability	1	2022	1	2022
Acquisition Milestones: Quickstrike Powered MS B	2	2022	2	2022
System Development: Quickstrike Extended Range: Contract Award	4	2020	4	2020
System Development: Quickstrike Powered BLU-1111 with PBXN-136	2	2022	4	2022
System Development: Quickstrike Powered Wing Kit Development	2	2022	4	2022
System Development: Quickstrike Powered PDR	4	2022	4	2022
Testing & Evaluation: Quickstrike Extended Range: Flight Certification	1	2021	4	2021
Testing & Evaluation: Quickstrike Extended Range: Qualification Test	3	2021	3	2021
Testing & Evaluation: Quickstrike Extended Range: Aircraft Integration Test	4	2021	4	2022
Testing & Evaluation: Quickstrike Powered Payload Qualification	1	2022	4	2022
Clandestine Mining				
Acquisition Milestones: Clandestine Mining: Production & Deployment Decision	1	2021	1	2021
Acquisition Milestones: Clandestine Mining: Increment 1 Capability	2	2021	2	2021
System Development: Clandestine Mining: Future Upgrades	1	2020	2	2022
System Development: Clandestine Mining: Increment 2	1	2020	2	2021
Testing & Evaluation: Clandestine Mining: Testing Increment 1	1	2020	1	2021
Testing & Evaluation: Clandestine Mining Testing Increment 2	3	2021	3	2022
Testing & Evaluation: Clandestine Mining: Future Upgrades	4	2022	4	2022
Mine Improvements				
System Development: Minefield Planning Tactical Decision Aid Improvements: Target	1	2020	4	2022
System Development: Target Detection Algorithms / Operational Data & Technology Refresh	2	2022	4	2022

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Testing & Evaluation: Target Detection Improvement Test	1	2020	4	2022

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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
2993: Encapsulated Effector	0.085	14.224	27.022	40.337	-	40.337	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

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, this program was designated a Maritime Accelerated Acquisition program by the Navy Accelerated Acquisition Board of Directors and uses 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.

Increased funding in FY 2022 supports critical design, contractor testing, and initial integration to the deployment platform.

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

	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Product Development	13.100	23.675	35.580	0.000	35.580
Articles:	-	-	-	-	-
FY 2021 Plans:					
Award prime contract for design and fabrication of prototype units. Conduct System Requirement Review and System Functional Review to establish the functional baseline. Continue refinement of targeting logic and algorithms and identify torpedo hardware/software modifications to support a Hammerhead capability. Coordinate delivery platform requirements to support development, testing, and platform integration. Requirements analysis and trade-studies to support pre-planned product improvement over baseline capability.					
FY 2022 Base 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. Begin development of Hammerhead carriage to enable integration and deployment. Continue pre-planned product improvement to increase lethality, expand target sets, and optimize system performance.					
FY 2022 OCO Plans:					
N/A					
FY 2021 to FY 2022 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy	Date: May 2021
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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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
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Increased funding supports detailed design, contractor testing, and prototype articles. Funding also supports development and integration with deployment platform.

Title: Support	0.250	0.100	0.100	0.000	0.100
Articles:	-	-	-	-	-
FY 2021 Plans: Engineering support of Hammerhead mine design and development.					
FY 2022 Base Plans: Continue engineering support of Hammerhead mine design and development.					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement: No change.					

Title: Management	0.100	0.196	0.371	0.000	0.371
Articles:	-	-	-	-	-
FY 2021 Plans: Provide programmatic and financial support.					
FY 2022 Base Plans: Continue to provide programmatic and financial support.					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 funding increase supports additional contract and program management support as required.					

Title: Test and Evaluation	0.774	3.051	4.286	0.000	4.286
Articles:	-	-	-	-	-
FY 2021 Plans: Continue laboratory testing and modeling and simulation of weapon performance to support the Hammerhead configuration.					
FY 2022 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy	Date: May 2021
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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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Continue weapon software and hardware testing to support underwater launch. Effort includes test assets and range support to verify weapon modifications. FY 2022 OCO Plans: N/A FY 2021 to FY 2022 Increase/Decrease Statement: FY2022 funding increase supports hardware and software testing including test assets and range support.					
Accomplishments/Planned Programs Subtotals	14.224	27.022	40.337	0.000	40.337

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.

The full funding requirement for the Middle Tier of Acquisition prototype effort as outlined in the Report to Congress is below:

FY21: \$27.0M

FY22: \$40.3M

FY23: \$35.5M

FY24: \$22.4M

The total cost of the MTA prototyping effort is \$125.2M, and is fully funded in RDT&E.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy **Date:** May 2021

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 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	0.000	3.105	Oct 2019	5.901	Oct 2020	6.502	Oct 2021	-		6.502	-	-	-
Weapon Interfaces & Modifications	WR	NUWC NPT : Newport, RI	0.000	3.661	Oct 2019	1.311	Oct 2020	1.911	Oct 2021	-		1.911	-	-	-
System Safety	WR	NUWC NPT : Newport, RI	0.000	0.573	Oct 2019	0.150	Oct 2020	0.150	Oct 2021	-		0.150	-	-	-
System Development & Integration	C/CPFF	Various : Various	0.000	5.761	Oct 2019	0.000		0.000		-		0.000	-	-	-
System Development & Integration	C/CPFF	Contractor, TBD : Various	0.000	0.000		16.313	Jun 2021	25.817	Jan 2022	-		25.817	-	-	-
System Development & Integration	C/CPFF	Contractor, TBD : TBD	0.000	0.000		0.000		1.200	Nov 2021	-		1.200	-	-	-
Subtotal			0.000	13.100		23.675		35.580		-		35.580	-	-	N/A

Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Cyber / Tech support	WR	NSWC PC : Panama City, FL	0.085	0.180	Oct 2019	0.000		0.000		-		0.000	-	-	-
Systems Engineering Support	TBD	ISPA Technology : Panama City, FL	0.000	0.070	Nov 2019	0.100	Nov 2020	0.100	Nov 2021	-		0.100	-	-	-
Subtotal			0.085	0.250		0.100		0.100		-		0.100	-	-	N/A

Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	0.000	0.774	Oct 2019	1.856	Oct 2020	1.816	Oct 2021	-		1.816	-	-	-
Government Test and Evaluation	WR	NUWC NPT : Newport, RI	0.000	0.000		0.145	Oct 2020	0.170	Oct 2021	-		0.170	-	-	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy **Date:** May 2021

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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	FY 2020				FY 2021				FY 2022			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Encapsulated Effector												
Acquisition Milestones		KP-1 ▲					Contract Award ▲				KP-2 ▲	
Engineering	Preliminary Design Engineering											
		TDP ▲										
	Prototyping											
								PDR ▲				
								Detailed Design Engineering			CDR ▲	
					P3I Targeting SW update							
Test and Evaluation		Sensor Test										
					Evaluation of Targeting and Fire Control Algorithms							
						Launch Test						
System Development											Prototype Articles	

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy **Date:** May 2021

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: Knowledge Point 1	2	2020	2	2020
Acquisition Milestones: Contract Award	3	2021	3	2021
Acquisition Milestones: Knowledge Point 2	3	2022	3	2022
Engineering: Preliminary Design Engineering	1	2020	3	2021
Engineering: Technical Data Package	2	2020	2	2020
Engineering: Prototyping	1	2020	4	2020
Engineering: Preliminary Design Review	4	2021	4	2021
Engineering: Detailed Design Engineering	4	2021	2	2022
Engineering: Critical Design Review	3	2022	3	2022
Engineering: P3I - Targeting SW Update	1	2021	4	2022
Test and Evaluation: Sensor Test	2	2020	2	2020
Test and Evaluation: Evaluation of Targeting and Fire Control Algorithms	1	2021	4	2022
Test and Evaluation: Launch Test	3	2021	3	2021
System Deveopment: System Development: Prototype Articles	3	2022	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy										Date: May 2021		
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>				Project (Number/Name) 9999 / <i>Congressional Adds</i>			
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
9999: <i>Congressional Adds</i>	0.000	26.530	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding is provided for the development and test articles for Quickstrike - Extended Range (ER). The Quickstrike-ER program transitions technology developed and successfully demonstrated under a Joint Capability Demonstration (JCTD) project and supports a Joint Emergent Operational Needs Statement (JEONS). The extended range accessory is a wing kit, in addition to a GPS-guided tail section, which enables precise, standoff delivery of mines from safe distances. Funding will support aircraft flight clearance and safety qualification.

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

	FY 2020	FY 2021
Congressional Add: Quick strike joint direct attack munition	26.530	0.000
FY 2020 Accomplishments: N/A		
FY 2021 Plans: N/A		
Congressional Adds Subtotals	26.530	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy **Date:** May 2021

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Quickstrike Extended Range	WR	NSWC PCD : Panama City, FL	0.000	2.580	Feb 2020	0.000		0.000		-		0.000	-	-	-
Quickstrike Extended Range	WR	NSWC IHD : Indian Head, MD	0.000	0.200	Feb 2020	0.000		0.000		-		0.000	-	-	-
Quickstrike Extended Range	TBD	BOEING : St. Charles, MO	0.000	16.612	Jul 2020	0.000		0.000		-		0.000	-	-	-
Subtotal			0.000	19.392		0.000		0.000		-		0.000	-	-	N/A

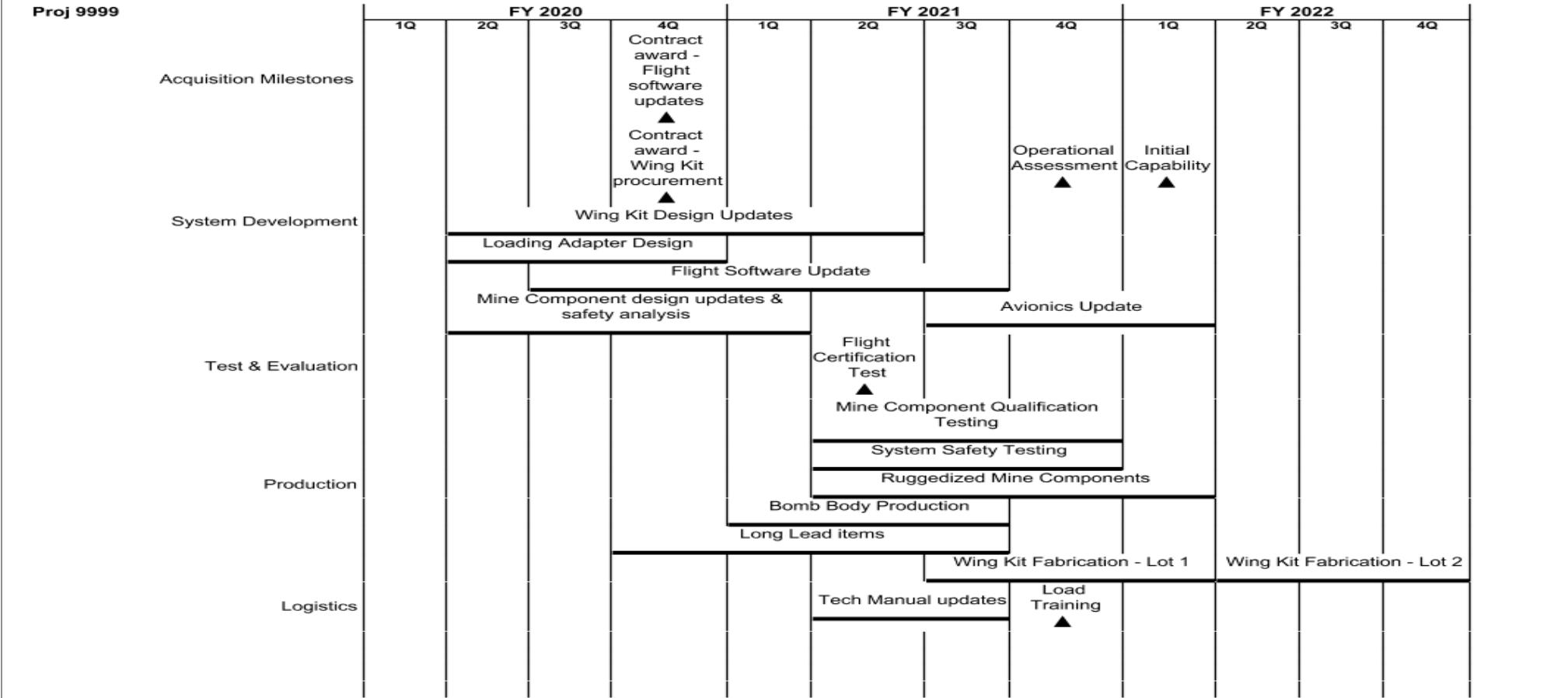
Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support	WR	NSWC PCD : Panama City, FL	0.000	0.720	Feb 2020	0.000		0.000		-		0.000	-	-	-
Engineering Support	TBD	BOEING : Chicago, IL	0.000	0.240	Feb 2020	0.000		0.000		-		0.000	-	-	-
Engineering Support	WR	Eglin AF : Okaloosa, FL	0.000	0.673	Feb 2020	0.000		0.000		-		0.000	-	-	-
Engineering Support	WR	NUWC NPT : Newport, VA	0.000	0.240	Feb 2020	0.000		0.000		-		0.000	-	-	-
Subtotal			0.000	1.873		0.000		0.000		-		0.000	-	-	N/A

Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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 PCD : Panama City, FL	0.000	0.240	Feb 2020	0.000		0.000		-		0.000	-	-	-
Development Test & Evaluation	TBD	BOEING : Chicago, IL	0.000	1.898	Feb 2020	0.000		0.000		-		0.000	-	-	-
Development Test & Evaluation	WR	EGLIN AF : Okaloosa, FL	0.000	3.007	Feb 2020	0.000		0.000		-		0.000	-	-	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy **Date: May 2021**

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy **Date:** May 2021

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 9999				
Acquisition Milestones: Contract award - Flight software updates	4	2020	4	2020
Acquisition Milestones: Contract award - Wing Kit procurement	4	2020	4	2020
Acquisition Milestones: Operational Assessment	4	2021	4	2021
Acquisition Milestones: Initial Capability	1	2022	1	2022
System Development: Wing Kit Design Updates - Environmental rugged	2	2020	2	2021
System Development: Loading Adapter Design	2	2020	4	2020
System Development: Flight Software Update	3	2020	3	2021
System Development: Mine Component design updates & safety analysis	2	2020	1	2021
System Development: Avionics Update	3	2021	1	2022
Test & Evaluation: Flight Certification Test	2	2021	2	2021
Test & Evaluation: Mine Component Qualification Testing	2	2021	4	2021
Test & Evaluation: System Safety Testing	2	2021	4	2021
Production: Ruggedized Mine Components	2	2021	1	2022
Production: Bomb Body Production	1	2021	3	2021
Production: Long Lead Items	4	2020	3	2021
Production: Wing Kit Fabrication 1	3	2021	1	2022
Production: Wing Kit Fabrication 2	2	2022	4	2022
Logistics: Tech Manual updates	2	2021	3	2021
Logistics: Load Training	4	2021	4	2021