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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy **Date:** March 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	210.716	24.640	21.747	28.964	-	28.964	54.300	49.668	48.442	43.585	Continuing	Continuing
0267: <i>Mine Improvements</i>	210.716	16.933	18.401	14.160	-	14.160	19.703	10.763	10.152	10.355	Continuing	Continuing
2993: <i>Encapsulated Effector</i>	0.000	7.707	3.346	14.804	-	14.804	34.597	38.905	38.290	33.230	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element 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 target detection of modern threat vessels, reconfiguring and improving existing mine hardware for delivery from safe standoff distances, including integration with unmanned systems, adding a capability for networked command and control of deployed minefields, updating minefield planning tools to enable required operational timelines, and developing a wide area of coverage mine system capable of operating in intermediate and deep water depths. Core capabilities enabled include forward presence, deterrence, sea control, power projection, and maritime security to maintain freedom of the seas.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	25.635	25.756	22.021	-	22.021
Current President's Budget	24.640	21.747	28.964	-	28.964
Total Adjustments	-0.995	-4.009	6.943	-	6.943
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-4.009			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.995	0.000			
• Program Adjustments	0.000	0.000	6.943	-	6.943
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Change Summary Explanation

FY18: -\$0.995M total adjustment (SBIR reduction): -\$222K for Quickstrike; -\$462K for Clandestine Delivered Mines; -\$311K for Encapsulated Effector
 FY19: -\$4.009M Congressional reduction for Encapsulated Effector Delayed New Start

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Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 0604601N / Mine Development	
<p>FY20: \$6.943M total adjustment: +\$9.493M programmatic adjustment for Encapsulated Effector to support system development and integration efforts; -\$2.550M total adjustment for Mines Improvement to account for the availability of prior year execution balances; -\$1.0M for Quickstrike, -\$1.55M for Clandestine Delievered Mines.</p> <p>The FY 2020 funding request was reduced by \$2.550 million to account for the availability of prior year execution balances.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0267: <i>Mine Improvements</i>	210.716	16.933	18.401	14.160	-	14.160	19.703	10.763	10.152	10.355	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Naval mines are used to deter or control adversary movements, including surface ships and submarines. Mine Improvements R&D supports the capability to maintain effectiveness of mines facing new threat targets with increasing emphasis on major regional conflicts and littoral warfare in shallow water. The funding supports four major project areas.

1) Quickstrike Mod 3 improves effectiveness of existing Quickstrike 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.

2) Aerial delivery improvements support capabilities required by a Joint Emergent Operational Needs Statement (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.

3) Clandestine Delivered Mine (CDM) provides a capability required by the JEON PC-0012 which will convert 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.

4) Minefield planning improvements include incorporation of new targeting algorithms, mine settings, and corresponding damage data for weapon/target pairs into existing minefield planning software. Also included is the development of upgrades to the software tool to allow optimization of minefield planning to account for new precision placement capabilities inherent to the JDAM-guided Quickstrike and CDM mines described above.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	11.762	12.668	9.860	0.000	9.860
Articles:	-	-	-	-	-
FY 2019 Plans: Quickstrike Mines: Continue generating operational data, based on updated fleet priority targets, for following target detection algorithms: fast patrol boat, diesel electric submarines, and large ship algorithms. Develop ruggedized flight gear interfaces to be compatible with GPS-guidance kits and high speed water impacts. Perform safety analysis of proposed design changes to mitigate hazards.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy				Date: March 2019		
Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604601N / Mine Development		Project (Number/Name) 0267 / Mine Improvements		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>CDM: Integrate the programmable Target Detection Device Mk 71 into CDM as a product improvement. Develop initial remote control architecture for CDM, including underwater networking between mines, modifies commercial communications equipment to optimize reliability and range, while minimizing probability of detection by adversaries. Develop preliminary design of an updated fuze design to allow for remote arming and disarming functions. Perform safety analysis of proposed design changes to mitigate hazards.</p> <p>FY 2020 Base Plans: Quickstrike: Continue generating operational data, based on updated fleet priority targets, for following target detection algorithms: fast patrol boat, diesel electric submarines, and large ship algorithms. Conduct assessment of flight gear upgrades to ensure weapon survivability and suitability for intended mining missions. 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>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The FY20 funding request was reduced to account for the availability of prior year execution balances. In addition, FY20 funding decreased due to fielding of Fast Patrol Boat and Capital Ship algorithms for Quickstrike Mod 3 as well as completion of development efforts for CDM Increment 1.</p>						
<p>Title: Support</p> <p>Articles:</p> <p>FY 2019 Plans: Maintain cyber security posture and provide technical support of Mine Warfare development lab. Begin cyber security analysis and documentation in support of the remote control of the Clandestine Delivered Mine.</p> <p>FY 2020 Base 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 Clandestine Delivered Mine.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		0.085 -	0.090 -	0.095 -	0.000 -	0.095 -

UNCLASSIFIED

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Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604601N / Mine Development		Project (Number/Name) 0267 / Mine Improvements		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
No significant changes.						
Title: Test and Evaluation		5.006	5.558	4.115	0.000	4.115
Articles:		-	-	-	-	-
FY 2019 Plans: Quickstrike: Support JEONS capability development by testing Quickstrike configuration with JDAM equipped tail section, including interface reliability testing and aircraft integration testing. Support testing of a developmental wing kit accessory to increase delivery range of Quickstrike mines. CDM: Conduct laboratory integration testing and in-water test of CDM to evaluate interfaces with delivery vehicle, proper deployment and safe arming sequence. Conduct end-to-end testing of CDM phase I during an in-water event that demonstrates weapon build-up, loading, transit, delivery, arming sequence, target detection, and simulated fire. Complete safety qualification testing of fuze and battery components of CDM. Conduct in-water demonstration of remote control of CDM prototypes with programmable target detection device Mk 71. Conduct laboratory testing improved fuzing design which enables reversible arming and disarming.						
FY 2020 Base Plans: 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. 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 for use with CDM.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to completion of flight testing of JDAM-equipped configurations. Also, CDM Increment 1 testing will complete in FY19.						
Title: Management:		0.080	0.085	0.090	0.000	0.090
Articles:		-	-	-	-	-
FY 2019 Plans: Program management support, contract support and travel.						
FY 2020 Base Plans:						

UNCLASSIFIED

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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>	

<u>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</u>	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Program management support, contract support and travel.					
<i>FY 2020 OCO Plans:</i> N/A					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> No significant changes.					
Accomplishments/Planned Programs Subtotals	16.933	18.401	14.160	0.000	14.160

<u>C. Other Program Funding Summary (\$ in Millions)</u>											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• WPN 3231: <i>Quickstrike Mine</i>	6.337	9.758	5.183	-	5.183	5.289	8.585	8.793	24.023	0.000	130.851
<u>Remarks</u>											
<u>D. Acquisition Strategy</u>											
Procurement of Target Detecting Device (TDD) Mk 71, MK 62/63 kits, MK 65, Clandestine Delivered Mine (CDM) kits and associated components.											
<u>E. Performance Metrics</u>											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604601N / Mine Development				Project (Number/Name) 0267 / Mine Improvements					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	117.357	0.000		0.000		0.000		-		0.000	0.000	117.357	-
Ancillary Hardware Development	C/CPAF	Various : Various	4.112	0.000		0.000		0.000		-		0.000	0.000	4.112	-
Software Development	WR	NSWC, PC : Panama City, FL	22.685	1.828	Oct 2017	2.091	Oct 2018	1.157	Oct 2019	-		1.157	0.000	27.761	-
Clandestine Mine	WR	NSWC, PC : Panama City, FL	6.700	3.233	Oct 2017	2.847	Oct 2018	2.101	Oct 2019	-		2.101	0.000	14.881	-
Clandestine Mine	WR	NSWC, IH : Indian Head, MD	7.475	4.533	Oct 2017	5.750	Oct 2018	4.542	Oct 2019	-		4.542	0.000	22.300	-
Clandestine Mine	C/CPFF	JHU/APL : Baltimore, MD	7.001	2.168	Jul 2018	1.980	Nov 2018	2.060	Nov 2019	-		2.060	0.000	13.209	-
Quickstrike JDAM	WR	NSWC PC : Panama City, FL	1.628	0.000		0.000		0.000		-		0.000	0.000	1.628	-
Quickstrike JDAM	WR	NSWC IH : Indian Head, MD	1.647	0.000		0.000		0.000		-		0.000	0.000	1.647	-
Subtotal			168.605	11.762		12.668		9.860		-		9.860	0.000	202.895	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	0.932	0.085	Nov 2017	0.090	Oct 2018	0.095	Oct 2019	-		0.095	Continuing	Continuing	Continuing
Subtotal			0.932	0.085		0.090		0.095		-		0.095	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Development Test & Evaluation	WR	NSWC PC : Panama City, FL	0.000	5.006	Oct 2017	3.715	Oct 2018	3.032	Oct 2019	-		3.032	0.000	11.753	-

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Appropriation/Budget Activity 1319 / 5						R-1 Program Element (Number/Name) PE 0604601N / Mine Development				Project (Number/Name) 0267 / Mine Improvements					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
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	Oct 2017	1.843	Oct 2018	1.083	Oct 2019	-		1.083	0.000	2.926	-
Subtotal			4.065	5.006		5.558		4.115		-		4.115	0.000	18.744	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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 Engineering Support	C/CPAF	Various : Various	36.302	0.050	Oct 2017	0.055	Oct 2018	0.060	Oct 2019	-		0.060	0.000	36.467	-
Program Management Support	C/CPAF	Various : Various	0.728	0.020	Oct 2017	0.020	Oct 2018	0.020	Oct 2019	-		0.020	Continuing	Continuing	Continuing
Travel	Various	NAVSEA : Washington DC	0.084	0.010	Oct 2017	0.010	Oct 2018	0.010	Oct 2019	-		0.010	Continuing	Continuing	Continuing
Subtotal			37.114	0.080		0.085		0.090		-		0.090	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			210.716	16.933		18.401		14.160		-		14.160	Continuing	Continuing	N/A
Remarks															

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PE 0604601N: *Mine Development*
Navy

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PE 0604601N / Mine Development

0267 / Mine Improvements

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
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>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0267				
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	2018	4	2023
System Development: Minefield Planning Tactical Decision Aid Improvements: Minefield Planning / Tactical Decision Aid	1	2018	3	2019
System Development: Minefield Planning Tactical Decision Aid Improvements: Technology Insertion from S&T	3	2023	4	2024
System Development: Clandestine Mining: Increment I	1	2018	4	2018
System Development: Clandestine Mining: TDD upgrade & Remote control	1	2018	2	2021
System Development: Clandestine Mining: Fuze upgrade & comms improvement	1	2018	2	2023
System Development: Clandestine Mining: System Safety	1	2018	4	2023
System Development: Clandestine Mining: Communications/Security update	3	2023	4	2024
System Development: Quickstrike JDAM Development: Quickstrike JDAM Development	1	2018	4	2018
Test and Evaluation: Target Detection: Target Detection Improvement Test	3	2024	4	2024
Test and Evaluation: Clandestine Mining Testing: End to End Demo	2	2018	3	2018
Test and Evaluation: Clandestine Mining Testing: Remote Control Test	4	2018	1	2019
Test and Evaluation: Clandestine Mining Testing: Fuze Upgrade Test	4	2018	4	2020
Test and Evaluation: Quickstrike Mod 3: QS Mod 3 Certification	1	2018	4	2023
Test and Evaluation: Quickstrike Mod 3: QS JDAM Testing	1	2018	4	2018

UNCLASSIFIED

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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2993: <i>Encapsulated Effector</i>	0.000	7.707	3.346	14.804	-	14.804	34.597	38.905	38.290	33.230	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Beginning in FY18, the Encapsulated Effector transitions technology developed by the Advanced Undersea Weapon System (AUWS) to enable capability. The program provides maritime mining capability in deeper water depths compared to existing bottom mines. Encapsulated Effector 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, incorporates remote control to allow operational flexibility to activate/deactivate and/or change targeting parameters, 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.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	7.542	3.269	13.680	0.000	13.680
Articles:	-	-	-	-	-
FY 2019 Plans: Conduct performance analysis and trade studies to develop a system level performance specification to support contract award in FY20. Conduct system functional review and performance requirements review. Finalize SEP and TEMP documents to guide engineering planning. Define subsystem interfaces and develop interface control document between primary hardware components and selected weapon. Conduct preliminary hazard assessment of system architecture.					
FY 2020 Base Plans: Award contract for lead systems design, integration, and testing. Conduct rapid prototyping and modeling and simulation to inform design decisions. Develop preliminary system design. Initiate pre-planned product improvement to increase lethality, expand target sets, and optimize system performance over baseline capability. Conduct system safety analysis to mitigate hazards.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

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Appropriation/Budget Activity 1319 / 5		R-1 Program Element (Number/Name) PE 0604601N / Mine Development	Project (Number/Name) 2993 / Encapsulated Effector			
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increased funding supports the 3QFY20 award for Encapsulated Effector system development and integration, thereby ramping up design and development efforts. Funding increase also supports increased requirements for additional targeting capabilities.						
Title: Support		0.085	0.041	0.180	0.000	0.180
Articles:		-	-	-	-	-
FY 2019 Plans: Continue cyber security analysis and documentation in support of the remote control of the Encapsulated Effector.						
FY 2020 Base Plans: Continue cyber security analysis and documentation in support of the remote control of the Encapsulated Effector.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: Increased funding supports anticipated level of effort required for cyber security as system matures.						
Title: Management:		0.080	0.036	0.170	0.000	0.170
Articles:		-	-	-	-	-
FY 2019 Plans: Program Management Support, contract support and travel.						
FY 2020 Base Plans: Program Management Support, contract support and travel.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: Increase corresponds to anticipated level of effort required to manage parallel development efforts of incremental improvements.						
Title: Test and Evaluation		0.000	0.000	0.774	0.000	0.774
Articles:		-	-	-	-	-
FY 2019 Plans:						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A						
<i>FY 2020 Base Plans:</i> Conduct risk-reduction testing of sensor prototypes and key system interfaces. Conduct modeling and simulation of weapon performance.						
<i>FY 2020 OCO Plans:</i> N/A						
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Increased funding supports the execution of risk-reduction testing of sensor prototypes and key system interfaces as well as conducting modeling and simulation of weapon performance.						
Accomplishments/Planned Programs Subtotals		7.707	3.346	14.804	0.000	14.804
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.						
E. Performance Metrics						
N/A						

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	0.000	5.988	May 2018	1.855	Oct 2018	2.574	Oct 2019	-		2.574	Continuing	Continuing	Continuing
Weapon Interfaces & Modifications	WR	NUWC NPT : Newport, RI	0.000	0.942	Oct 2018	0.800	Oct 2018	3.661	Oct 2019	-		3.661	Continuing	Continuing	Continuing
System Safety	WR	NSWC IHEODTD : Indian Head, MD	0.000	0.612	Jun 2018	0.312	Dec 2018	0.573	Oct 2019	-		0.573	Continuing	Continuing	Continuing
Communication & Sensing	C/CPFF	JHU/APL : Baltimore, MD	0.000	0.000		0.302	Nov 2018	0.531	Nov 2019	-		0.531	Continuing	Continuing	Continuing
System Development and Integration	C/CPFF	TBD : TBD	0.000	0.000		0.000		6.341	Apr 2020	-		6.341	Continuing	Continuing	Continuing
Subtotal			0.000	7.542		3.269		13.680		-		13.680	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	0.000	0.085	May 2018	0.041	Nov 2018	0.180	Oct 2019	-		0.180	Continuing	Continuing	Continuing
Subtotal			0.000	0.085		0.041		0.180		-		0.180	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	0.000		0.000		0.774	Oct 2019	-		0.774	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		0.774		-		0.774	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
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>					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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 Engineering Support	C/CPAF	Various : Various	0.000	0.080	Jun 2018	0.036	Oct 2018	0.170	Oct 2019	-		0.170	Continuing	Continuing	Continuing
Subtotal			0.000	0.080		0.036		0.170		-		0.170	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	7.707		3.346		14.804		-		14.804	Continuing	Continuing	N/A
Remarks															

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PE 0604601N: *Mine Development*
Navy

Date: March 2019

Appropriation/Budget Activity
1319 / 5

R-1 Program Element (Number/Name)
PE 0604601N / *Mine Development*

Project (Number/Name) 2993 / <i>Encapsulated Effector</i>

Encapsulated Effector		FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024															
		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																																							
		Milestone B Decision ◆								Contract Award ◆								PDR ◆								CDR ◆								Milestone C Decision ◆							
																																		IOC							
System Development		Requirements Analysis				Preliminary Design Engineering								Detailed Design Engineering																											
																		Contractor Testing								Developmental Testing															
																														Operational Assessment				Safety Qualification Testing							
Test and Evaluation																																		IOT&E							

2020DON - 0604601N - 2993

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
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>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Encapsulated Effector</i>				
Acquisition Milestones: Acquisition Documentation	1	2018	3	2019
Acquisition Milestones: Milestone B Decision	3	2019	3	2019
Acquisition Milestones: Milestone C Decision	4	2024	4	2024
Acquisition Milestones: System Functional Review	2	2019	2	2019
Acquisition Milestones: Contract Award	3	2020	3	2020
Acquisition Milestones: Preliminary Design Review	2	2021	2	2021
Acquisition Milestones: Critical Design Review	3	2022	3	2022
Acquisition Milestones: IOC	4	2024	4	2024
System Development: Preliminary Design Engineering	3	2019	2	2021
System Development: Detailed Design Engineering	3	2021	2	2022
System Development: Requirements Analysis	1	2018	2	2019
System Development: Test and Evaluation: Contractor Testing	4	2022	1	2023
System Development: Test and Evaluation: Developmental Testing	2	2023	3	2023
System Development: Test and Evaluation: Operational Assessment	3	2023	4	2023
System Development: Test and Evaluation: Safety Qualification Testing	1	2024	1	2024
System Development: Test and Evaluation: IOT&E	3	2024	4	2024