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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 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</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	1,247.224	145.670	125.766	173.056	-	173.056	209.776	251.186	277.741	297.960	Continuing	Continuing
0951: <i>Joint Warhead Fuze Sustainment Program</i>	610.533	61.612	23.226	17.330	-	17.330	6.872	3.091	0.000	0.000	0.000	722.664
2021: <i>Mk4B Shape Stable Nose Tip</i>	5.771	26.357	22.820	10.063	-	10.063	9.797	7.469	0.000	0.000	0.000	82.277
2228: <i>Technical Applications Programs</i>	617.456	13.996	32.873	111.083	-	111.083	126.699	154.897	157.970	109.401	Continuing	Continuing
3097: <i>Mk 7 / W-93</i>	0.000	23.908	26.000	32.475	-	32.475	62.932	82.360	116.672	185.400	Continuing	Continuing
3158: <i>Integrated Nuclear Weapons Security Sys Dev</i>	13.464	2.711	2.847	2.105	-	2.105	3.476	3.369	3.099	3.159	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	17.086	18.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	35.086

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 178

A. Mission Description and Budget Item Justification

The Joint Warhead Fuze Sustainment Program (0951) is an effort to develop advanced components to improve the reliability, safety, and security of Arming, Fuzing and Firing (AF&F) systems for nuclear reentry systems. The current effort is focused on supporting the alteration of the AF&F system for the MK5/W88 system which will be five years beyond its design life at the scheduled deployment of the AF&F alteration. This effort also supports future utilization of the developed components by the US Air Force and United Kingdom.

The Mk4B(formerly referred to as Mk4A) Shape Stable Nose Tip (SSNT) (2021) effort will convert reentry body (RB) forward shell assemblies (FSA's) from legacy carbon composite nose tips to SSNT's. This will require ground and flight testing of SSNT Reentry Body Assemblies, updates and modifications to RB documentation (Weapon Specifications, Interface Control Drawings, product drawings etc), updated Fire Control software for fleet implementation, conversion of war reserve RB's to FSA's with SSNT, procurement/conversion of surveillance and flight test units, Strategic Weapons Facility (SWF) logistics implementation planning and execution, review and update Mk4B surveillance planning and the DoD share of National Nuclear Security Administration (NNSA) Office of Secure Transportation (OST) for shipping.

The Technology Applications Program (2228) supports the TRIDENT II (D5) Submarine Launched Ballistic Missile (SLBM) that provides the U.S. a weapon system with greater accuracy and payload capability as compared to the TRIDENT I (C4) system. TRIDENT II enhances U.S. strategic deterrence providing a survivable, sea-based system capable of engaging the full spectrum of potential targets with fewer submarines.

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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 I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	
<p>D5LE2 will include System Level Architecture Trades Analysis, Guidance and Missile Technology Maturation. Trading system architecture concepts and implementing modern model based design and system engineering practices begins in a limited capacity in FY20 and expands in FY21. D5LE2 Avionics Architecture & Technology Development will include redesign/development of legacy D5 and D5LE electronic technologies which are now obsolete or have manufacturing lines that have shutdown. Avionics architectures, sensor, bus and component designs are inherently complex with design and manufacturing technologies continuously evolving. Technology advancements and improved system architecture concepts have the potential to improve system capability, modularity, manufacturability, SWS operations and sustainability.</p> <p>FY21 funding continues and adds D5LE2 tasks associated with research and development for Strategic Weapons System studies, and required technology maturation.</p> <p>Continuing and Expanded tasks:</p> <ul style="list-style-type: none">- Systems Studies and Architecture development- Radiation Hardened parts concepts and evaluation- Guidance concepts and sensors evaluation <p>New tasks</p> <ul style="list-style-type: none">- Post Boost Technologies concepts and evaluation- Battery concepts and evaluation- PBCS Manufacturing concepts- Nose Fairing Material evaluation- Equipment Section Material evaluation- Connector and cables evaluation <p>The Multi Star Enhanced Prelaunch (MEP) project leverages the capability of the D5 Life Extension Guidance (Mk6 Mod1) to sight two stars vice one combined with the interface updates to the Fire Control and Navigation subsystem, allowing for in-flight correction, the potential to operate in environments where GPS is denied, and may provide future relief to the strict tolerance requirements of the strategic navigator on the current OHIO class submarines and the COLUMBIA program.</p> <p>The Systems Engineering Modeling and Simulation capability will consist of three elements: Model Based Design, Strategic Weapon System (SWS) Integrated Modeling and Simulation/Common Architecture & Framework, and SWS Enhancement Ground Test. This effort will provide the capability to comprehensively evaluate and test the integrated SWS within representative operational environments, providing unprecedented visibility across the SWS and system performance characterization equivalent to flight testing. This capability will enable trade space analysis to identify technical margin, subsystem interactions, and lifecycle affordability opportunities to include other services and be able to identify the benefits and risks of commonality to the individual programs, requirements and CONOPs modifications that could facilitate commonality, potential common acquisition strategies between the services, and total life cycle cost implications.</p> <p>The 3097 RDTEN project has been designated as the Mk7/W93 warhead, formerly known as the Interoperative Warhead (IW) and also the Mk5/W88 Life extension program. The name change to Mk7/W93 is reflected herein. This project will design, develop, and test a future Navy warhead to include a new Navy Aeroshell for a</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
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Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>
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Submarine Launched Ballistic Missile (SLBM). Early FYDP efforts will primarily consist of developing programmatic planning and structure to support the continuing study and future program along with further exploration and refinement of the concept studies that resulted from the FY19 Navy Feasibility Study. Programmatic efforts will consist of program planning and development of cross-agency plans (risk and opportunity, decision documentation and communication). Following the results of the Navy Feasibility Study, refinement of the concept study will be accomplished through system trade studies and drafting initial high level requirements documents in order to support the program entering a Phase 2 (Feasibility Study and Design Options) / 2A (Design Definition and Cost Study) effort in FY24.

In FY21, the project will further refine the down-selected concepts, screening criteria and programmatic tradeoffs (e.g., cost, schedule, technical maturity) for the concepts being considered. Additionally FY21 will begin aeroshell development efforts to include developing the materials and infrastructure necessary to support a mass mock flight experiment shortly after Phase 3 (Engineering Development) authorization.

The Integrated Nuclear Weapons Security System (INWSS) (3158) efforts support the Nuclear Weapons Security program and SSBN Escort mission. The policies and requirements regarding the safeguard of nuclear weapons within the Department of Defense is established by DoD S5210.41M. Within the Department of the Navy, nuclear weapons are limited to TRIDENT Fleet Ballistic Missiles (FBM), either deployed aboard TRIDENT submarines or located landside at Naval Submarine Base, Kings Bay, or Naval Submarine Base, Bangor where missiles are first assembled as well as repaired. The Chief of Naval Operations (CNO) has assigned the Strategic Systems Programs (SSP), the FBM program manager, with mission responsibility for the safeguard of FBM nuclear technologies. This budget supports efforts directed at improving the current technological baseline through a series of studies. These efforts will improve countermeasure technologies to address detection, delay and denial.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	148.379	157.676	152.942	-	152.942
Current President's Budget	145.670	125.766	173.056	-	173.056
Total Adjustments	-2.709	-31.910	20.114	-	20.114
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-49.910			
• Congressional Rescissions	-	-			
• Congressional Adds	-	18.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.089	0.000			
• SBIR/STTR Transfer	-2.620	0.000			
• Program Adjustments	0.000	0.000	19.890	-	19.890
• Rate/Misc Adjustments	0.000	0.000	0.224	-	0.224

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

Project: 9999: *Congressional Adds*

Congressional Add: *Model Based Systems Engineering*

	FY 2019		FY 2020
	14.480		0.000

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
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Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Congressional Add: <i>Autonomous Strategic Force Protection Sensor Network</i>	2.606	0.000
Congressional Add: <i>High temperature composite material capacity expansion</i>	0.000	12.000
Congressional Add: <i>Next generation strategic inertial measurement unit</i>	0.000	6.000
Congressional Add Subtotals for Project: 9999	17.086	18.000
Congressional Add Totals for all Projects	17.086	18.000

Change Summary Explanation

The FY 2021 funding request was increased by \$20.114M from FY20. Project 3097 was increased by \$32.475 for Aeroshell development and furthers the feasibility study for the development of a future Navy warhead variant. The project is now named "Mk7/W93" per Nuclear Weapons Council direction to name the warhead variant as the project. The program was also reduced by \$12.585M to account for the availability of prior year execution balances. Rate and other miscellaneous adjustments account for an increase of \$.224M.

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 0951 / <i>Joint Warhead Fuze Sustainment Program</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
0951: <i>Joint Warhead Fuze Sustainment Program</i>	610.533	61.612	23.226	17.330	-	17.330	6.872	3.091	0.000	0.000	0.000	722.664
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 178

A. Mission Description and Budget Item Justification

The Joint Warhead Fuze Sustainment Program is an effort to develop advanced components to improve the reliability, safety, and security of AF&F systems for nuclear reentry systems. The current effort is focused on supporting the alteration of the AF&F system for the MK5/W88 system which will be five years beyond its design life at the scheduled deployment of the AF&F alteration. This effort also supports future utilization of the developed components by the US Air Force and United Kingdom.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: TRIDENT II	61.612	23.226	17.330	0.000	17.330
Articles:	-	-	-	-	-
Description: Identify, prioritize, develop, proof, and demonstrate advanced technologies that will be leveraged and incorporated into future AF&Fs.					
FY 2020 Plans: Continue missile integration of the Mk5A Alt 370 fuze development, and perform pre-flight test and analysis Continue design, develop and qualify production tools and processes, testers, gauges, AF&F simulators and trainers Continue support engineer working groups and program reviews					
Conduct system vulnerability analysis Conduct production engineering Conduct performance assessment of tested designs					
FY 2021 Base Plans: Continue production engineering to include component failure review Continue performance assessment of tested designs Continue system vulnerability analysis					
Finalize missile integration of the Mk5A Alt 370 fuze development, and perform pre-flight test and analysis					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 0951 / <i>Joint Warhead Fuze Sustainment Program</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Finalize design, develop and qualify production tools and processes, testers, gauges, AF&F simulators and trainers Provide final system Verification Cross-Reference Matrix (VCRM) Participate and provide documentation in support of the Special Safety Study FY 2021 OCO Plans: N/A FY 2020 to FY 2021 Increase/Decrease Statement: FY21 decrease is due to the transition of the AF&F simulators portion of the Joint Fuze Sustainment program to production, which is provided for in WPN Budget LI 1250.					
Accomplishments/Planned Programs Subtotals	61.612	23.226	17.330	0.000	17.330

C. Other Program Funding Summary (\$ in Millions)											
Line Item	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
• RDTEN/3219: <i>SBSD Nuclear Technology Development</i>	190.100	114.006	80.085	-	80.085	60.142	56.841	54.400	44.385	Continuing	Continuing
• RDTEN/3220: <i>Advanced Submarine System Development</i>	501.133	419.051	317.196	-	317.196	195.821	103.802	117.601	118.179	Continuing	Continuing
• OPN/5358: <i>SWS Modernization Funds</i>	253.579	258.933	258.910	-	258.910	272.865	271.139	263.819	269.083	0.000	2,917.401
• WPN/1250: <i>TRIDENT II Mods</i>	1,048.011	1,165.736	1,173.837	-	1,173.837	1,159.348	1,187.041	1,247.575	1,291.194	2,176.384	19,011.964
• SCN/1045: <i>OHIO Replacement Submarine</i>	3,173.400	1,820.927	4,014.650	-	4,014.650	3,996.677	4,150.151	5,204.052	6,107.939	85,685.907	115,788.666
• OMN/1D2D: <i>Fleet Ballistic Missile</i>	1,357.232	1,418.436	1,428.102	-	1,428.102	1,474.696	1,528.487	1,571.917	1,606.044	0.000	10,384.914

Remarks

D. Acquisition Strategy
Contracts will continue to be awarded to those sources who were engaged in the Mk4LE Reentry Body development program and are currently engaged in the production and/or operational support of the deployed Mk4LE Reentry Body on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302.-1, 3, 4

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 0951 / <i>Joint Warhead Fuze Sustainment Program</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			
Joint Warhead Fuze Sustainment DOE	MIPR	DOE : NM	506.520	48.264	Nov 2018	13.993	Jan 2020	14.760	Nov 2020	-		14.760	9.963	593.500	-
Joint Warhead Fuze Sustainment ITT	SS/CPFF	ITT : VA	23.172	3.851	Feb 2019	2.105	Jan 2020	0.000		-		0.000	0.000	29.128	-
Joint Warhead Fuze Sustainment LMMS	SS/CPFF	LMMS : CA	58.610	7.931	Jul 2019	5.317	Nov 2019	1.199	Nov 2020	-		1.199	0.000	73.057	-
Joint Warhead Fuze Sustainment	WR	NSWC Dahlgren : VA	18.924	0.551	Nov 2018	1.044	Nov 2019	0.000		-		0.000	0.000	20.519	-
Joint Warhead Fuze Sustainment	SS/CPFF	BAE : MD	1.739	0.150	Feb 2019	0.000		0.000		-		0.000	0.000	1.889	-
Joint Warhead Fuze Sustainment	SS/CPIF	APL : MD	0.929	0.073	Feb 2019	0.000		0.000		-		0.000	0.000	1.002	-
Joint Warhead Fuze Sustainment	WR	CNSW : ID	0.639	0.000		0.243	Oct 2019	0.000		-		0.000	0.000	0.882	-
Joint Warhead Fuze Sustainment	C/BA	PERATON : VA	0.000	0.000		0.000		0.828	Nov 2020	-		0.828	0.000	0.828	-
Joint Warhead Fuze Sustainment	C/BA	TOYON : VA	0.000	0.792	Feb 2019	0.524	Nov 2019	0.543	Oct 2020	-		0.543	0.000	1.859	-
Subtotal			610.533	61.612		23.226		17.330		-		17.330	9.963	722.664	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	610.533	61.612	23.226	17.330	-	17.330	9.963	722.664	N/A

Remarks

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / Strategic Sub & Wpns Sys Supt	Project (Number/Name) 0951 / Joint Warhead Fuze Sustainment Program
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Proj 0951	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
Joint Warhead Fuze Sustainment Program																												
Assembly Level Testing																												
Performance Assessment of Tested Designs																												
Development Tests																												
Production Engineering																												
General JCIDS Support																												
General Acquisition Planning Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 0951 / <i>Joint Warhead Fuze Sustainment Program</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Proj 0951</i>				
Joint Warhead Fuze Sustainment Program: Assembly Level Testing:	1	2019	4	2023
Joint Warhead Fuze Sustainment Program: Performance Assessment of Tested Designs:	1	2019	4	2023
Joint Warhead Fuze Sustainment Program: Development Tests:	1	2019	4	2023
Joint Warhead Fuze Sustainment Program: Production Engineering:	1	2019	4	2023
Joint Warhead Fuze Sustainment Program: General JCIDS Support:	1	2019	4	2023
Joint Warhead Fuze Sustainment Program: General Acquisition Planning Support:	1	2019	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>				Project (Number/Name) 2021 / <i>Mk4B Shape Stable Nose Tip</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
2021: <i>Mk4B Shape Stable Nose Tip</i>	5.771	26.357	22.820	10.063	-	10.063	9.797	7.469	0.000	0.000	0.000	82.277
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Mk4B (formerly referred to as Mk4A)Shape Stable Nose Tip (SSNT) effort will convert reentry body (RB) forward shell assemblies (FSA's) from legacy carbon composite nose tips to SSNT's. This will require ground and flight testing of SSNT RBA's, updates and modifications to RB documentation (Weapon Specifications, Interface Control Drawings, product drawings etc), updated Fire Control software for fleet implementation, conversion of war reserve RB's to FSA's with SSNT, procurement/conversion of surveillance and flight test units, Strategic Weapons Facility (SWF) logistics implementation planning and execution, review and update Mk4B surveillance planning and the DoD share of National Nuclear Security Administration (NNSA) Office of Secure Transportation (OST) for shipping.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Mk4B Shape Stable Nose Tip	26.357	22.820	10.063	0.000	10.063
Articles:	-	-	-	-	-
FY 2020 Plans:					
Continue Mk4B SSNT system requirements review					
Continue Development of the reentry body aerodynamics model and associated fire control flight parameters					
Continue Nosetip development hardware to support nosetip development testing					
Continue Qualification and buildup for forward shell development testing.					
Continue Engineering support for both development and qualification testing (ground and flight)					
Program and engineering support during material characterization of nosetip billet materials					
FY 2021 Base Plans:					
Continue Mk4B SSNT system requirements review					
Continue Development of the reentry body aerodynamics model and associated fire control flight parameters					
Continuing Engineering support for both development and qualification testing (ground and flight)					
FY 2021 OCO Plans:					
N/A					
FY 2020 to FY 2021 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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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
FY21 to FY20 Funding decrease due to nosetip billet materials beginning transition to production, shown in Navy WPN budget LI 1250 (12.757M).					
Accomplishments/Planned Programs Subtotals	26.357	22.820	10.063	0.000	10.063

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

Line Item	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
• WPN/1250: <i>Trident II Mods</i>	1,048.011	1,165.736	1,173.837	-	1,173.837	1,159.348	1,187.041	1,247.575	1,291.194	2,176.384	19,011.964

Remarks

D. Acquisition Strategy

Contracts will continue to be awarded to those sources who were engaged in the Mk4LE Reentry Body development program and are currently engaged in the production and/or operational support of the deployed Mk4LE Reentry Body on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302.-1, 3, 4

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 2021 / <i>Mk4B Shape Stable Nose Tip</i>
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Proj 2021	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				
Mk4B Shape Stable Nose Tip: General Acquisition Planning Support																																
Mk4B Shape Stable Nose Tip: Production Engineering																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 2021 / <i>Mk4B Shape Stable Nose Tip</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 2021				
Mk4B Shape Stabe Nose Tip: General Acquisition Planning Support: Schedule Detail	1	2019	4	2023
Mk4B Shape Stable Nose Tip: Production Engineering: Schedule Detail	1	2019	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>				Project (Number/Name) 2228 / <i>Technical Applications Programs</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
<i>2228: Technical Applications Programs</i>	617.456	13.996	32.873	111.083	-	111.083	126.699	154.897	157.970	109.401	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 2228 consists of three elements: D5LE2 Life Extension, Multi-Start Enhanced Pre-Launch, and Modeling and Simulation.

D5LE2 Life Extension:

The Submarine Launched Ballistic Missile SLBM is the most survivable leg of the triad and foundational to STRATCOMs deterrence strategy. The heart of the SLBM capability is the D5LE Strategic Weapon System (SWS) currently hosted aboard the OHIO platform and planned to be the initial SWS on the COLUMBIA platform. D5LE cannot support the COLUMBIA platform throughout its predicted service life (2084) due to age, attrition, and obsolescence of critical components within the system. Aging components (such as Flight Electronics, and Guidance) fall below requirements as early as the late 2030s and non-aging components are attrited by flight tests and spares consumption and fall below requirements shortly thereafter.

The 2018 Nuclear Posture Review identified the need for Strategic systems to be more flexible and adaptable in the face of adversaries who are increasingly showing the ability to quickly deploy enhanced capabilities. The D5LE2 weapon system will not only need to deliver the range and accuracy of the current system, but must do so in the face of an adversary with improved defensive capabilities which will drive the need for additional attributes to increase the probability of survival.

Meeting these new and evolving requirements will require that the D5LE2 architecture be developed so that it can be tailored to meet the uncertain future requirements. Being able to expand at the speed of relevance will result in an architecture which will be based on modular interfaces which enables flexibility and adaptability. The need for technology that is not part of the current design will be critical to being able to provide a system which meets and adapts with these new requirements.

Previous experience has shown that the timeline for developing new technologies for the use in this challenging environment routinely spans 10 years. Therefore, enabling technologies for D5LE2 must be started in anticipation of program need to avoid putting unacceptable risk in the execution of the program of record.

The D5LE2 acquisition strategy technology investments are based on the current Technology and Manufacturing Readiness Levels (TRL/MRL) by commodity and are time phased to support reaching an appropriate TRL/MRL by Systems Engineering Milestones. The technology investments are architecture agnostic (i.e. they must be developed regardless of the System Study results) for the fundamental building blocks for the Strategic Weapons System. D5LE2 Technology Development targets replacements for legacy D5 and D5LE technologies now obsolete with manufacturing lines shutdown that are required regardless of architecture chosen (e.g. radiation hardened parts) and/or have long lead development timelines. Technology advancements and improved system architecture concepts will unlock existing system capability, and add flexibility/adaptability, manufacturability, SWS operations, and sustainability.

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 2228 / <i>Technical Applications Programs</i>
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In order to support STRATCOM without gapping capability, SSP must begin architecture agnostic technology maturation on unique strategic components in FY20 and initiate studies to identify a modernized System Level Architecture. FY20 scope has been reduced to only those areas most critical to

The System Concepts Baseline Refinement (SCR), which is on the critical path to System Requirements Review (SRR). Additionally, FY20 is focused on filling requirements voids in the areas of Threat Effectiveness, Cyber Vulnerabilities, evaluating the SWS contribution to platform survivability, and developing the utility curves by which concepts will be evaluated. FY21 iterates on the work done in FY20 and key architecture decisions will be made.

The FY20 and FY21 plans are based and timed on historical execution to support the proposed D5LE2 timeline. The system studies are phased to support an iterative update to the D5LE2 concept baseline culminating in a sufficiently refined system concept and requirements to support an SRR in mid FY25.

Multi Star Enhanced Pre-Launch:

The Multi Star Enhanced Prelaunch (MEP) project leverages the capability of the D5 Life Extension Guidance (Mk6 Mod1) to sight two stars vice one combined with the interface updates to the Fire Control and Navigation subsystem, allowing for improved in-flight correction. This capability reduces Weapon System reliance on Global Positioning System (GPS) and Bathymetry data which allows for operation in environments where GPS is denied and supports Submarine security during patrol. This capability also has potential for future relief to the strict tolerance requirements of the strategic navigator on the current OHIO Class Submarines and the COLUMBIA class program.

Modeling and Simulation:

The Systems Engineering Modeling and Simulation capability will consist of three elements: Model Based Design, Strategic Weapon System (SWS) Integrated Modeling and Simulation/Common Architecture & Framework, and SWS Enhancement Ground Test. This effort will provide the capability to comprehensively evaluate and test the integrated SWS within representative operational environments, providing unprecedented visibility across the SWS and system performance characterization equivalent to flight testing. This capability will enable trade space analysis to identify technical margin, subsystem interactions, and lifecycle affordability opportunities to include other services and be able to identify the benefits and risks of commonality to the individual programs, requirements and CONOPs modifications that could facilitate commonality, potential common acquisition strategies between the services, and total life cycle cost implications.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: D5LE2	0.000	18.274	96.001	0.000	96.001
Articles:	-	-	-	-	-
FY 2020 Plans:					
Initiate System Studies: In order to support the NPR requirements for flexibility and adaptability as a core function of the D5LE2 system SSP will evaluate mission and system level requirements based on existing and emerging threats and utility functions such as:					

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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
<ul style="list-style-type: none"> - Threat effectiveness study - Contribution to platform survivability study - SWS Functional and Behavior Modeling Development - Integrated Test Concepts - Cyber effectiveness study <p>Technology Investments:</p> <ul style="list-style-type: none"> - Assess high temperature materials, refractory materials, high temperature composites - Develop Model Based design concepts and component based performance models - Initiate Radiation Hardened Parts concepts and evaluation: - Begin to develop radiation hardness approach and radiation hardness assurance plan - Evaluation of potential new or obsolescent replacement parts. Areas include processors, memory, ASICs, analog components, discrettes, passive components, embedded components, PWBs <p>Initiate Guidance Concepts and Sensors:</p> <ul style="list-style-type: none"> - Evaluate Guidance concepts (Strapdown, allocations, aiding) - TRL/MRL evaluation of selected sensors (e.g. PIGA, XFOG, RASP, Stellar) - Mechanical components evaluation(e.g. stable members, shock mounts, connectors, torque motors, slip rings). <p>FY 2021 Base Plans:</p> <p>System Studies:</p> <p>FY21 activities build upon the activities that began in FY20. The System concept baseline (SCB) continues its refinement while key architecture decisions begin to be made based on the more mature requirements set. Detailed looks into Lifecycle concepts begin across the SWS and initial performance allocations will be evaluated.</p> <p>Continue:</p> <ul style="list-style-type: none"> - Threat effectiveness study - Contribution to platform survivability study - SWS Functional and Behavior Modeling Development - Refine Integrated Test Concepts - Cyber effectiveness study 					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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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>Initiate:</p> <ul style="list-style-type: none"> - Evaluation of mission and system level requirements - Key function and physical architecture decisions (Avionics, Radiation hardening, Data, Communication) - Lifecycle Concepts (Safety, Design for Test & Sustainment) - Performance Allocations all of which support future systems studies and inform future technology investments <p>Technology Investments:</p> <p>Continue:</p> <p>Radiation Hardened Parts concepts and evaluation</p> <ul style="list-style-type: none"> - Continue development of radiation hardness approach - Refine Radiation Hardness Assurance Plan to include testing/verification needed based on environments <p>Guidance Concepts and Sensors evaluation:</p> <ul style="list-style-type: none"> - Continues evaluations of concepts informed by systems studies and expands into concepts that were lower priority in FY20 - Continues/completes TRL/MRL evaluation of sensors - Continues mechanical component evaluation and begins mechanical prototype component evaluation and environmental testing <p>Initiate:</p> <p>Radiation Hardened Parts concepts and evaluation</p> <ul style="list-style-type: none"> - Database tool selection - Initial draft of electronics parts procurement plan - Collect parts data - Begin evaluation of additive shielding. <p>Guidance Concepts and Sensors evaluation:</p> <ul style="list-style-type: none"> - Begins simulation/HWIL for high risk items 					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020				
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 2228 / <i>Technical Applications Programs</i>				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<ul style="list-style-type: none"> - Begins Accelerometer and Gyroscope high fidelity lab/simulation testing <p>Post Boost Technologies concepts and evaluation</p> <ul style="list-style-type: none"> - Begins Technology evaluation with Thermal/Structural analysis and material characterization - Begins initial thruster concepts - Initiates prototype design - Initiates cold gas test planning and execution - Begins alternate manufacturing process development begins <p>Battery concepts and evaluations</p> <ul style="list-style-type: none"> - Establishes initial key concepts - Analytic study/detailed trades of battery chemistry - Feasibility assessments of various battery approaches to include submarine/man safety evaluation <p>PBCS Manufacturing concepts</p> <ul style="list-style-type: none"> - Alternate manufacturing process evaluation begins - Structural analysis and material characterization begins - Long lead prototype material procurement - Process model developed - Weld reduction targets evaluated - Chemical composition testing begins <p>Nose Fairing and Equipment Section Materials</p> <ul style="list-style-type: none"> - Research candidate technologies and additive manufacturing capabilities - Space claim and layout configuration models - Establish initial subsystem model interfaces - First order material and layout configuration assessments for stress, thermal and mass properties - Coupon level fabrication and testing for initial characterization - Acquire limited tooling <p>Connectors/Cables</p>						

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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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>- Evaluation begins to refine producible or alternate cable technologies for weight, bandwidth, radiation survivability, and other features</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY21 funding continues and adds D5LE2 tasks associated with research and development for Strategic Weapons System studies, and required technology maturation.</p> <p>Continuing and Expanded tasks:</p> <ul style="list-style-type: none"> - Systems Studies and Architecture development - Radiation Hardened parts concepts and evaluation - Guidance concepts and sensors evaluation <p>New tasks</p> <ul style="list-style-type: none"> - Post Boost Technologies concepts and evaluation - Battery concepts and evaluation - PBCS Manufacturing concepts - Nose Fairing Material evaluation - Equipment Section Material evaluation - Connector and cables evaluation 					
<p>Title: Multi-Star Enhanced Prelaunch (MEP)</p> <p align="right">Articles:</p> <p>FY 2020 Plans: complete DASO30 test preparation for DASO 30 execution. Complete verification testing and flight test range coordination. Execute DASO30 test and begin processing test data.</p> <p>FY 2021 Base Plans: FY21: Complete flight test report. Complete assessment of MEP demonstration performance against typical weapon system and model predictions.</p> <p>FY 2021 OCO Plans:</p>	9.973	10.709	4.628	0.000	4.628
	-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy				Date: February 2020		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>		Project (Number/Name) 2228 / <i>Technical Applications Programs</i>		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A						
FY 2020 to FY 2021 Increase/Decrease Statement: The reduction in funding from FY20 to FY21 is due to reduced efforts in development and shifting of focus to analyzing and assessing testing performance.						
Title: System Engineering Modeling and Simulation		4.023	3.890	10.454	0.000	10.454
		Articles:	-	-	-	-
FY 2020 Plans: Begin development and deployment of secure computing infrastructure at Secret level. Continue development of model based design integration plan. Continue modeling and simulation gap analysis. Continue System Behavioral Model process and methods Development.						
FY 2021 Base Plans: Begin SWS Hardware in the Loop Development. Begin SWS functional simulation development. Begin Infrastructure for Methods, Procedures, and Policies for handling Models. Begin development of secure computing infrastructure at Top Secret level. Begin development of physical model based tools/virtual reality for training and planning. Continue development of model based design integration plan. Continue modeling and simulation gap analysis. Continue System Behavioral Model process and methods Development. Continue deployment of secure computing infrastructure at Secret level.						
FY 2021 OCO Plans: N/A						
FY 2020 to FY 2021 Increase/Decrease Statement: Modeling and Simulation efforts increase from FY20 to FY21 to support modeling associated with trade space, system description, SWS hardware in the loop, enhanced ground test, and secure computing infrastructure to enable these activities. (6.564M)						
Accomplishments/Planned Programs Subtotals		13.996	32.873	111.083	0.000	111.083

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Contracts will continue to be awarded to those sources who were engaged in program and are currently engaged in the production and/or operational support on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302.-1, 3, 4

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy												Date: February 2020			
Appropriation/Budget Activity 1319 / 7				R-1 Program Element (Number/Name) PE 0101221N / Strategic Sub & Wpns Sys Supt				Project (Number/Name) 2228 / Technical Applications Programs							
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
Technical Applications LMSS	SS/CPPIF	LMSS : CA	165.272	1.800	Jan 2019	9.706	Jan 2020	49.409	Nov 2020	-		49.409	Continuing	Continuing	Continuing
Technical Applications DRAPER	SS/CPFF	DRAPER : MA	337.604	11.244	Mar 2019	7.202	Nov 2019	31.794	Nov 2020	-		31.794	Continuing	Continuing	Continuing
Technical Applications APL	SS/CPFF	APL : MD	0.000	0.000		6.286	Dec 2019	9.700	Oct 2020	-		9.700	Continuing	Continuing	Continuing
Technical Applications VAR	Various	Various : Various	19.662	0.000		5.719	Nov 2019	8.474	Nov 2020	-		8.474	Continuing	Continuing	Continuing
Technical Applications CRANE	SS/CPFF	CRANE : IN	0.000	0.000		0.000		6.285	Nov 2020	-		6.285	Continuing	Continuing	Continuing
Technical Applications Dahlgren	WR	Dahlgren : VA	94.618	0.352	Jan 2019	3.107	Nov 2019	2.763	Nov 2020	-		2.763	Continuing	Continuing	Continuing
Technical Applications GDMS	SS/CPFF	GDMS : MA	0.300	0.600	Jan 2019	0.853	Jan 2020	1.406	Oct 2020	-		1.406	Continuing	Continuing	Continuing
Technical Applications NGMS	SS/CPFF	NGMS : CA	0.000	0.000		0.000		1.252	Oct 2020	-		1.252	Continuing	Continuing	Continuing
Subtotal			617.456	13.996		32.873		111.083		-		111.083	Continuing	Continuing	N/A
Project Cost Totals			617.456	13.996		32.873		111.083		-		111.083	Continuing	Continuing	N/A
Remarks															

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

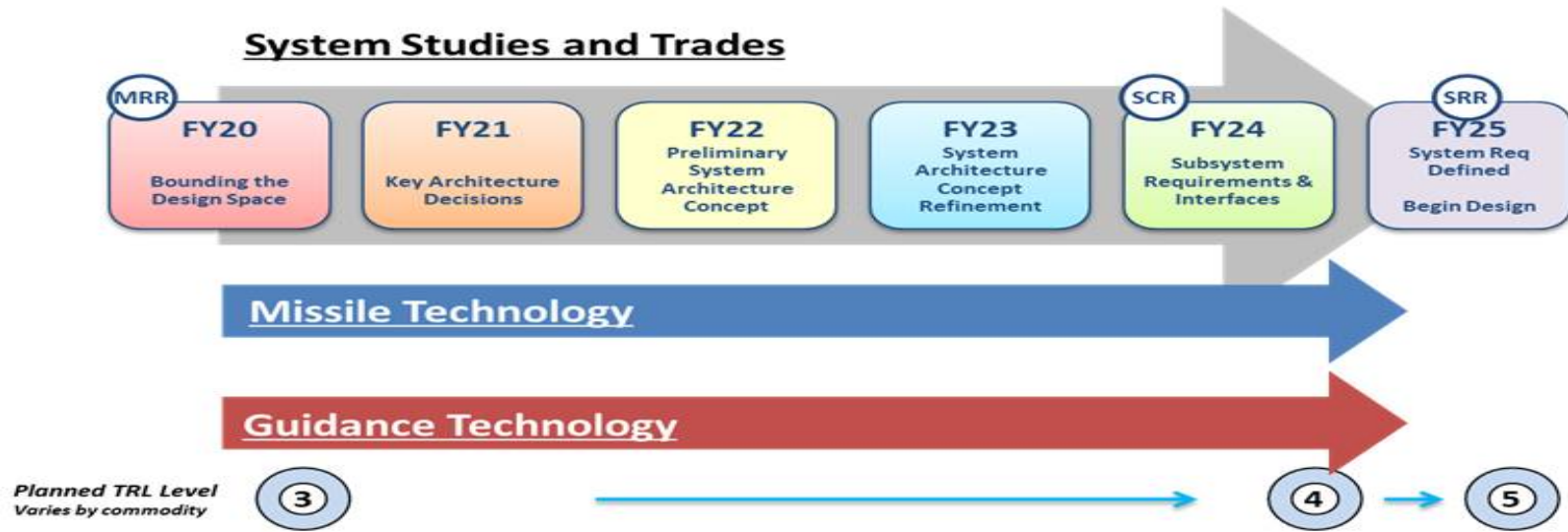
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 2228 / <i>Technical Applications Programs</i>
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Proj 2228	FY 2019				FY 2020				FY 2021				FY 2022				FY 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
Multi-Star Enhanced Prelaunch (MEP)																												
MEP Subsystem Interface Specifications Developed																												
MEP Early Engineering Software Development																												
MEP Engineering Software Development																												
MEP Subsystem Testing																												
MEP Preliminary System Integration & Test																												
MEP Final Engineering Software Development																												
MEP Final System Integration Test																												
MEP DASO Flight Test Demonstration																												
MEP Post Flight Test Data Analysis																												
Range Safety & Flight Readiness Review Support																												
Flight Test Analysis/Documentation Support/Accuracy Assessment																												
System Engineering Modeling and Simulation																												
SWS Integrated Modeling & Simulation/ Common Framework																												
SWS Enhancement Group Test																												
Model-Based Design																												
TradeSpace Model Execution Infrastructure																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / Strategic Sub & Wpns Sys Supt	Project (Number/Name) 2228 / Technical Applications Programs

Proj 2228 - D5LE2 Schedule



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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 2228				
Multi-Star Enhanced Prelaunch (MEP): MEP Subsystem Interface Specifications Developed:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Early Engineering Software Development:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Engineering Software Development:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Subsystem Testing:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Preliminary System Integration & Test:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Final Engineering Software Development:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Final System Integration Test:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP DASO Flight Test Demonstration:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): MEP Post Flight Test Data Analysis:	1	2019	4	2022
Multi-Star Enhanced Prelaunch (MEP): Range Safety & Flight Readiness Review Support:	1	2021	4	2022
Multi-Star Enhanced Prelaunch (MEP): Flight Test Analysis/Documentation Support/Accuracy Assessment:	1	2021	4	2022
System Engineering Modeling and Simulation: SWS Integrated Modeling & Simulation/Common Framework:	1	2019	4	2023
System Engineering Modeling and Simulation: SWS Enhancement Group Test:	1	2019	4	2023
System Engineering Modeling and Simulation: Model-Based Design:	1	2021	4	2023
System Engineering Modeling and Simulation: TradeSpace Model Execution:	1	2021	4	2023
System Engineering Modeling and Simulation: Infrastructure:	1	2021	4	2024
D5LE2:	1	2020	4	2025
D5LE2: System Studies and Trades: Schedule Detail	1	2020	4	2025

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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
D5LE2: Key Architecture Decisions: Schedule Detail	1	2021	4	2021
D5LE2: System Architecture Concept Refinement: Schedule Detail	1	2022	1	2024
D5LE2: System Baseline Concept Review: Schedule Detail	1	2024	4	2024
D5LE2: Subsystem Requirements & Interfaces: Schedule Detail	1	2024	4	2025
D5LE2: System Requirements Defined: Schedule Detail	1	2025	4	2025
D5LE2: System Requirements Review: Schedule Detail	3	2025	3	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>				Project (Number/Name) 3097 / <i>Mk 7 / W-93</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
3097: <i>Mk 7 / W-93</i>	0.000	23.908	26.000	32.475	-	32.475	62.932	82.360	116.672	185.400	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 3097 RDTEN project has been designated as the Mk7/W93 warhead, a third variant for the Trident. This project was formerly known as the Interoperative Warhead (IW) and also the Mk5/W88 Life extension program; the name change to Mk7/W93 is reflected herein. This project will design, develop, and test a future Navy warhead to include a new Navy Aeroshell for a Submarine Launched Ballistic Missile (SLBM). Early FYDP efforts will primarily consist of developing programmatic planning and structure to support the continuing study and future program along with further exploration and refinement of the concept studies that resulted from the FY19 Navy Feasibility Study. Programmatic efforts will consist of program planning and development of cross-agency plans (risk and opportunity, decision documentation and communication). Following the results of the Navy Feasibility Study, refinement of the concept study will be accomplished through system trade studies and drafting initial high level requirements documents in order to support the program entering a Phase 2 (Feasibility Study and Design Options) / 2A (Design Definition and Cost Study) effort in FY24.

In FY21, the project will further refine the down-selected concepts, screening criteria and programmatic tradeoffs (e.g., cost, schedule, technical maturity) for the concepts being considered. Additionally FY21 will begin aeroshell development efforts to include developing the materials and infrastructure necessary to support a mass mock flight experiment shortly after Phase 3 (Engineering Development) authorization. The W93/Mk7 project efforts will also include: an Arming, Fuzing, and Firing (AF&F) Subsystem, Release Assembly, Nuclear Explosive Package (NEP) System Integration.

*Schedule detail for project 3097 is available at a higher classification.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Mk7 / W93 (formerly W78/88-1 Life Extension Program)	23.908	26.000	32.475	0.000	32.475
Articles:	-	-	-	-	-
FY 2020 Plans: Develop programmatic planning and structure to support the continuing study and future program along with further exploration and refinement of the concept studies. Programmatic efforts will consist of working group charter definition, drafting program plans and cross-agency plans (risk and opportunity, decision documentation and communication). Following the results of the Navy Feasibility Study, refinement of the concept study will be accomplished through system trade studies and drafting initial high level requirements documents to include initial drafts of Phase 2 study plan, Systems Engineering Program Plan (SEMP), System Qualification and SPALT planning, Ground and					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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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
flight test program planning, preliminary reliability and safety assessment, Modeling and analysis, flight sciences support, and Deployment planning. <i>FY 2021 Base Plans:</i> Continue programmatic planning and structure to support the continuing study and future warhead variant Continue exploration and refinement of the concept studies. Continue drafting and refinement of high level requirements documents to include drafts of Phase 2 study plan, Systems Engineering Program Plan (SEMP), System Qualification and SPALT planning, test planning, preliminary reliability and safety assessment, Integrated Master Plan/ Integrated Master Schedule, Safety Program Plan). Continue Systems integration and qualification planning. Continue Requirements definition and preparation for Systems Requirements Review. Begin Aeroshell Design options trade study. Conduct Integrated Baseline Review (IBR). Begin Aeroshell Thermal Protection System (TPS) material development Begin material modeling and analysis including vulnerability, accuracy, reliability, and flight performance predictions and assessments <i>FY 2021 OCO Plans:</i> N/A <i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY21 increases as program begins material modeling and analysis for Aeroshell development					
Accomplishments/Planned Programs Subtotals	23.908	26.000	32.475	0.000	32.475

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy Contracts will be awarded to those sources who were engaged in the W78/88-1 Life Extension Program and are currently engaged in the production and/or operational support of the deployed W78/88-1 Systems on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302.-1, 3, 4

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 3097 / Mk 7 / W-93
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Proj 3097	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
Navy Feasibility Study (NFS)																												
Mk7 / W93 (further schedule detail available at a higher classification)																												

2021PB - 0101221N - 3097

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3097				
Navy Feasibility Study (NFS):	1	2019	4	2020
Mk7 / W93 (further schedule detail available at a higher classification): Schedule Detail	1	2021	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>				Project (Number/Name) 3158 / <i>Integrated Nuclear Weapons Security Sys Dev</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
3158: <i>Integrated Nuclear Weapons Security Sys Dev</i>	13.464	2.711	2.847	2.105	-	2.105	3.476	3.369	3.099	3.159	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Enhanced Special Weapons effort supports the Nuclear Weapons Security (NWS) program and SSBN Escort mission. The policies and requirements regarding the safeguard of nuclear weapons within the Department of Defense is established by DoD S5210.41M. Within the Department of the Navy, nuclear weapons are limited to TRIDENT Fleet Ballistic Missiles (FBM), either deployed aboard TRIDENT submarines or located landside at Naval Submarine Base, Kings Bay or Naval Submarine Base, Bangor where missiles are first assembled as well as repaired. The CNO has assigned SSP, the FBM program manager, with mission responsibility for the safeguard of FBM nuclear assets. More specifically, the mission includes landside and pier operations as well as transits to and from the dive point, each of which present challenges to personnel as well as existing technologies. This budget supports efforts directed at improving the current technological baseline through a series of studies focusing on land and in transit requirements. Collectively, these efforts will improve countermeasure technologies addressing detection, delay and denial.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Integrated Nuclear Weapons Security Sys Dev	2.711	2.847	2.105	0.000	2.105
Articles:	-	-	-	-	-
FY 2020 Plans:					
Continue Wide Area/Extended Detection: Development of technologies to increase detection, localization, classification, and tracking capabilities beyond the perimeter of the limited area, waterfront restricted area, along the convoy route and transit route. This effort includes technologies to detect intruders in difficult environments such as dense foliage, marsh, fog and heavy rain.					
Continue research and development efforts towards the improvement of countermeasures technologies addressing detection, delay and denial.					
Continue Analysis of Alternatives on WQX-2 follow on Sensor Selection & Transition					
FY 2021 Base Plans:					
Continue Wide Area/Extended Detection: Development of technologies to increase detection, localization, classification, and tracking capabilities beyond the perimeter of the limited area, waterfront restricted area, along the convoy route and transit route. This effort includes technologies to detect intruders in difficult environments such as dense foliage, marsh, fog and heavy rain.					
Continuing research and development efforts towards the improvement of countermeasures technologies addressing detection, delay and denial.					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 3158 / <i>Integrated Nuclear Weapons Security Sys Dev</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Continue Analysis of Alternatives on WQX-2 follow on Sensor Selection & Transition Identify/support technology needed for aerial surveillance, air-based sensors, and detection and defeat(passive and active)of unmanned aircraft systems. Investment into technologies that aide in mitigating risks posed by Cyber-security threats, assess susceptibility and vulnerability to malicious activities, and to strengthen against unauthorized or inadvertent disclosure. FY 2021 OCO Plans: N/A FY 2020 to FY 2021 Increase/Decrease Statement: Reduction from FY20 to FY21 reflects ramp down of intensive efforts on WQX-2 sensor selection and a ramp up of investments into newer threat areas.					
Accomplishments/Planned Programs Subtotals	2.711	2.847	2.105	0.000	2.105

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>
• OPN/Various-2: <i>OPN (Nuclear Weapons Security)</i>	29.852	41.991	34.427	-	34.427	35.098	35.791	36.506	37.236	Continuing	Continuing
• OMN/11D2D-3: <i>Fleet Ballistic Missile (Nuclear Weapons Security)</i>	81.424	82.569	89.409	-	89.409	99.659	97.100	102.160	97.478	Continuing	Continuing
• OMN/11D2D-5: <i>Fleet Ballistic Missile (Transit/Escort)</i>	110.861	124.191	108.817	-	108.817	110.104	111.942	114.105	116.390	Continuing	Continuing
• MCN/Various-1: <i>MILCON (CNI) (Nuclear Weapons Security)</i>	88.960	0.000	0.000	-	0.000	160.460	0.000	0.000	0.000	0.000	391.609

Remarks

D. Acquisition Strategy
Procurements are being executed through a combination of private contractors (large and small business), government Centers of Excellence (COEs), other government agencies and the Naval Submarine Bases, Kitsap and Kings Bay. Contract awards are based upon "best value" determinations, and where practical will be performance based or include incentive provisions.

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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 / 7				PE 0101221N / Strategic Sub & Wpns Sys Supt				3158 / Integrated Nuclear Weapons Security Sys Dev							
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
Integrated Nuclear Weapons Security Sys Dev	SS/CPFF	APL : MD	4.170	0.199	Feb 2019	2.647	Feb 2020	0.206	Nov 2020	-		0.206	Continuing	Continuing	Continuing
Integrated Nuclear Weapons Security Sys Dev	WR	NSWC : VA	4.549	0.201	Feb 2019	0.000		1.008	Nov 2020	-		1.008	Continuing	Continuing	Continuing
Integrated Nuclear Weapons Security Sys Dev	SS/CPFF	JRC : VA	3.296	0.233	Feb 2019	0.200	Feb 2020	0.343	Oct 2020	-		0.343	Continuing	Continuing	Continuing
Integrated Nuclear Weapons Security Sys Dev	C/BA	DRAPER : MA	0.355	0.201	Feb 2019	0.000		0.150	Oct 2020	-		0.150	Continuing	Continuing	Continuing
Integrated Nuclear Weapons Security Sys Dev	WR	CNS : ID	0.652	1.213	Aug 2019	0.000		0.000		-		0.000	0.000	1.865	-
Integrated Nuclear Weapons Security Sys	C/CPFF	GDMS : MA	0.442	0.456	Feb 2019	0.000		0.398	Nov 2020	-		0.398	Continuing	Continuing	Continuing
Integrated Nuclear Weapons Security Sys	C/BA	ONR : DC	0.000	0.208	Feb 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			13.464	2.711		2.847		2.105		-		2.105	Continuing	Continuing	N/A
Project Cost Totals			13.464	2.711		2.847		2.105		-		2.105	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 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 3158 / <i>Integrated Nuclear Weapons Security Sys Dev</i>
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Proj 3158	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
NWS Wide Area/Extended Detection																												
AoA WQX-2 Sensor Selection & Transition																												
Air Technologies																												
Cyber Technologies																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 3158 / <i>Integrated Nuclear Weapons Security Sys Dev</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3158				
NWS Wide Area/Extended Detection:	1	2019	4	2025
AoA WQX-2 Sensor Selection & Transition: Schedule Detail	1	2019	4	2025
Air Technologies: Schedule Detail	1	2019	4	2025
Cyber Technologies: Schedule Detail	1	2019	4	2025

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 9999 / <i>Congressional Adds</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
9999: <i>Congressional Adds</i>	0.000	17.086	18.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	35.086
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This funding is a congressional add to support High temperature composite material capacity expansion and Next Generation Strategic Inertial Measurement Unit.

High Temperature Composite Material expansion supports development and production effort for three dimensionally reinforced carbon/carbon SSNTs and further high temperature composite material in support of SSNT and future Navy reentry systems.

Funding for Next Generation Strategic Inertial Measurement Unit will research, develop and demonstrate radiation-hardened navigation technologies for reentry specific applications, strategic grade inertial instruments, software, electromechanical components and algorithms that exercise strategic skills and are applicable to the long-term viability of the nation's strategic grade guidance systems.

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

	FY 2019	FY 2020
Congressional Add: Model Based Systems Engineering FY 2019 Accomplishments: - Update Standards and Methods based upon FY18 Accomplishments - Improve Model Based Engineering (MBE) Infrastructure for data and model exchange in secure environment - Update Process with lessons learned from FY18 Accomplishments - Implement command MBE training for civilian and military staff FY 2020 Plans: N/A	14.480	0.000
Congressional Add: Autonomous Strategic Force Protection Sensor Network FY 2019 Accomplishments: Develop advanced sensor systems for counterterrorism and antiterrorism operations to meet rigorous performance metrics necessary for nuclear facility, material, and weapons protection. FY 2020 Plans: N/A	2.606	0.000
Congressional Add: High temperature composite material capacity expansion	0.000	12.000

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020
<p><i>FY 2019 Accomplishments:</i> N/A</p> <p><i>FY 2020 Plans:</i> -Investments into expansion of capabilities to produce three dimensionally reinforced carbon/ carbon SSNTs and further high temperature composite material in support of SSNT and future Navy reentry systems.</p> <ul style="list-style-type: none"> - Support key processes such as weaving, infusion and densification of the composite materials. - Support improved capabilities to modernize and optimize manufacturing to drive productivity, anticipated part size, and improved performance capabilities 		
<p><i>Congressional Add:</i> Next generation strategic inertial measurement unit</p> <p><i>FY 2019 Accomplishments:</i> N/A</p> <p><i>FY 2020 Plans:</i> -Conduct technical trade studies to deliver a navigation solution that optimizes the system for size, weight, and power while maintaining the flight test accuracy requirements</p> <ul style="list-style-type: none"> -Analyze, design, deliver, and test iterations of a small navigation grade IMU and other non-inertial navigation aids. -Conduct trade study/cost-benefit analysis to determine the best value hardware solution for processing and input/output hardware design. -Perform System and Component Engineering of Navigation and avionics systems -Conduct analysis, simulation and test of design options -Assess guidance options including improved/alternate correlation algorithms for reference generation and validation of selected sensors. 	0.000	6.000
Congressional Adds Subtotals	17.086	18.000

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

N/A

Remarks

D. Acquisition Strategy

Contracts will be awarded to those sources who were engaged in program and are currently engaged in the production and/or operational support on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302.-1, 3, 4

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

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>
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Proj 9999	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
Congressional Add: Model Based Systems Engineering																												
Congressional Add: Autonomous Strategic Force Protection Sensor Network																												
Congressional Add: High Temperature Composite Materials																												
Congressional Add: Next Generation Strategic Inertial Measurement Unit																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0101221N / <i>Strategic Sub & Wpns Sys Supt</i>	Project (Number/Name) 9999 / <i>Congressional Adds</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 9999				
Congressional Add: Model Based Systems Engineering: Model Based Systems Engineering	1	2019	4	2019
Congressional Add: Autonomous Strategic Force Protection Sensor Network: Autonomous Strategic Force Protection Sensor Network	1	2019	4	2019
Congressional Add: High Temperature Composite Materials: High Temperature Composite Materials	1	2020	4	2020
Congressional Add: Next Generation Strategic Inertial Measurement Unit: Next Generation Strategic Inertial Measurement Unit	1	2020	4	2020