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

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	234.378	22.105	56.464	92.607	-	92.607	76.197	55.305	44.833	44.356	Continuing	Continuing
0267: <i>Mine Improvements</i>	226.021	18.890	14.160	58.029	-	58.029	37.319	17.051	11.640	10.498	Continuing	Continuing
2993: <i>Encapsulated Effector</i>	8.357	3.215	14.804	34.578	-	34.578	38.878	38.254	33.193	33.858	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	0.000	27.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	27.500

Note

The FY 2021 funding request was reduced by \$0.849M to account for the availability of prior year execution balances.

Efforts within this program support JEON PC-0012 Advanced Mining.

A. Mission Description and Budget Item Justification

The Mines Improvement Program Element (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) Adapting existing mine hardware for delivery from 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 2021 funding supports two major efforts: Quickstrike - Extended Range (ER) and Hammerhead.

Funding is provided for the development and test articles for Quickstrike - Extended Range (ER). The Quickstrike ER program will transition 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.

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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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Increased funding also supports the new 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.

Core capabilities enabled by these efforts include: forward presence, deterrence, sea control, power projection, and maritime security to maintain freedom of the seas.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	21.747	28.964	54.300	-	54.300
Current President's Budget	22.105	56.464	92.607	-	92.607
Total Adjustments	0.358	27.500	38.307	-	38.307
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	27.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	1.210	0.000			
• SBIR/STTR Transfer	-0.852	0.000			
• Program Adjustments	0.000	0.000	38.277	-	38.277
• Rate/Misc Adjustments	0.000	0.000	0.030	-	0.030

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 2019	FY 2020
	0.000	27.500
	0.000	27.500
	0.000	27.500

Change Summary Explanation

FY19: +\$1.210 BTR for Quickstrike Extended Range; -\$0.852M SBIR reduction

FY20: +\$27.500M Congressional add for Quickstrike Extended Range

FY21: +\$39.126M programmatic adjustment for Quickstrike - Extended Range efforts, -\$0.849M prior year execution, \$0.030M rate adjustments

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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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
0267: <i>Mine Improvements</i>	226.021	18.890	14.160	58.029	-	58.029	37.319	17.051	11.640	10.498	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

The FY 2021 funding request has been reduced by \$0.849M to account for the availability of prior year 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, modular 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 Quickstrike ER capabilities.
- 2) Clandestine Delivered Mine (CDM) provides a capability required by the JEONS which converts legacy mining systems for delivery by Extra Large Unmanned Undersea Vehicles (XLUUV). 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 and adds remote command and control functions 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.

Increased funding in FY21 supports the continued development 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. Increased funding also supports Quickstrike Long Range.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Product Development	13.804	9.860	42.837	0.000	42.837
Articles:	-	-	-	-	-

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p><i>FY 2020 Plans:</i> CDM: Develop detailed designs for Increment II, based on prototype demonstration results in FY19 and Fleet feedback. Refine communications protocols for underwater communication. Develop preliminary design of an updated fuze design to allow for remote arming and disarming functions on Increment III. Perform safety analysis of proposed design changes to mitigate hazards.</p> <p>Quickstrike Mines: Continue generating operational data, based on updated fleet priority targets, for the following target detection algorithms: fast patrol boat, diesel electric submarines, and large ship algorithms.</p> <p>Minefield Planning: Develop a new optimization algorithm adapted for precision delivery systems such as CDM and Quickstrike Extended Range, which will allow minefield planners to develop more effective and efficient minefields. This transitions technology developed by the Office of Naval Research under a Future Naval Capability program.</p> <p><i>FY 2021 Base Plans:</i> Quickstrike ER: Continue Quickstrike Extended Range development and certification efforts to support an initial capability. Perform requirements analysis, including design trade studies, to support development of a long-range standoff capability. Support long-range technology prototypes and concept of operations development.</p> <p>CDM: Continue development of CDM incremental improvements, including completing design of an updated fuze to allow for remote arming and disarming functions. Continue development of networked communications to improve system resiliency and security. Conduct system safety assessment and analysis to mitigate hazards in order to obtain concurrence by safety approval authorities.</p> <p>Quickstrike: Continue generating operational data, based on updated fleet priority targets.</p> <p>Minefield Planning: Continue minefield planning updates to support CDM and Quickstrike Extended Range.</p> <p><i>FY 2021 OCO Plans:</i> N/A</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Increased funding in FY 2021 continues development and certification of the Quickstrike ER to support fielding of an initial capability. The Quickstrike ER transitions technology developed and demonstrated successfully under</p>					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
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an Joint Capability Demonstration (JCTD) project and supports a Joint Emergent Operational Need (JEON). Increased funding also supports long range stand off of Quickstrike aerial mines.					
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Title: Support	0.000	0.095	0.000	0.000	0.000
Articles:	-	-	-	-	-
<p>FY 2020 Plans: Maintain cyber security posture and provide technical support of Mine Warfare development lab. Continue cyber security analysis and documentation in support of the remote control of the CDM.</p> <p>FY 2021 Base Plans: N/A</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Beginning in FY 21, support costs including safety and flight clearance support, transition to Product Development category. These costs are included within the Product Development category since the lab is used exclusively for Mine Improvement projects.</p>					

Title: Test and Evaluation	5.006	4.115	15.032	0.000	15.032
Articles:	-	-	-	-	-
<p>FY 2020 Plans: Quickstrike: Begin aircraft integration for F/A-18E/F aircraft. CDM: Complete safety qualification testing of fuze and battery components of CDM. Laboratory testing of improved fuzing design which enables reversible arming and disarming for CDM upgrade kit.</p> <p>FY 2021 Base Plans: Quickstrike Extended Range: 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. Quickstrike: Finish aircraft certification of F/A-18 E/F. 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>					

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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>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
CDM: Initiate safety qualification testing of updated fuze and battery components of CDM Increment 2. Conduct functional and reliability testing of engineering design model of reversible fuze design. FY 2021 OCO Plans: N/A FY 2020 to FY 2021 Increase/Decrease Statement: Funding increases reflect: - F/A-18 E/F flight hours required to obtain final flight clearance for operational use - Start of fuze qualification testing (explosives) for CDM upgrade - Aircraft integration and flight testing of Quickstrike Extended Range onboard B-52					
Title: Management: Articles:	0.080 -	0.090 -	0.160 -	0.000 -	0.160 -
FY 2020 Plans: Provide programmatic, financial, and engineering support.					
FY 2021 Base Plans: Provide programmatic, financial, and engineering support.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Additional program support required for transition of Quickstrike-Extended Range capability from JCTD.					
Accomplishments/Planned Programs Subtotals	18.890	14.160	58.029	0.000	58.029

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• WPN 3231: <i>Maritime Mines</i>	9.733	5.183	5.802	-	5.802	8.687	9.299	44.975	46.303	0.000	199.202
Remarks											

D. Acquisition Strategy
Procurement of Target Detecting Device (TDD) Mk 71, MK 62/63 kits, MK 65, Clandestine Delivered Mine (CDM) kits and associated components.

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

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / Mine Development	Project (Number/Name) 0267 / Mine Improvements
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NSWC PC : NSWC PC	117.357	0.000		0.000		0.000		-		0.000	0.000	117.357	-
Ancillary Hardware Development	Various	Various : Various	4.112	0.000		0.000		2.802	Oct 2020	-		2.802	Continuing	Continuing	Continuing
Software Development	WR	NSWC PC : Panama City, FL	24.513	2.376	Oct 2018	1.157	Oct 2019	2.880	Oct 2020	-		2.880	Continuing	Continuing	Continuing
Clandestine Mine	WR	NSWC PC : Panama City, FL	9.933	3.147	Oct 2018	2.101	Oct 2019	2.467	Oct 2020	-		2.467	Continuing	Continuing	Continuing
Clandestine Mine	WR	NSWC IH : Indian Head, MD	12.008	6.291	Oct 2018	4.542	Oct 2019	3.739	Oct 2020	-		3.739	Continuing	Continuing	Continuing
Clandestine Mine	C/CPFF	JHU/APL : Baltimore, MD	9.169	1.990	Nov 2018	2.060	Oct 2019	1.760	Nov 2020	-		1.760	Continuing	Continuing	Continuing
Quickstrike JDAM	WR	NSWC IH : Indian Head, MD	1.647	0.000		0.000		0.000		-		0.000	0.000	1.647	-
Quickstrike JDAM	WR	NSWC PC : Panama City, FL	0.000	0.000		0.000		7.826	Nov 2020	-		7.826	Continuing	Continuing	Continuing
Quickstrike Extended Range	C/CPAF	Boeing : St. Charles, MO	0.000	0.000		0.000		9.180	Oct 2020	-		9.180	Continuing	Continuing	Continuing
Quickstrike Extended Range	TBD	Contractor, TBD : TBD	0.000	0.000		0.000		11.270	Jan 2021	-		11.270	Continuing	Continuing	Continuing
Quickstrike Extended Range	WR	Eglin AFB : Okaloosa, FL	0.000	0.000		0.000		0.673	Oct 2020	-		0.673	Continuing	Continuing	Continuing
Quickstrike Extended Range	WR	NUWC NPT : Newport, RI	0.000	0.000		0.000		0.240	Oct 2020	-		0.240	Continuing	Continuing	Continuing
Subtotal			178.739	13.804		9.860		42.837		-		42.837	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
IA/ILS/Technical	WR	NSWC PC : Panama City, FL	1.017	0.000		0.095	Oct 2019	0.000		-		0.000	0.000	1.112	-
Subtotal			1.017	0.000		0.095		0.000		-		0.000	0.000	1.112	N/A

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

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / Mine Development	Project (Number/Name) 0267 / Mine Improvements
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development Test & Evaluation	WR	NSWC PC : Panama City, FL	5.006	3.666	Oct 2018	3.032	Oct 2019	8.206	Oct 2020	-		8.206	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPAF	Various : Various	0.000	1.340	Jul 2019	0.000		0.000		-		0.000	0.000	1.340	-
Aircraft interface & survivability testing	WR	NSWC PC : Panama City, FL	4.065	0.000		0.000		0.000		-		0.000	0.000	4.065	-
Development Test & Evaluation	WR	NSWC IH : Indian Head, MD	0.000	0.000		1.083	Oct 2019	4.243	Oct 2020	-		4.243	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	Eglin, AFB : Okaloosa, MO	0.000	0.000		0.000		2.583	Oct 2020	-		2.583	Continuing	Continuing	Continuing
Subtotal			9.071	5.006		4.115		15.032		-		15.032	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Engineering Support	C/CPAF	Various : Various	36.352	0.050	Jul 2019	0.060	Oct 2019	0.090	Oct 2020	-		0.090	0.000	36.552	-
Program Management Support	C/CPAF	Various : Various	0.748	0.030	Jul 2019	0.020	Oct 2019	0.070	Oct 2020	-		0.070	Continuing	Continuing	Continuing
Travel	Various	NAVSEA : Washington DC	0.094	0.000	Jul 2019	0.010	Oct 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			37.194	0.080		0.090		0.160		-		0.160	Continuing	Continuing	N/A

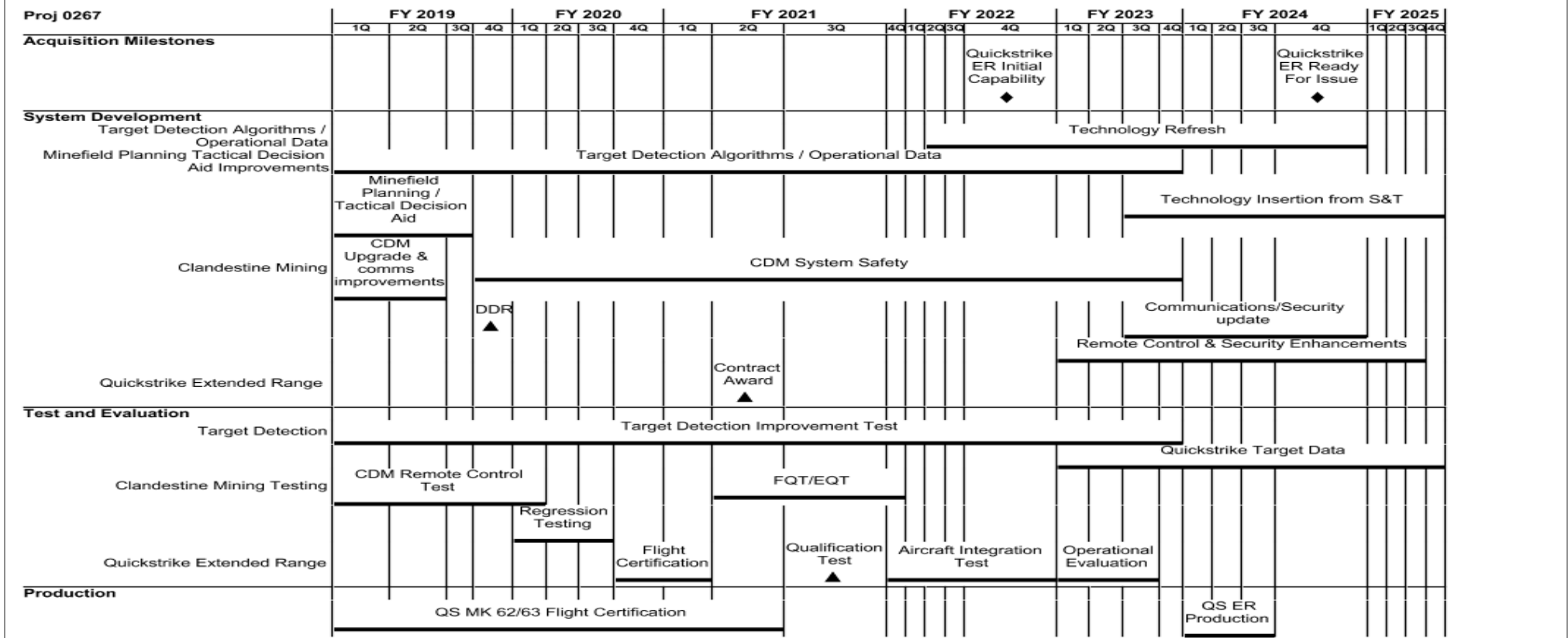
Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals		226.021	18.890	14.160	58.029	-	58.029	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604601N / <i>Mine Development</i>	Project (Number/Name) 0267 / <i>Mine Improvements</i>
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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy **Date:** February 2020

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>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0267				
Acquisition Milestones: Quickstrike ER Initial Capability	4	2022	4	2022
Acquisition Milestones: Quickstrike ER RFI	4	2024	4	2024
System Development: Target Detection Algorithms / Operational Data: Technology Refresh	2	2022	4	2024
System Development: Minefield Planning Tactical Decision Aid Improvements: Target Detection Algorithms / Operational Data	1	2019	4	2023
System Development: Minefield Planning Tactical Decision Aid Improvements: Minefield Planning / Tactical Decision Aid	1	2019	3	2019
System Development: Minefield Planning Tactical Decision Aid Improvements: Technology Insertion from S&T	3	2023	4	2025
System Development: Clandestine Mining: Fuze upgrade & comms improvement	1	2019	2	2019
System Development: Clandestine Mining: System Safety	4	2019	4	2023
System Development: Clandestine Mining: Communications/Security update	3	2023	4	2024
System Development: Clandestine Mining: Detailed Design Review	4	2019	4	2019
System Development: Clandestine Mining: Remote Control & Security Enhancements	1	2023	3	2025
System Development: Quickstrike Extended Range: Contract Award	2	2021	2	2021
Test and Evaluation: Target Detection: Target Detection Improvement Test	1	2019	4	2023
Test and Evaluation: Target Detection: Quickstrike Target Data	1	2023	4	2025
Test and Evaluation: Clandestine Mining Testing: Remote Control Test	1	2019	1	2020
Test and Evaluation: Clandestine Mining Testing: Fuze Qualification / Environmental Test	2	2021	4	2021
Test and Evaluation: Clandestine Mining Testing: Regression Testing	1	2020	3	2020
Test and Evaluation: Quickstrike Extended Range: Flight Certification	4	2020	1	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy **Date:** February 2020

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Test and Evaluation: Quickstrike Extended Range: Qualification Test	3	2021	3	2021
Test and Evaluation: Quickstrike Extended Range: Aircraft Integration Test	4	2021	4	2022
Test and Evaluation: Quickstrike Extended Range: Operational Evaluation	1	2023	3	2023
Production: Quickstrike ER Production	1	2024	3	2024
Production: Quickstrike MK 62/63 Flight Certification	1	2019	2	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>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2993: <i>Encapsulated Effector</i>	8.357	3.215	14.804	34.578	-	34.578	38.878	38.254	33.193	33.858	Continuing	Continuing
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 has been designated as a Maritime Accelerated Acquisition program by the Navy Accelerated Acquisition Board of Directors and is using 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 weapon which is self-contained and is released when a target is detected and uses mobility to engage the target. 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 2021 supports the award for design and fabrication of prototype units.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Product Development	3.055	13.680	31.573	0.000	31.573
Articles:	-	-	-	-	-
FY 2020 Plans: Finalize system performance specification to support contract award in early FY21. Conduct system functional review and performance requirements review. Develop prototype launcher for weapons integration and testing. Develop targeting logic and algorithms to determine criteria for weapons launch. Prepare interface requirements between mine system delivery platform and weapon.					
FY 2021 Base Plans: Award prime contractor for design and fabrication of prototype units. Conduct System Requirement Review, System Functional Review, and Preliminary Design Review to establish an initial technical baseline. Continue development and refinement of targeting logic and algorithms based on evaluation results.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Increased funding for contract award for lead systems design, integration, and testing. Development for signal processing, targeting logic, and energy management functions will increase as design matures. Initiate pre-					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
planned product improvement to increase lethality, expand target sets, and optimize system performance over baseline capability.					
Title: Support	0.000	0.180	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2020 Plans: Continue cyber security analysis and documentation in support of the Encapsulated Effector.					
FY 2021 Base Plans: N/A					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Beginning in FY 2021, cyber documentation costs are included within the Product Development category since it is a required step in the development process.					
Title: Management	0.080	0.170	0.170	0.000	0.170
Articles:	-	-	-	-	-
FY 2020 Plans: Provide programmatic, financial, and engineering support.					
FY 2021 Base Plans: Provide programmatic, financial, and engineering support.					
FY 2021 OCO Plans: N/A					
Title: Test and Evaluation	0.080	0.774	2.835	0.000	2.835
Articles:	-	-	-	-	-
FY 2020 Plans: Evaluate sensor prototype performance during laboratory and in-water test events. Correlate empirical results to modeling and simulation results to validate performance predictions. Conduct testing of prototype launch capsule to assess weapon modifications to enable underwater launch and ensure reliable release from the capsule.					
FY 2021 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy	Date: February 2020
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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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Begin laboratory testing of prototype components. Continue modeling and simulation of targeting logic and algorithms. Begin platform integration using surrogates and mock-ups in a lab environment. <i>FY 2021 OCO Plans:</i> N/A <i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Increased funding in FY 2021 supports risk-reduction testing of sensor prototypes and key system interfaces as well as the modeling and simulation of weapon performance.					
Accomplishments/Planned Programs Subtotals	3.215	14.804	34.578	0.000	34.578

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

N/A

Remarks

D. Acquisition Strategy

The Encapsulated Effector plans to leverage Navy warfare center expertise to perform requirements analysis and engineering architecture design to identify mature technologies to meet the operational objectives. Those engineering products will be provided to a prime contractor for final system integration and testing. 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.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
1319 / 5				PE 0604601N / Mine Development				2993 / Encapsulated Effector							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary hardware Development	WR	NSWC PC : Panama City, FL	5.988	1.586	Oct 2018	3.105	Oct 2019	4.321	Oct 2020	-		4.321	Continuing	Continuing	Continuing
Weapon Interfaces & Modifications	WR	NUWC NPT : Newport, RI	0.942	0.662	Oct 2018	3.661	Oct 2019	4.241	Oct 2020	-		4.241	Continuing	Continuing	Continuing
System Safety	C/CPFF	NUWC NPT : Newport, RI	0.612	0.157	Dec 2018	0.573	Oct 2019	0.330	Oct 2020	-		0.330	Continuing	Continuing	Continuing
Communication & Sensing	WR	JHU/APL : Baltimore, MD	0.650	0.650	Nov 2018	0.000		0.000		-		0.000	0.000	1.300	-
System Development & Integration	TBD	Contractor, TBD : TBD	0.000	0.000		6.341	Apr 2020	22.681	Nov 2020	-		22.681	0.000	29.022	-
Subtotal			8.192	3.055		13.680		31.573		-		31.573	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Cyber / Tech support	WR	NSWC PC : Panama City, FL	0.085	0.000		0.180	Oct 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			0.085	0.000		0.180		0.000		-		0.000	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Test and Evaluation	WR	NSWC PC : Panama City, FL	0.000	0.080	Oct 2018	0.774	Oct 2019	2.835	Oct 2020	-		2.835	Continuing	Continuing	Continuing
Subtotal			0.000	0.080		0.774		2.835		-		2.835	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy **Date:** February 2020

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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Encapsulated Effector	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025							
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q				
Acquisition Milestones	Acquisition Documentation				KP-1 ▲				Contract Award ▲				KP-2 ▲				KP-3 ▲				Initial Capability ▲											
Engineering	Preliminary Design Engineering								CDR ▲																							
	Requirement Analysis				TDP ▲				PDR ▲				Detailed Design Engineering																			
	Prototyping								P3I - Targeting SW Update								P3I - Weapon SW Update															
Test and Evaluation	Sensor Test ▲								Launch Test ▲								Contractor Testing				Developmental Testing				QRA ▲							
									Evaluation of Targeting and Fire Control Algorithms								Laboratory Testing of Components				Safety Qualification Testing											
System Development									Prototype Articles																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy **Date:** February 2020

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: Acquisition Documentation	1	2019	3	2019
Acquisition Milestones: Contract Award	1	2021	1	2021
Acquisition Milestones: Knowledge Point 2	2	2022	2	2022
Acquisition Milestones: Initial Capability	4	2023	4	2023
Acquisition Milestones: Knowledge Point 3	3	2023	3	2023
Acquisition Milestones: Knowledge Point 1	2	2020	2	2020
Engineering: Preliminary Design Engineering	1	2019	2	2021
Engineering: Critical Design Review	2	2022	2	2022
Engineering: Requirement Analysis	1	2019	4	2019
Engineering: Technical Data Package	2	2020	2	2020
Engineering: Detailed Design Engineering	4	2021	2	2022
Engineering: Preliminary Design Review	3	2021	3	2021
Engineering: P3I - Targeting SW Update	1	2021	2	2023
Engineering: P3I - Weapon SW Update	1	2021	2	2023
Engineering: Prototyping	3	2019	4	2020
Test and Evaluation: Contractor Testing	4	2022	1	2023
Test and Evaluation: Developmental Testing	2	2023	3	2023
Test and Evaluation: Quick Reaction Assessment	3	2023	3	2023
Test and Evaluation: Safety Qualification Testing	1	2023	3	2023
Test and Evaluation: Sensor Test	2	2020	2	2020
Test and Evaluation: Laboratory Testing of Components	4	2022	1	2023
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 2021 Navy **Date:** February 2020

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: Launch Test	1	2021	1	2021
System Deveopment: System Development: Prototype Articles	2	2022	1	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
9999: <i>Congressional Adds</i>	0.000	0.000	27.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	27.500
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 2019	FY 2020
Congressional Add: Quick strike joint direct attack munition	0.000	27.500
FY 2019 Accomplishments: N/A		
FY 2020 Plans: Develop ruggedized flight gear and mine components to withstand operationally relevant aircraft environments and high speed water impacts. Perform updates to wing kit flight software launch acceptable region to account for new configuration. Design of an adapter to enable loading onto B-52H aircraft. Prepare a technical data package of the Quickstrike ER configuration, including drawings of flight gear, bomb bodies, and mine components. Establish package, handling storage, and transport equipment to ensure supportability. Perform modeling and analysis to support flight clearance recommendation and approval. Mine component qualification, aircraft integration, and safety test planning to support limited flight envelope certification of the Quickstrike ER on the B-52H aircraft. Effort includes test range support, aircraft and mine test assets, and an interim flight clearance for aircraft testing. Conduct safety analysis of proposed design changes to mitigate safety hazards and receive safety board concurrence with changes.		
Congressional Adds Subtotals	0.000	27.500

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 2021 Navy **Date:** February 2020

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 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Quickstrike Extended Range	WR	NSWC PCD : Panama City, FL	0.000	0.000		2.580	Feb 2020	0.000		-		0.000	0.000	2.580	-
Quickstrike Extended Range	WR	NSWC IHD : Indian Head, MD	0.000	0.000		0.600	Feb 2020	0.000		-		0.000	0.000	0.600	-
Quickstrike Extended Range	TBD	BOEING : St. Charles, MO	0.000	0.000		17.182	Jul 2020	0.000		-		0.000	0.000	17.182	-
Subtotal			0.000	0.000		20.362		0.000		-		0.000	0.000	20.362	N/A

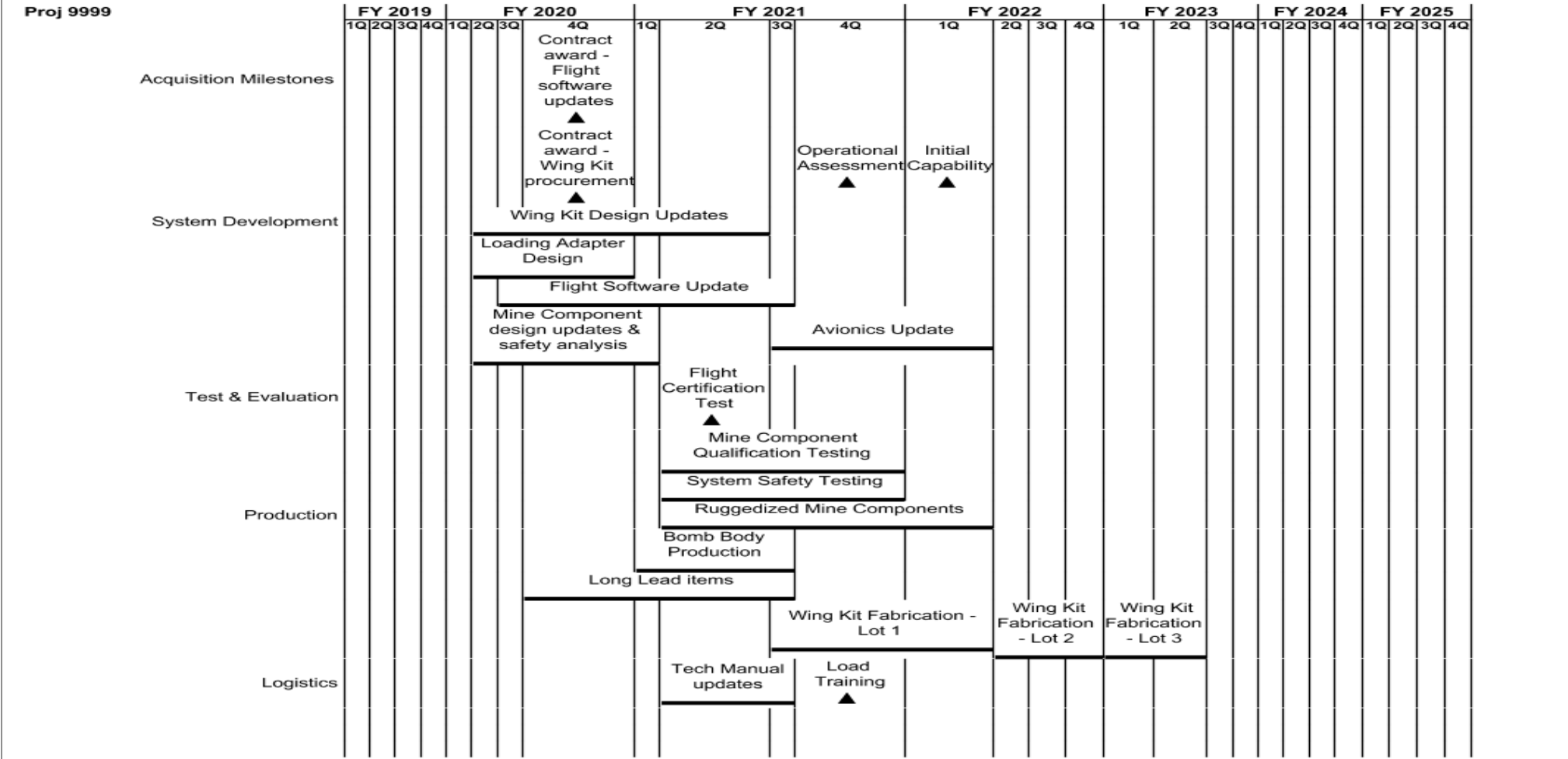
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support	WR	NSWC PCD : Panama City, FL	0.000	0.000		0.720	Feb 2020	0.000		-		0.000	0.000	0.720	-
Engineering Support	TBD	BOEING : Chicago, IL	0.000	0.000		0.240	Feb 2020	0.000		-		0.000	0.000	0.240	-
Engineering Support	WR	Eglin AF : Okaloosa, FL	0.000	0.000		0.673	Feb 2020	0.000		-		0.000	0.000	0.673	-
Engineering Support	WR	NUWC NPT : Newport, VA	0.000	0.000		0.240	Feb 2020	0.000		-		0.000	0.000	0.240	-
Subtotal			0.000	0.000		1.873		0.000		-		0.000	0.000	1.873	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development Test & Evaluation	WR	NSWC PCD : Panama City, FL	0.000	0.000		0.240	Feb 2020	0.000		-		0.000	0.000	0.240	-
Development Test & Evaluation	TBD	BOEING : Chicago, IL	0.000	0.000		1.898	Feb 2020	0.000		-		0.000	0.000	1.898	-
Development Test & Evaluation	WR	EGLIN AF : Okaloosa, FL	0.000	0.000		3.007	Feb 2020	0.000		-		0.000	0.000	3.007	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy **Date:** February 2020

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-4, RDT&E Schedule Profile: PB 2021 Navy Date: February 2020

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

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
<i>2021PB - 0604601N - 9999</i>		

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy **Date:** February 2020

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
Production: Wing Kit Fabrication 3	1	2023	2	2023
Logistics: Tech Manual updates	2	2021	3	2021
Logistics: Load Training	4	2021	4	2021