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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 0204229N / <i>Tomahawk Mssn Planning Ctr</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	0.000	233.913	273.036	200.308	-	200.308	131.110	57.234	43.915	30.797	Continuing	Continuing
4032: <i>NAV/COMMS</i>	0.000	4.649	4.144	0.807	-	0.807	0.000	0.000	0.000	0.000	0.000	9.600
4033: <i>M-Code</i>	0.000	20.922	28.912	15.875	-	15.875	12.708	7.915	3.520	3.066	Continuing	Continuing
4034: <i>Maritime Strike</i>	0.000	169.486	192.854	125.237	-	125.237	72.043	9.644	0.000	0.000	0.000	569.264
4035: <i>JMEWS</i>	0.000	16.376	29.128	45.638	-	45.638	37.119	22.078	22.626	9.014	Continuing	Continuing
4036: <i>TTWCS TMPC PPPI</i>	0.000	22.480	17.998	12.751	-	12.751	9.240	17.597	17.769	18.717	Continuing	Continuing

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 289

A. Mission Description and Budget Item Justification

The Block V is a modernized TACTOM missile which includes the Navigation / Communications (NAV/COMMs) upgrade. NAV/COMMs is a title replacement for Anti-Access, Area Denial (A2AD). Funds support development of the Tomahawk Weapons System (TWS) encompassing Tactical Tomahawk upgrades including baseline improvements into the Block V missile All-Up Round (AUR), Tactical Tomahawk Weapons Controls System (TTWCS), Theater Mission Planning Center (TMPC) upgrades and other missile system improvements to maintain pace with threats. The TWS provides a long range cruise missile attack capability against fixed and mobile targets. Tomahawk is capable of being deployed from both submarines and surface ships and significantly increases the total capability of joint forces.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under Operational Systems Development because it includes development efforts to upgrade systems that have been fielded or have received approval for Full Rate Production (FRP) and anticipate funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	252.395	320.134	199.250	-	199.250
Current President's Budget	233.913	273.036	200.308	-	200.308
Total Adjustments	-18.482	-47.098	1.058	-	1.058
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-47.098			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-9.009	0.000			
• SBIR/STTR Transfer	-9.474	0.000			
• Program Adjustments	0.000	0.000	0.800	-	0.800

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>			
• Rate/Misc Adjustments	0.001	0.000	0.258	-	0.258
Change Summary Explanation					
Financial: The FY 2021 budget increased by \$1.058M to account for program and miscellaneous adjustments. Technical: Not applicable					
Schedule:					
PU 4032:					
NAV/COMMS Operational Test moved from 3Q FY2020 to 1Q FY2021 due to efforts required to comply with the provisions of section 1634 of the 2018 National Defense Authorization Act					
NAV/COMMS Modernization Blk IV (Block V) Fleet Release moved from 4Q FY2020 to 2Q FY2021					
NAV/COMMS Functional Ground Test moved from 3QFY2019 to 4QFY2019					
NAV/COMMS LRIP Kit Award Lot-2 moved from 1Q FY2020 to 2Q FY2020					
NAV/COMMS Production Deliveries moved from 1Q FY2020 through 4Q FY2024 to 1Q FY2020 through 4Q FY2025					
PU 4033:					
Previous enacted budgets have resulted in M-Code program elongation. For M-Code Increment I Milestone B (conducted 4Q2019), RDTE funds were re-phased enabling the M-Code program to be fully funded and executable.					
Milestone B moved from 3Q FY2019 to 4Q FY2019					
Milestone C moved from 1Q FY2023 to 2Q FY2023					
M-Code PDR moved from 2Q FY2020 to 3Q FY2020					
M-Code CDR moved from 4Q FY2020 to 2Q FY2021					
M-Code DT moved from 3Q FY2020 through 1Q FY2023 to 2Q FY2021 through 1Q FY2023					
M-Code OT moved from 2Q FY2023 through 4Q FY2024 to 3Q FY2023 through 4Q FY2025					
M-Code EMD Award Phase I removed					
M-Code EMD Award Phase II removed					
M-Code EMD Award added					
M-Code Lot-1 moved from 1Q FY2023 to 2Q FY2023					
M-Code Lot-2 moved from 1Q FY2024 to 2Q FY2024					
PU 4034:					

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<p>Previous enacted budgets, as well as efforts associated with complying with the provisions of section 1634 of the 2018 National Defense Authorization Act, have driven significant changes to the program schedule. In order to provide greater clarity, the program's schedule as depicted in the R-4 has been re-designed, making line item comparisons unfeasible.</p> <p>PU 4035:</p> <p>Previous enacted budgets have resulted in JMEWS program elongation. Re-planning due to enacted budgets moved JMEWS Milestone B to 2Q FY2020. RDTE funds were re-phased enabling JMEWS program to be fully funded and executable.</p> <p>Milestone B moved from 4Q FY2019 to 2Q FY2020 Milestone C moved from 1Q FY2024 to 4Q FY2024 JMEWS TTWCS SW Dev moved from 1Q FY2020 through 4Q FY2024 to 3Q FY2020 through 4Q FY2025 JMEWS Fuze Risk Reduction moved from 3Q FY2018 through 4Q FY2019 to 1Q FY2019 through 1Q FY2021 JMEWS Warhead, Fuze, Target Design Integration removed JMEWS PDR moved from 3Q FY2020 to 2Q FY2021 JMEWS CDR moved from 2Q FY2021 to 2Q FY2022 JMEWS DT moved from 2Q FY2021 through 4Q FY2023 to 2Q FY2023 through 2Q FY2024 JMEWS OT removed JMEWS EMD Contract Award moved from 4Q FY2019 to 2Q FY2020 JMEWS Long-Lead Energetics Award moved from 1Q FY2024 to 4Q FY2023</p> <p>PU 4036:</p> <p>Moved TMPC 6.0 IOC from 4Q FY2020 to 2Q FY2021 to align with NAV/COMMS IOC Extend the TMPC 6.0 PAT & DT/OT end date from 4Q FY2020 to 2Q FY2021 Moved TMPC 7.0 IOC from 4Q FY2022 to 4Q FY2023 to align with MST IOC Moved TMPC 7.0 SW Dev & Integration end date from 4Q FY2021 to 4Q FY2022 Moved TMPC 7.0 PAT & DT/OT end date from 4Q FY2022 to 4Q FY2023 Extend the TMPC 8.0 Requirements definition end date from 4Q FY2020 to 4Q FY2021. Extend the TMPC 8.0 Software Development & Integration end date from 1Q FY2024 to 4Q FY2024 TMPC 8.0 PAT & DT/OT moved from 2Q FY2024 through 4Q FY2024 to 1Q FY2025 through 4Q FY2025 Added TTWCS v5.6 IOC to 2Q FY2021 Added TTWCS v5.6.1 IOC to 4Q FY2023 Added TTWCS v5.7 IOC to 4Q FY2025</p>		

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Added TTWCS v5.7 SW Dev&Int to 1Q FY2022 through 3Q FY2024 Added TTWCS v5.7 Candidate Dev to 4Q FY2019 through 4Q FY2021		

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4032 / NAV/COMMS
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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
4032: NAV/COMMS	0.000	4.649	4.144	0.807	-	0.807	0.000	0.000	0.000	0.000	0.000	9.600
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 289

Note
PU 4032 title changed from Anti-Access, Area Denial (A2AD) to Navigation/Communications (NAV/COMMS).

A. Mission Description and Budget Item Justification

This project funds NAV/COMMS engineering change proposal (ECP) upgrades to the navigation and communication of the Tactical Tomahawk (TACTOM). TACTOM navigation modernization will enable launch via a fine alignment solution and navigation using TERCOM/DSMAC/Vertical Update Point in a GPS denied/degraded environment. TACTOM communications development replaces 5Khz DAMA with Advanced Communication Architecture (ACA) leveraging National Technical Means (NTM), replacing the Satellite Data Link Terminal (SDLT) with an Integrated Single Box Solution (ISBS) that combines Dual Transmit and Receive Capability in a single box, replacing existing UHF antenna and adding a second band antenna.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Navigation/Communications	4.649	4.144	0.807	0.000	0.807
Articles:	-	-	-	-	-
FY 2020 Plans: FY 2020 plans include the continuation of NAV/COMMS technical engineering support for the Integrated Single Box Solution (ISBS) radio developer and Advanced Communication Architecture (ACA) Network Service Provider, as well as test planning for Operational Flight Test (OFT) in support of NAV/COMMS Initial Operational Capability (IOC).					
FY 2021 Base Plans: FY 2021 plans include completion of the AUR Operational Test Readiness Review (OTRR) and Operational Flight Test (OFT) to achieve Initial Operational Capability (IOC) of the NAV/COMMS ECP.					
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
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4032 / NAV/COMMS

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Decrease from FY 2020 to FY 2021 due to completion of technical development and the transition of the program into testing and production.					
Accomplishments/Planned Programs Subtotals	4.649	4.144	0.807	0.000	0.807

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• WPN 2101: <i>Tomahawk</i>	98.570	386.157	277.694	-	277.694	5.033	5.023	5.058	5.363	199.574	14,342.375
• OPN 5253: <i>Tomahawk Support Equipment</i>	86.045	59.436	84.087	-	84.087	84.283	85.020	86.133	87.391	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.335	0.069	0.068	-	0.068	0.055	0.040	0.012	0.012	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	16.496	22.986	19.572	-	19.572	18.704	22.496	22.946	23.405	Continuing	Continuing
• WPN 2301: <i>Tomahawk Mods</i>	0.000	0.000	164.915	-	164.915	206.075	314.823	281.247	297.004	3,056.602	4,320.666

Remarks

Starting in FY 2021, funding for Tomahawk Modification programs has been realigned from WPN BLI 2101 to new WPN BLI 2301.

D. Acquisition Strategy

Tactical Tomahawk communications and navigation development is funded via the National Reconnaissance Office (NRO) and Raytheon Missile Systems to include the development of either multiple or multi-band antennas, for the integrated single box solution radio. These changes were incorporated during missile recertification which began in FY 2019.

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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 0204229N / Tomahawk Mssn Planning Ctr				4032 / NAV/COMMS								
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	
NAV/COMMS Improvements Prime Integrator	SS/CPFF	Raytheon : Tucson, AZ	0.000	1.773	Apr 2019	0.000		0.000		-		0.000	0.000	1.773	-	
Subtotal			0.000	1.773		0.000		0.000		-		0.000	0.000	1.773	N/A	
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
NAV/COMMS Development Support	WR	NAWC-AD : Pax River, MD	0.000	0.057	Jan 2019	0.222	Nov 2019	0.000		-		0.000	0.000	0.279	-	
NAV/COMMS Development Support	WR	NAWC-WD : China Lake, CA	0.000	0.909	Dec 2018	0.187	Dec 2019	0.000		-		0.000	0.000	1.096	-	
NAV/COMMS Development Support	WR	NUWC-NPT : Newport, RI	0.000	0.894	Feb 2019	1.010	Feb 2020	0.000		-		0.000	0.000	1.904	-	
NAV/COMMS Development Support	WR	NSWC-CR : Corona, CA	0.000	0.055	Feb 2019	0.100	Jan 2020	0.000		-		0.000	0.000	0.155	-	
NAV/COMMS Development Support	WR	NSWC-DD : Dahlgren, VA	0.000	0.702	Jan 2019	0.844	Feb 2020	0.000		-		0.000	0.000	1.546	-	
NAV/COMMS Development Support	WR	COTF : Norfolk, VA	0.000	0.084	May 2019	0.412	Nov 2019	0.000		-		0.000	0.000	0.496	-	
NAV/COMMS Development Support	SS/CPFF	Precise : Lexington Park, MD	0.000	0.175	May 2019	0.304	Mar 2020	0.000		-		0.000	0.000	0.479	-	
Subtotal			0.000	2.876		3.079		0.000		-		0.000	0.000	5.955	N/A	
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
NAV/COMMS Test & Evaluation	WR	NAWC-WD : China Lake, CA	0.000	0.000	Dec 2018	0.802	Mar 2020	0.761	Dec 2020	-		0.761	0.000	1.563	-	

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4032 / NAV/COMMS
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
NAV/COMMS Test & Evaluation	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.263	Jan 2020	0.000		-		0.000	0.000	0.263	-
NAV/COMMS Test & Evaluation	WR	COTF : Norfolk, VA	0.000	0.000		0.000		0.046	Dec 2020	-		0.046	0.000	0.046	-
Subtotal			0.000	0.000		1.065		0.807		-		0.807	0.000	1.872	N/A

Remarks
FY 2021 NAV/COMMS Test and Evaluation funding required for flight test and associated procedures leading to fleet release.

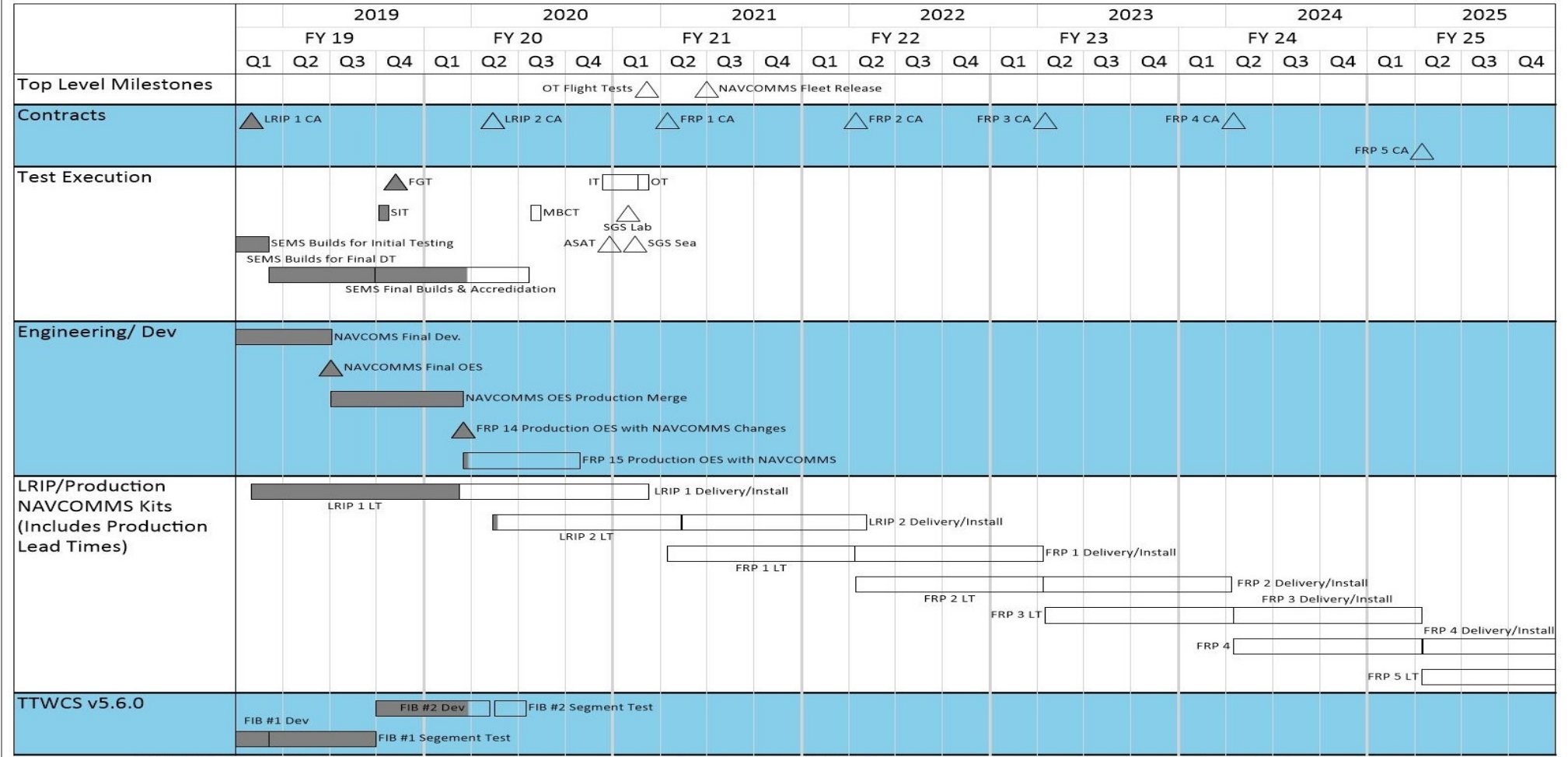
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	4.649	4.144	0.807	-	0.807	0.000	9.600	N/A

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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4032 / NAV/COMMS
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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4032 / NAV/COMMS

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
NAV/COMMS				
Acquisition Milestones: Milestones: NAV/COMMS Modernization Blk IV Fleet Release	2	2021	2	2021
Test and Evaluation: NAV/COMMS Functional Ground Test	4	2019	4	2019
Test and Evaluation: NAV/COMMS Operational Test	1	2021	1	2021
Production Milestones: Contract Awards: NAV/COMMS LRIP Kit Award Lot-1	1	2019	1	2019
Production Milestones: Contract Awards: NAV/COMMS LRIP Kit Award Lot-2	2	2020	2	2020
Production Milestones: Contract Awards: NAV/COMMS FRP Kit Award Lot-3	2	2021	2	2021
Production Milestones: Contract Awards: NAV/COMMS FRP Kit Award Lot-4	2	2022	2	2022
Production Milestones: Contract Awards: NAV/COMMS FRP Kit Award Lot-5	2	2023	2	2023
Production Milestones: Contract Awards: NAV/COMMS FRP Kit Award Lot-6	2	2024	2	2024
Production Milestones: Contract Awards: NAV/COMMS FRP Kit Award Lot-7	2	2025	2	2025
Deliverables: NAV/COMMS Production Deliveries	1	2020	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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4033 / M-Code
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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
4033: M-Code	0.000	20.922	28.912	15.875	-	15.875	12.708	7.915	3.520	3.066	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The M-Code ACAT IVT Increment I program upgrades the Tactical Tomahawk to the next generation Global Positioning System (GPS) satellite constellation required to maintain GPS-provided position, navigation, and timing (PNT) for the missiles and is estimated to be available for operations in FY 2024. The M-code mandate and Public Law restricts the purchase of only M-code-capable GPS User Equipment (MGUE) after FY 2017 unless a waiver is granted by the Secretary of Defense. Previous enacted budgets have resulted in M-Code program elongation. For M-Code Increment I Milestone B (conducted 4Q2019), RDTE funds were re-phased enabling the M-Code program to be fully funded and executable.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: M-Code	20.922	28.912	15.875	0.000	15.875
Articles:	-	-	-	-	-
FY 2020 Plans: M-Code planned activities include continuation of EMD efforts and completion of Preliminary Design Review (PDR). EMD efforts include hardware and software development, design, development, integration, and testing of the integrated ASIC chip in the upgraded Tactical Tomahawk (TACTOM) Anti-Jam Receiver (AGR5).					
FY 2021 Base Plans: M-Code planned activities include continuation of EMD efforts and completion of Critical Design Review (CDR). EMD efforts include hardware and software development, design, development, integration, and testing of the integrated ASIC chip in the upgraded Tactical Tomahawk (TACTOM) Anti-Jam GPS Receiver.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: Decrease of funding from FY 2020 to FY 2021 is due to the planned completion of Critical Design in 2Q FY 2021.					
Accomplishments/Planned Programs Subtotals	20.922	28.912	15.875	0.000	15.875

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

Line Item	FY 2019	FY 2020	FY 2021	FY 2021	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Cost To	
			Base	OCO	Total					Complete	Total Cost
• WPN 2101: <i>Tomahawk</i>	98.570	386.157	277.694	-	277.694	5.033	5.023	5.058	5.363	199.574	14,342.375
• OPN 5253: <i>Tomahawk Support Equipment</i>	86.045	59.436	84.087	-	84.087	84.283	85.020	86.133	87.391	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.335	0.069	0.068	-	0.068	0.055	0.040	0.012	0.012	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	16.496	22.986	19.572	-	19.572	18.704	22.496	22.946	23.405	Continuing	Continuing
• WPN 2301: <i>Tomahawk Mods</i>	0.000	0.000	164.915	-	164.915	206.075	314.823	281.247	297.004	3,056.602	4,320.666

Remarks

Starting in FY 2021, funding for Tomahawk Modification programs has been realigned from WPN BLI 2101 to new WPN BLI 2301.

D. Acquisition Strategy

The M-Code (ACAT IV) Increment I acquisition strategy includes the development, integration, test, qualification and production of a new GPS receiver which will satisfy Public Law 111-383, sec 913 compliance. M-Code capability enables the missile to maintain GPS integrity in an enhanced spoofing environment. M-Code Milestone B occurred in FY 2019, Milestone C is planned for FY 2023, and the capability will Fleet Release in FY 2025. The M-Code program includes upgrades to the All-Up Round (AUR) missile, Tactical Tomahawk Weapons Control System (TTWCS) v5.7, Submarine Combat & Control System (CCS), and also requires upgrade to the Theater Mission Planning Center (TMPC) program (under PU 4036).

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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 0204229N / Tomahawk Mssn Planning Ctr					Project (Number/Name) 4033 / M-Code				

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
M-Code-AUR	C/CPFF	Raytheon : Tuscon, AZ	0.000	6.190	Aug 2019	25.010	Mar 2020	13.548	Mar 2021	-		13.548	Continuing	Continuing	Continuing
M-Code - AUR	SS/FFP	Raytheon : Raytheon, AZ/SAS:	0.000	9.000	Feb 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
M-Code - TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.239	Jan 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
M-Code - TTWCS	SS/CPFF	LMBM : Baltimore, MD	0.000	0.371	Aug 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
M-Code - TTWCS	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.065	Aug 2019	0.000		0.000		-		0.000	0.000	0.065	-
M-Code - AUR	SS/CPFF	UARC APL : Laurel, MD	0.000	1.870	Feb 2019	1.121	Feb 2020	0.250	Nov 2020	-		0.250	0.000	3.241	-
Subtotal			0.000	17.735		26.131		13.798		-		13.798	Continuing	Continuing	N/A

Remarks
 FY 2021 M-Code product development funding required to continue the Engineering and Manufacturing Development phase while continuing design & certification of the Application Specific Integrated Circuit (ASIC) chip, as well as fabrication, integration, testing and evaluation (IT&E) of the ASIC chip into the upgraded Anti-jam GPS Receiver (AGR-5) and the beginning stages of IT&E of the AGR-5 into subsystem components and the AUR missile. Previous enacted budgets have resulted in M-Code program elongation. For M-Code Increment I Milestone B (conducted 4Q2019), RDTE funds were re-phased enabling the M-Code program to be fully funded and executable. FY20 JHU/ APL funding moved to Product Development as the effort funded is related to the upgrade of the NAVSIL for M-Code capability.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
M-Code Development Support	WR	NAWC-WD : China Lake, CA	0.000	0.146	Feb 2019	0.275	Jan 2020	0.200	Nov 2020	-		0.200	Continuing	Continuing	Continuing
M-Code Development Support	WR	NAWC-AD : Patuxent River, MD	0.000	0.409	Dec 2018	1.300	Dec 2019	1.277	Nov 2020	-		1.277	0.000	2.986	-
M-Code Development Support	WR	NUWC-NPT : Newport, RI	0.000	0.402	May 2019	0.317	Jan 2020	0.000		-		0.000	0.000	0.719	-
M-Code Development Support	WR	NSWC-IH : Indian Head, MD	0.000	0.644	Jun 2019	0.110	Apr 2020	0.250	Nov 2020	-		0.250	Continuing	Continuing	Continuing

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4033 / M-Code
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
M-Code/TTWCS Development Spt	WR	NSWC-DD : Dahlgren, VA	0.000	1.263	Dec 2018	0.127	Apr 2020	0.000		-		0.000	Continuing	Continuing	Continuing
M-Code Development Support	SS/CPFF	Various : Various	0.000	0.101	Dec 2018	0.000		0.000		-		0.000	0.000	0.101	-
Subtotal			0.000	2.965		2.129		1.727		-		1.727	Continuing	Continuing	N/A

Remarks
FY 20 funding to NUWC-NPT supports Combat & Control System (CCS) and TTWCS.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
M-Code Test & Evaluation	WR	NAWC-AD : Patuxent River	0.000	0.000		0.135	Feb 2020	0.100	Nov 2020	-		0.100	Continuing	Continuing	Continuing
M-Code/TTWCS Test & Evaluation	WR	NUWC-NPT : Newport, RI	0.000	0.000		0.290	Feb 2020	0.000		-		0.000	0.000	0.290	-
Subtotal			0.000	0.000		0.425		0.100		-		0.100	Continuing	Continuing	N/A

Remarks
FY 2021 M-Code Test and Evaluation will encompass modeling and simulation of the AGR-5 in navigation simulators designed to simulate real-world M-Code, Y-Code, and jamming environments. Test vectors will be designed, developed, and finalized to guide the M&S testing events

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
M-Code	WR	NAWC-AD : Patuxent River	0.000	0.222	Sep 2019	0.227	Mar 2020	0.250	Nov 2020	-		0.250	Continuing	Continuing	Continuing
Subtotal			0.000	0.222		0.227		0.250		-		0.250	Continuing	Continuing	N/A

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4033 / <i>M-Code</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
M-CODE				
Acquisition Milestones: Milestones: Milestone B	4	2019	4	2019
Acquisition Milestones: Milestones: Milestone C	2	2023	2	2023
Systems Development: Contract Award: M-Code EMD Award	4	2019	4	2019
Systems Development: Critical Design Reviews: M-Code PDR	3	2020	3	2020
Systems Development: Critical Design Reviews: M-Code CDR	2	2021	2	2021
Systems Development: Test and Evaluation: M-Code Operational Test	3	2023	4	2025
Systems Development: Test and Evaluation: M-Code Inc I Fleet Release	4	2025	4	2025
Production Milestones: Contract Awards: M-Code Lot-1	2	2023	2	2023
Production Milestones: Contract Awards: M-Code Lot-2	2	2024	2	2024
Production Milestones: Contract Awards: M-Code Lot-3	2	2025	2	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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4034 / Maritime Strike
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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
4034: <i>Maritime Strike</i>	0.000	169.486	192.854	125.237	-	125.237	72.043	9.644	0.000	0.000	0.000	569.264
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Maritime Strike Tomahawk modernization effort provides the capability to hit moving maritime targets through mid-course guidance via a third party or seeker mode, to a terminal seeker area of uncertainty.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Maritime Strike Tomahawk	169.486	192.854	125.237	0.000	125.237
Articles:	18	-	-	-	-
FY 2020 Plans:					
Continuation of activities in support of Maritime Strike Tomahawk (MST). Effort includes integration of seeker suites and mature software algorithm code. Software functionality qualification; establish validation and verification procedures through data collection. Missile Operationally Embedded Software (OES) development continues, laboratory development of Modeling and Simulation capabilities in the lab for missile performance and algorithm maturity; simulation updates. Develop interfaces through NAVWAR to support data quality infrastructure.					
Build-up of Engineering Development Models for test and design verification test parameters. Early developmental captive flight tests and simulations to refine software algorithm performance. Establish Hardware-in-the-Loop (HWIL) capability and associated test and support equipment. Technical Data package for seeker production units will complete in 3Q FY2020 at Knowledge Point 3 which supports procurement in FY21. Refine Modeling and Simulation capability through software performance enhancements. Continue TTWCS and missile software development. Continue development of logistics, training, and installation products. Develop transition to production requirements, telemeter products, develop kitting requirements and container requirements. Develop procedures for induction to recertification line, acceptance test procedures, and automated test equipment.					
FY 2021 Base Plans:					
Continuation of activities in support of Maritime Strike Tomahawk (MST). Effort includes maturation of software algorithm code, software functionality qualification, establish validation and verification procedures through data collection. Missile OES system test software buildup, Modeling and Simulation capabilities in the lab for missile					

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4034 / <i>Maritime Strike</i>

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
performance and algorithm maturity, requirement for hardware qualification, and software buildup. System of System Test Environment development, updates, and analyses, simulations to refine software algorithm performance. Complete TTWCS initial software build. Continue development of logistics, training, and installation products. Continue development of Vertical Launch System (VLS). Upgrade VLS simulation programs for use during multiple certification efforts at multiple labs and on board ship. Refine procedures for induction into recertification line, acceptance test procedures, and automated test equipment. Refine and test interfaces through NAVWAR to support data quality infrastructure. Continue transition to production requirements, telemeter products, develop kitting requirements and containers. Continue development of procedures for induction into recertification line, acceptance test procedures, and automated test equipment. Continue end to end system testing.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY2020 to FY2021 decrease of \$67.617 is based on the completion of a critical design review for the Maritime Seeker Hardware Design (as formalized at Knowledge Point 2), AUR Seeker Integration and creation of Maritime Lab facilities to conduct IT&E efforts in FY2020 and Maritime TTWCS and TMPC software development.					
Accomplishments/Planned Programs Subtotals	169.486	192.854	125.237	0.000	125.237

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• WPN 2101: <i>Tomahawk</i>	98.570	386.157	277.694	-	277.694	5.033	5.023	5.058	5.363	199.574	14,621.951
• OPN 5253: <i>Tomahawk Support Equipment</i>	86.045	78.593	85.083	-	85.083	84.111	84.526	86.202	87.524	Continuing	Continuing
• OPN 9120: <i>Initial and Vendor Direct Spares</i>	0.335	0.069	0.068	-	0.068	0.055	0.040	0.012	0.012	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	18.446	23.799	19.574	-	19.574	18.706	22.498	22.948	23.407	Continuing	Continuing
• WPN 2301: <i>Tomahawk Mods</i>	0.000	0.000	164.915	-	164.915	206.075	314.823	281.247	297.004	3,056.602	4,320.666

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4034 / <i>Maritime Strike</i>

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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Remarks

Starting in FY 2021, funding for Tomahawk Modification programs has been realigned from WPN BLI 2101 to new WPN BLI 2301.

D. Acquisition Strategy

Maritime Strike Tomahawk (MST) will enable surface warfare engagement capability from U.S. Navy Guided Missile Cruiser (CG), Guided Missile Destroyer (DDG), and Nuclear Powered Fast Attack Submarine (SSN) platforms. The MST program includes upgrades to the All-Up Round (AUR) missile, the Tactical Tomahawk Weapons Control System (TTWCS) and also required upgrades to the Theater Mission Planning Center (TMPC) programs (under PU 4036). MST was designated a DoDI 5000.02 Rapid Deployment Capability (RDC) by the Assistant Secretary of the Navy (Research, Development, and Acquisition) (ASN (RDA)) in Oct 2016. Milestone decision authority ensures program accountability through knowledge points which inform progress on critical design, production readiness, system test readiness, flight readiness, operational test readiness and fielding decision. To facilitate rapid fleet fielding, hardware design was phased to the beginning of the program. Technical Data package for seeker production units will complete in 3Q FY2020 at Knowledge Point 3 which supports procurement in FY21. Seeker software development will continue with initial Engineering Design Models (EDMs). Initial Operational Capability (IOC) will occur in FY 2023 following a Quick Reaction Assessment (QRA) and characterization of operational performance. This strategy affords the program flexibility in achieving a threshold capability in a timely manner. Following IOC, further procurements will comply with DoDI 5000.02 as a program of record.

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4034 / Maritime Strike
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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			
Maritime Strike - AUR	SS/CPPIF	Raytheon : Tucson, AZ	0.000	123.344	Nov 2018	151.462	Dec 2019	96.463	Dec 2020	-		96.463	74.909	446.178	-
Maritime Strike - AUR	WR	NAWCWD : China Lake, CA	0.000	17.252	Dec 2018	8.495	Nov 2019	7.035	Nov 2020	-		7.035	0.000	32.782	-
Maritime Strike- TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	3.771	Mar 2019	1.700	Dec 2019	3.000	Dec 2020	-		3.000	0.000	8.471	-
Maritime Strike- TTWCS	WR	NSWC-DD : Dahlgren, VA	0.000	0.671	Dec 2018	6.796	Nov 2019	2.000	Nov 2020	-		2.000	0.000	9.467	-
Maritime Strike- TTWCS	WR	NUWC-DN : Newport, RI	0.000	1.003	Jan 2019	1.699	Nov 2019	1.000	Nov 2020	-		1.000	0.000	3.702	-
Maritime Strike - AUR	MIPR	NRO : Chantilly, VA	0.000	2.048	Jun 2019	2.490	Dec 2019	0.000		-		0.000	0.000	4.538	-
Subtotal			0.000	148.089		172.642		109.498		-		109.498	74.909	505.138	N/A

Remarks
 FY 2021 Maritime Strike funding includes the maturation of software algorithm code. FY 2021 funding supports system test software buildup, completion of qualification, QRA software buildup, system of systems test environment development, updates, and analyses. TTWCS initial build complete, MST training development, and TMPC initial Product Acceptance Test and Fix-it Build #1 complete. Refine procedures for induction to recertification line, acceptance test procedures, and automated test equipment.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Maritime Strike Development Support	WR	NAWC-WD : China Lake	0.000	2.129	Dec 2018	2.964	Nov 2019	0.000		-		0.000	0.000	5.093	-
Martime Strike Development Support	SS/CPFF	UARC APL : Laurel, MD	0.000	0.217	Mar 2019	0.452	Dec 2019	0.000		-		0.000	0.000	0.669	-
Maritime Strike Development Support	WR	NSWC-DD : Dahlgren, VA	0.000	5.708	Dec 2018	1.740	Nov 2019	1.000	Nov 2020	-		1.000	1.000	9.448	-
Maritime Strike Development Support	WR	NAWC-AD : Pax River, MD	0.000	1.239	Nov 2018	1.530	Nov 2019	0.000		-		0.000	0.000	2.769	-
Maritime Strike Development Support	WR	NUWC-NPT : Newport, RI	0.000	0.163	Nov 2018	0.000		0.500	Nov 2020	-		0.500	0.000	0.663	-

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4034 / Maritime Strike
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Maritime Strike Development Support	WR	NSWC-PHD : Port Hueneme, CA	0.000	1.243	Dec 2018	1.350	Nov 2019	0.000		-		0.000	0.000	2.593	-
Maritime Strike Development Support	C/CPFF	SSC : San Diego, CA	0.000	3.392	Dec 2018	0.639	Dec 2019	0.000		-		0.000	0.000	4.031	-
Maritime Strike Development Support	WR	NAVWAR : San Diego, CA	0.000	2.980	Jan 2019	2.490	Dec 2019	2.239	Nov 2020	-		2.239	0.000	7.709	-
Maritime Strike Development Support	C/CPFF	NUWC-DN : Newport, RI	0.000	0.383	Mar 2019	0.327	Dec 2019	0.000		-		0.000	0.000	0.710	-
Maritime Strike Development Support	SS/CPFF	Precise : Pax River, MD	0.000	1.105	Dec 2018	1.424	Nov 2019	0.000		-		0.000	0.000	2.529	-
Maritime Strike Development Support	MIPR	US Army : Redstone Arsenal, AL	0.000	1.102	Dec 2018	0.767	Nov 2019	0.000		-		0.000	0.000	1.869	-
Subtotal			0.000	19.661		13.683		3.739		-		3.739	1.000	38.083	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Maritime Strike Test and Evaluation	WR	NAWC-WD : China Lake	0.000	1.092	Dec 2018	5.029	Nov 2019	6.000	Nov 2020	-		6.000	6.000	18.121	-
Maritime Strike Test and Evaluation	WR	NAWC-AD : Pax River	0.000	0.000	Nov 2018	1.000	Nov 2019	1.500	Dec 2020	-		1.500	0.000	2.500	-
Maritime Strike Test and Evaluation	WR	NSWC-DD : Dahlgren, VA	0.000	0.000	Dec 2018	0.500	Nov 2019	4.500	Nov 2020	-		4.500	0.000	5.000	-
Maritime Strike Test and Evaluation	WR	NSWC-PHD : Port Hueneme, CA	0.000	0.644	Dec 2018	0.000		0.000		-		0.000	0.000	0.644	-
Subtotal			0.000	1.736		6.529		12.000		-		12.000	6.000	26.265	N/A

Remarks
 FY 2021 Test and Evaluation Maritime Strike funding required to support Operationally Embedded Software (OES) development, system test software buildup, QRA software buildup. System of System Test Environment development, updates, and analyses, simulations to refine software algorithm performance. TTWCS initial build complete and missile software development/testing, hardware qualification of the seeker suite.

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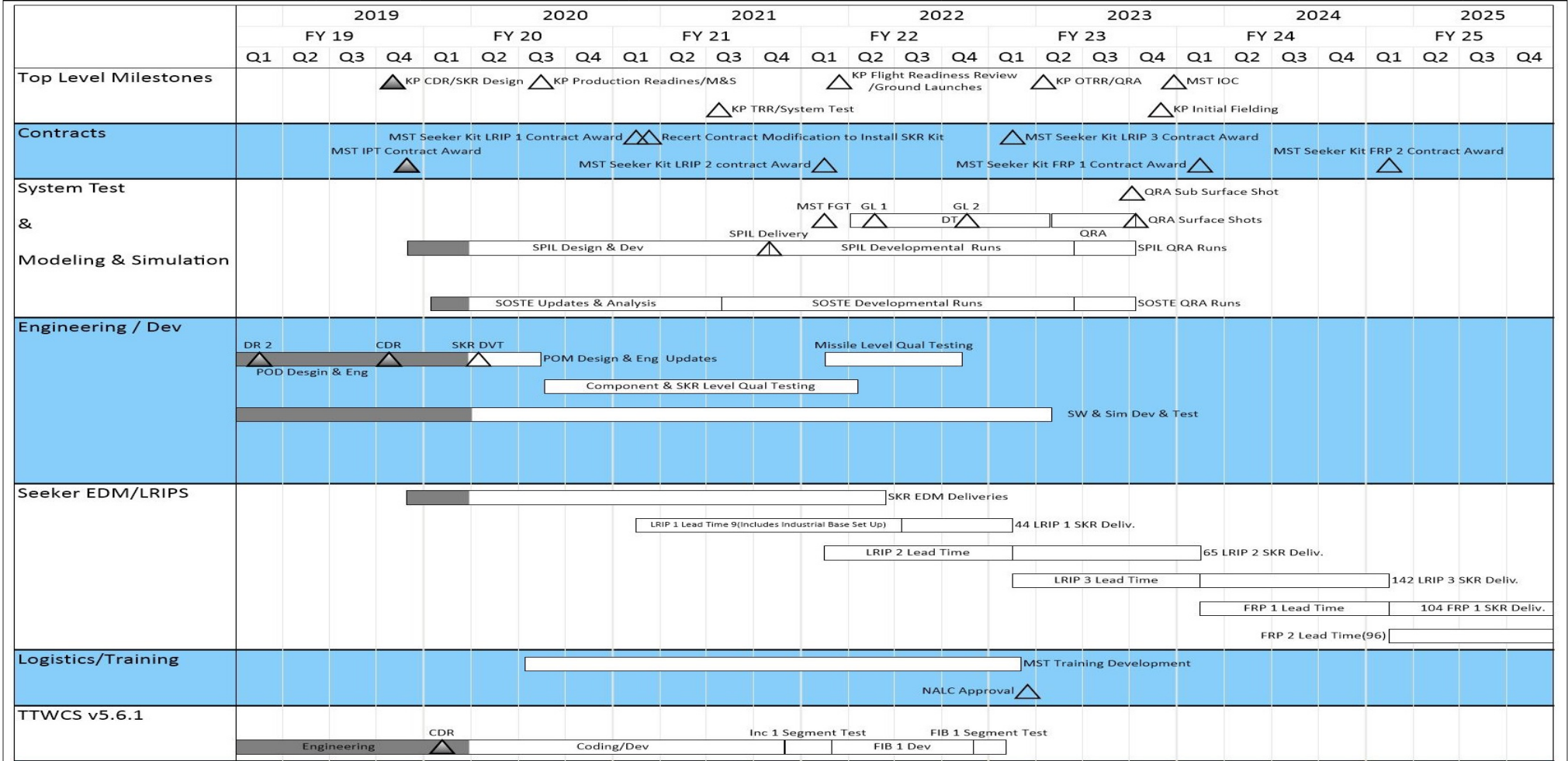
Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy								Date: February 2020					
Appropriation/Budget Activity 1319 / 7				R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4034 / <i>Maritime Strike</i>					
	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	169.486		192.854		125.237		-		125.237	81.909	569.486	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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4034 / Maritime Strike
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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4034 / <i>Maritime Strike</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 4034				
Acquisition Milestones: Top Level Milestones: KP Critical Design Review	4	2019	4	2019
Acquisition Milestones: Top Level Milestones: KP Production Readiness Review	3	2020	3	2020
Acquisition Milestones: Top Level Milestones: KP Flight Readiness Review	1	2022	1	2022
Acquisition Milestones: Top Level Milestones: KP Test Readiness Review	3	2021	3	2021
Acquisition Milestones: Top Level Milestones: KP Operational Test Readiness Review	2	2023	2	2023
Acquisition Milestones: Top Level Milestones: MST IOC	4	2023	4	2023
Acquisition Milestones: Top Level Milestones: KP7 Initial Fielding	4	2023	4	2023
Contracts: Contract Awards: MST IPT Contract Award	4	2019	4	2019
Contracts: Contract Awards: MST Seeker Kit LRIP 1 Contract Award	1	2021	1	2021
Contracts: Contract Awards: Recert Contract Modification to Install SKR Kit	1	2021	1	2021
Contracts: Contract Awards: MST Seeker Kit LRIP 2 Contract Award	1	2022	1	2022
Contracts: Contract Awards: MST Seeker Kit LRIP 3 Contract Award	1	2023	1	2023
Contracts: Contract Awards: MST Seeker Kit FRP 1 Contract Award	1	2024	1	2024
Contracts: Contract Awards: MST Seeker Kit FRP 2 Contract Award	1	2025	1	2025
System Test & Modeling & Simulation: SPIL Design & Dev	4	2019	4	2021
System Test & Modeling & Simulation: SPIL Delivery	4	2021	4	2021
System Test & Modeling & Simulation: SPIL Development Runs	4	2021	2	2023
System Test & Modeling & Simulation: SPIL QRA Runs	2	2023	4	2023
System Test & Modeling & Simulation: SoSTE Update & Analysis	1	2020	3	2021
System Test & Modeling & Simulation: SoSTE Development Runs	3	2021	2	2023
System Test & Modeling & Simulation: SoSTE QRA Runs	2	2023	4	2023

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4034 / Maritime Strike
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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
System Test & Modeling & Simulation: MST FGT	1	2022	1	2022
System Test & Modeling & Simulation: GL 1	2	2022	2	2022
System Test & Modeling & Simulation: GL 2	4	2022	4	2022
System Test & Modeling & Simulation: DT	2	2022	2	2023
System Test & Modeling & Simulation: QRA	2	2023	4	2024
System Test & Modeling & Simulation: QRA Sub Surface Shot	4	2023	4	2023
System Test & Modeling & Simulation: QRA Surface Shot	4	2023	4	2023
Reviews: Engineering/Dev: POM Design & Eng Updates	1	2019	3	2020
Reviews: Engineering/Dev: POD Design & Eng	1	2019	4	2019
Reviews: Engineering/Dev: DR 2	1	2019	1	2019
Reviews: Engineering/Dev: CDR	4	2019	4	2019
Reviews: Engineering/Dev: SKR DVT	2	2020	2	2020
Reviews: Engineering/Dev: Component & SKR Level Qual Testing	3	2020	2	2022
Reviews: Engineering/Dev: Missile Level Qual Testing	1	2022	4	2022
Reviews: Engineering/Dev: SW & Sim Dev & Test	1	2019	2	2023
Reviews: TTWCS v5.6.1: Engineering	1	2019	1	2020
Reviews: TTWCS v5.6.1: CDR	1	2020	1	2020
Reviews: TTWCS v5.6.1: Coding/Dev	1	2020	4	2021
Reviews: TTWCS v5.6.1: Inc 1 Segment Test	4	2021	1	2022
Reviews: TTWCS v5.6.1: FIB 1 Dev	1	2022	4	2022
Reviews: TTWCS v5.6.1: FIB 1 Segment Test	4	2022	1	2023
Seeker EDM/LRIPS: SKR EDM Deliveries	4	2019	2	2022
Seeker EDM/LRIPS: LRIP 1 Lead Time 9Industrial Base Set Up	1	2021	3	2022
Seeker EDM/LRIPS: 44 LRIP 1 SKR Deliveries	3	2022	1	2023
Seeker EDM/LRIPS: LRIP 2 Lead Time	1	2022	1	2023

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4034 / <i>Maritime Strike</i>
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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Seeker EDM/LRIPS: 65 LRIP 2 SKR Del	1	2023	1	2024
Seeker EDM/LRIPS: LRIP 3 Lead Time	1	2023	1	2024
Seeker EDM/LRIPS: 142 LRIP 3 SKR Del	1	2024	1	2025
Seeker EDM/LRIPS: FRP 1 Lead Time	1	2024	1	2025
Seeker EDM/LRIPS: 104 FRP 1 SKR Del	1	2025	4	2025
Seeker EDM/LRIPS: FRP 2 Lead Time 96	1	2025	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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4035 / JMEWS
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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
4035: JMEWS	0.000	16.376	29.128	45.638	-	45.638	37.119	22.078	22.626	9.014	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Joint Multiple-Effects Warhead System (JMEWS) ACAT III program enables the Tactical Tomahawk to utilize multiple lethal effects to address Hard and Deeply Buried Targets (HDBT) while increasing the Tomahawk Weapon System (TWS) capabilities against Integrated Air Defense Systems (IADS) and Weapons of Mass Destruction (WMD). Previous enacted budgets have resulted in JMEWS program elongation. Re-planning due to enacted budgets moved JMEWS Milestone B to 2Q FY2020. RDTE funds were re-phased enabling JMEWS program to be fully funded and executable.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: JMEWS	16.376	29.128	45.638	0.000	45.638
Articles:	-	-	-	-	-
FY 2020 Plans: JMEWS planned activities include completing Milestone B to begin the JMEWS Engineering and Manufacturing Development (EMD) phase. Initial EMD efforts include hardware and software development, performing fuze and warhead integration, performing subscale testing required to improve lethality modeling capabilities, systems engineering reviews and Safety Review Boards.					
FY 2021 Base Plans: JMEWS planned activities include the continuation of the EMD phase and completion of Preliminary Design Review (PDR). EMD efforts continue with hardware and software development, Target construction, Insensitive Munitions and Hazard Classification Testing, Arena Testing, fuze and warhead integration, systems engineering reviews, and Safety Review Boards.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2020 to FY 2021 increase is because the program will be ramping up for Preliminary Design Review and execution of Critical Design.					
Accomplishments/Planned Programs Subtotals	16.376	29.128	45.638	0.000	45.638

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4035 / <i>JMEWS</i>
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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 2101: <i>Tomahawk</i>	98.570	386.157	277.964	-	277.964	5.033	5.023	5.058	5.363	199.574	14,342.645
• OPN 5253: <i>Tomahawk Support Equipment</i>	86.045	59.436	84.087	-	84.087	84.283	85.020	86.133	87.391	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.335	0.069	0.068	-	0.068	0.055	0.040	0.012	0.012	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	16.496	22.986	19.572	-	19.572	18.704	22.496	22.946	23.405	Continuing	Continuing
• WPN 2301: <i>Tomahawk Mods</i>	0.000	0.000	164.915	-	164.915	206.075	314.823	281.247	297.004	3,056.602	4,320.666

Remarks
Starting in FY 2021, funding for Tomahawk Modification programs has been realigned from WPN BLI 2101 to new WPN BLI 2301.

D. Acquisition Strategy

Joint Multiple Effects Warhead System (JMEWS) (ACAT III) acquisition strategy includes the development, integration, test, qualification and production of a new warhead that will greatly expand the land target set that the Tomahawk missile is capable of defeating by combining the blast and fragmentation capabilities of the current warhead with a new penetration capability and improved mission planning. JMEWS will also be compliant with Insensitive Munitions requirements which improves safety during transportation and storage on land and aboard ships and submarines. JMEWS Milestone B will occur in FY 2020, Milestone C is planned for FY 2024, and the capability will Fleet Release in FY 2027. JMEWS program includes upgrades to the All-Up Round (AUR) missile, the Tactical Tomahawk Weapons Control System (TTWCS) and also required upgrades Theater Mission Planning Center (TMPC) program (under PU 4036). Previous enacted budgets have resulted in JMEWS program elongation. RDTE funds were re-phased enabling JMEWS program to be fully funded and executable.

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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 0204229N / Tomahawk Mssn Planning Ctr					Project (Number/Name) 4035 / JMEWS				

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
JMEWS	SS/CPPIF	Raytheon : Tucson, AZ	0.000	1.162	Feb 2020	14.897	Jul 2020	26.280	Jul 2021	-		26.280	Continuing	Continuing	Continuing
JMEWS	WR	NAWC-WD : China Lake, CA	0.000	8.844	Dec 2018	0.000		6.700	Dec 2020	-		6.700	Continuing	Continuing	Continuing
JMEWS/TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.026	Feb 2019	0.600	Mar 2020	0.000		-		0.000	0.000	0.626	-
Subtotal			0.000	10.032		15.497		32.980		-		32.980	Continuing	Continuing	N/A

Remarks

FY 2021 increase in JMEWS product development efforts funds hardware and software design development, performing fuze and warhead integration, Insensitive Munitions/ Hazard Classification and Arena Testing, system engineering reviews and several Safety Review Boards.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
JMEWS Development Support	SS/CPFF	UARC-APL : Laurel, MD	0.000	0.105	Apr 2019	0.075	Dec 2019	0.100	Dec 2020	-		0.100	Continuing	Continuing	Continuing
JMEWS Development Support	WR	NSWC-IH : Indian Head, MD	0.000	0.091	Feb 2019	0.864	Dec 2019	0.900	Nov 2020	-		0.900	Continuing	Continuing	Continuing
JMEWS Development Support	WR	NSWC-DD : Dahlgren, VA	0.000	0.360	Mar 2019	0.850	Jan 2020	1.458	Nov 2020	-		1.458	Continuing	Continuing	Continuing
JMEWS Development Support	WR	NAWC-AD : Patuxent River, MD	0.000	0.570	Dec 2018	0.577	Dec 2019	0.588	Nov 2020	-		0.588	0.000	1.735	-
JMEWS Development Support	WR	NAWC-WD : China Lake, CA	0.000	0.197	Dec 2018	5.217	Nov 2019	0.500	Nov 2020	-		0.500	0.000	5.914	-
JMEWS/TTWCS VLS Dev Support	SS/CPFF	NSWC-DD : Dahlgren, VA	0.000	0.130	Mar 2019	0.290	Dec 2019	0.200	Dec 2020	-		0.200	0.000	0.620	-
JMEWS Development Support	SS/CPFF	Precise Systems : Lexington Park, MD	0.000	0.161	Dec 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			0.000	1.614		7.873		3.746		-		3.746	Continuing	Continuing	N/A

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4035 / JMEWS
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			

Remarks
FY 2021 JMEWS Development Support funds government oversight efforts of the transition to the Engineering and Manufacturing Development phase, including conduct of scheduled technical reviews.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JMEWS T&E	WR	NAWC-WD : China Lake, CA	0.000	4.730	Dec 2018	3.664	Dec 2019	7.800	Nov 2020	-		7.800	0.000	16.194	-
JMEWS T&E	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.689	Mar 2020	0.700	Nov 2020	-		0.700	0.000	1.389	-
JMEWS/TTWCS T&E	WR	NUWC-NPT : Newport, RI	0.000	0.000		0.900	Mar 2020	0.000		-		0.000	0.000	0.900	-
Subtotal			0.000	4.730		5.253		8.500		-		8.500	0.000	18.483	N/A

Remarks
The NAWC-WD increase from FY2020 to FY2021 is due to in-sourcing funds associated with Warhead and Fuze test and qualification efforts, procurement of EMD energetics, and Target Design Integration efforts.

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JMEWS	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.505	Mar 2020	0.412	Nov 2020	-		0.412	0.000	0.917	-
Subtotal			0.000	0.000		0.505		0.412		-		0.412	0.000	0.917	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			0.000	16.376	29.128	45.638	-	45.638	Continuing	Continuing	N/A

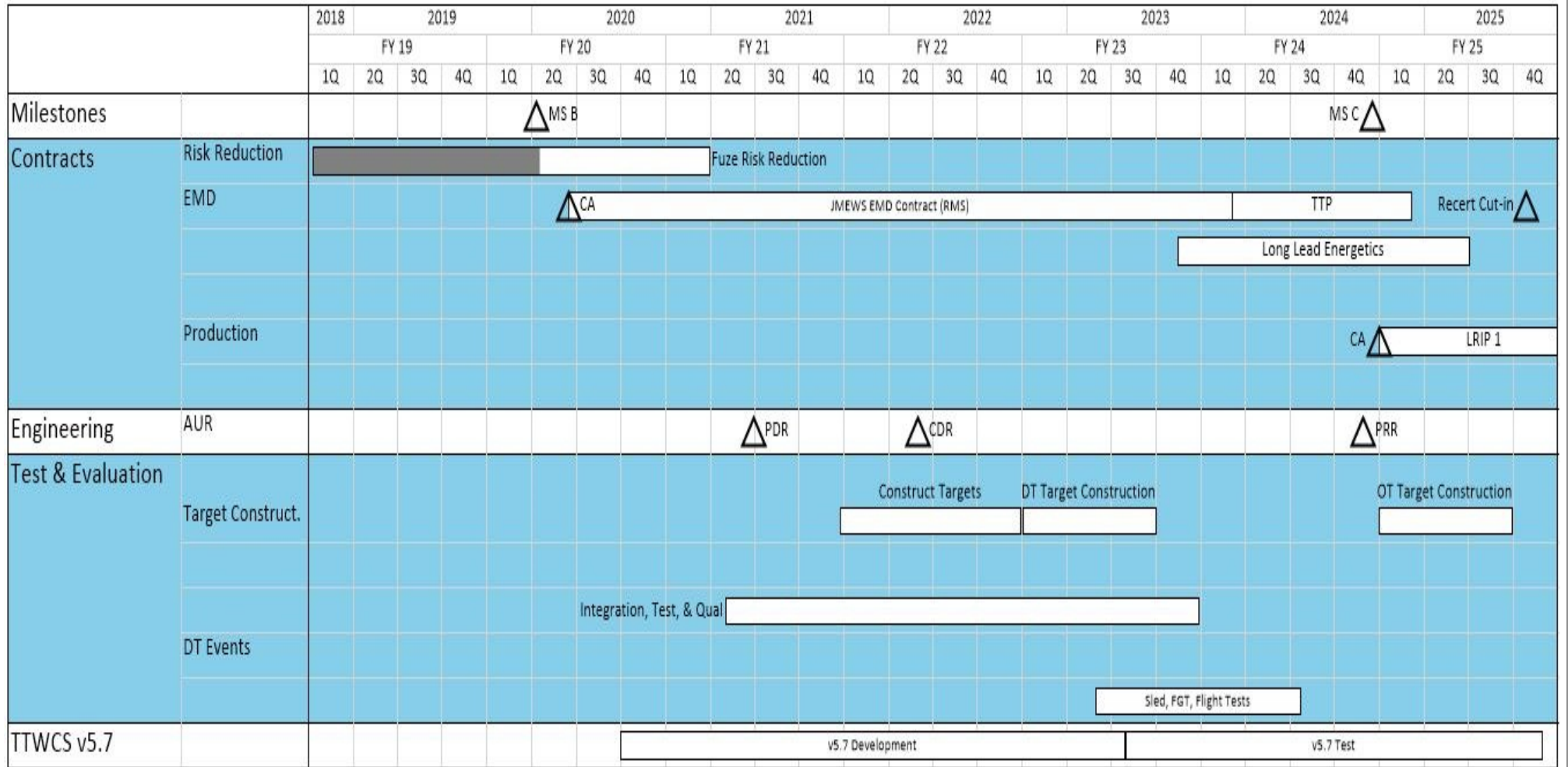
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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy							Date: February 2020			
Appropriation/Budget Activity 1319 / 7			R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>			Project (Number/Name) 4035 / <i>JMEWS</i>				
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	

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 0204229N / Tomahawk Mssn Planning Ctr					Project (Number/Name) 4035 / JMEWS				



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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4035 / JMEWS

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
JMEWS				
Acquisition Milestones: Milestones: Milestone B	2	2020	2	2020
Acquisition Milestones: Milestones: Milestone C	4	2024	4	2024
Systems Development: Software Development: JMEWS TTWCS SW Dev	3	2020	4	2025
Systems Development: Hardware Development: JMEWS FUZE RISK REDUCTION	1	2019	1	2021
Reviews: Acquisition Reviews: JMEWS PDR	2	2021	2	2021
Reviews: Acquisition Reviews: JMEWS CDR	2	2022	2	2022
Test and Evaluation: JMEWS DT	2	2023	2	2024
Production Milestones: Contract Awards: JMEWS EMD Contract Award	2	2020	2	2020
Production Milestones: Contract Awards: JMEWS Long-Lead Energetics Award	4	2023	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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4036 / <i>TTWCS TMPC PPPI</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
4036: <i>TTWCS TMPC PPPI</i>	0.000	22.480	17.998	12.751	-	12.751	9.240	17.597	17.769	18.717	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Theater Mission Planning Center (TMPC) consists of Commercial and Government Off-The-Shelf (COTS/GOTS) software and COTS hardware. TMPC is the mission planning segment of the Tomahawk Weapon System (TWS) that provides subsystems for the precision targeting, route planning, mission distribution, and strike management of Tomahawk cruise missile missions from sites located ashore and afloat. TMPC optimizes all aspects of the Tomahawk missile mission to successfully engage a target.

TMPC provides mission planning at the theater and operational levels and is designed for high rate mission planning production responsive to national strategic, operational, and tactical requirements. TMPC develops and distributes missions; provides command information services for all variants of the Tomahawk missile; provides strike planning, execution, coordination, control and reporting, and provides Maritime Component Commanders (MCC) the capability to plan or modify conventional TWS missions. TMPC is employed in major joint combat operations and Overseas Contingency Operations. TMPC has evolved into 4 scalable configurations deployed at 189 sites: Cruise Missile Support Activities (CMSAs) (3), Tomahawk Strike Mission Planning Cells (TSMPCs) (3), Carrier Strike Groups (CSGs) (19 - 10 CVN), and Firing Units (FRUs) (145 - 88 Surface / 57 Subsurface). Additionally, TMPC is installed in Labs (6) and Training Classrooms (13) that contain various combinations of the four configurations. TMPC software development activities support new capabilities for the Tomahawk Weapon System while also decreasing mission planning time, increasing the quality and accuracy of each mission and reducing complexity. TMPC was previously referred to as Tomahawk Command and Control System (TC2S).

The Tactical Tomahawk Weapons Control System (TTWCS) provides launch capability for surface and submarine platforms. Development of the TTWCS provides a common architecture to launch the TACTOM and all variants in inventory. Development of upgrades to the TTWCS is required to meet the Department of Defense Information Technology Standards Registry, to meet FORCEnet compliance and be Internet Protocol Version 6 ready in order to remain interoperable within the Joint Service Architecture and to retain weapons system viability and usability for our Sailors. Additionally, TTWCS provides launch capability for both types of modernization efforts, Navigation/Communications and Maritime, through an incremental approach to software and hardware upgrades. These efforts provide battle-group tactical flexibility and responsiveness while maximizing TWS wartime capability.

Pre-Planned Product Improvement (P3I) funding is required to create an integrated future strategy across the Tomahawk Weapon System. This includes identifying potential capability upgrades, advanced technologies, and new requirements resulting from target and lethality assessments, engine performance analysis, data-fusion studies, campaign planning, mission analysis, fleet experimentation and kill chain analysis. Perform nonrecurring engineering activities, systems and software development, integration and testing of capability upgrades to address emergent threats, Urgent Operational Needs (UONS), fleet gaps, and the Tomahawk Operational Readiness Document (ORD).

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4036 / <i>TTWCS TMPC PPPI</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>Title: Theater Mission Planning Center (TMPC)</p> <p align="right">Articles:</p> <p>FY 2020 Plans: Continue evaluation of TMPC design process to ensure Tomahawk missile performance characteristics are adequately modeled in TMPC. Continue navigation and communications system testing at the TWS level required to support the TWS Modernization program. Continue coding of Maritime Strike Tomahawk capability. Continue requirements definition and preliminary design to support TWS Joint Multiple Effects Warhead System (JMEWS) transition, demonstration and test efforts.</p> <p>FY 2021 Base Plans: Continue evaluation of TMPC design process to ensure Tomahawk missile performance characteristics are adequately modeled in TMPC. Complete navigation and communications system testing at the TWS level required to support the TWS Modernization program. Continue coding of Maritime Strike Tomahawk capability. Complete requirements definition to support TWS Joint Multiple Effects Warhead System (JMEWS) transition, demonstration and test efforts.</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Decrease in funds in FY 2021 from FY 2020 of \$3.689 million is the result of completing all TMPC 6.0 testing and evaluation efforts in 2Q FY 2021 to align with updated NAV/COMMS IOC.</p>	19.670	16.407	12.718	0.000	12.718
	-	-	-	-	-
<p>Title: Tactical Tomahawk Weapons Control System (TTWCS)</p> <p align="right">Articles:</p> <p>FY 2020 Plans: Complete TTWCS software development efforts necessary to enable Tomahawk navigation and communications modernization. Conduct integration and functional testing for TTWCS v5.6 which includes NAV/COMMS navigation and modernization improvements. Correct and verify software deficiencies found in segment testing and develop final software "fix-it" build for system level test events. Continue TTWCS ship test, ship certifications and prepare for operational test events. Continue TTWCS v5.6.1 development to address hardware and software obsolescence, enabling integration of Maritime Strike Tomahawk developed software into firing units. Perform nonrecurring engineering activities, systems and software development, integration and</p>	2.810	1.591	0.033	0.000	0.033
	-	-	-	-	-

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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 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4036 / <i>TTWCS TMPC PPPI</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
testing of capability upgrades to address emergent threats, Urgent Operational Needs (UONS), fleet gaps, and the Tomahawk Operational Readiness Document (ORD).					
<i>FY 2021 Base Plans:</i> Continue to perform nonrecurring engineering activities, systems and software development, integration and testing of capability upgrades.					
<i>FY 2021 OCO Plans:</i> N/A					
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY 2020 to FY 2021 decrease of \$1.558 million is based on the completion of TTWCS V5.6 Developmental Test and Operational Test events in early FY 2021.					
Accomplishments/Planned Programs Subtotals	22.480	17.998	12.751	0.000	12.751

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
• OPN 5253: <i>Tomahawk Support Equipment</i>	86.045	59.436	84.087	-	84.087	84.283	85.020	86.133	87.391	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.034	0.069	0.068	-	0.068	0.055	0.040	0.012	0.012	Continuing	Continuing
• WPN 2101: <i>Tomahawk</i>	98.570	386.157	277.964	-	277.964	5.033	5.023	5.058	5.363	199.574	14,622.221
• WPN 6120: <i>Spares and Repair Parts</i>	16.496	22.986	19.572	-	19.572	18.704	22.496	22.943	23.405	Continuing	Continuing
• WPN 2301: <i>Tomahawk Mods</i>	0.000	0.000	164.915	-	164.915	206.075	314.823	281.247	297.004	3,056.602	4,320.666

Remarks
Starting in FY 2021, funding for Tomahawk Modification programs has been realigned from WPN BLI 2101 to new WPN BLI 2301.

D. Acquisition Strategy
TMPC and TTWCS require periodic hardware and software updates to maintain compliance with Information Assurance (IA) standards and maintain system relevance against emerging threats. TMPC and TTWCS segments will rely on a blend of industry and government expertise through the remaining life of the program.

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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 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4036 / TTWCS TMPC PPPI							
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
TMPC 7.0	SS/CPFF	Perspecta : San Jose, CA	0.000	6.657	Dec 2018	0.228	Dec 2019	0.292	Dec 2020	-		0.292	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.238	Dec 2018	0.095	Dec 2019	0.095	Jan 2021	-		0.095	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	BAE Systems : San Diego, CA	0.000	1.200	Dec 2018	0.095	Dec 2019	0.095	Dec 2020	-		0.095	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	Leidos : California, MD	0.000	3.225	Dec 2018	4.736	Dec 2019	3.709	Dec 2020	-		3.709	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	UARC APL : Laurel, MD	0.000	0.887	Nov 2018	0.105	Nov 2019	0.114	May 2021	-		0.114	Continuing	Continuing	Continuing
TMPC 7.0	WR	NAWC-AD : Patuxent River, MD	0.000	2.432	Nov 2018	1.291	Dec 2019	0.531	Nov 2020	-		0.531	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	Perspecta : San Jose, CA	0.000	0.370	Dec 2018	1.137	Dec 2019	1.236	Dec 2020	-		1.236	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.465	Nov 2018	2.029	Nov 2019	1.248	Jan 2021	-		1.248	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.326	Nov 2018	0.791	Nov 2019	0.804	Dec 2020	-		0.804	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	Leidos : California, MD	0.000	0.618	Nov 2018	2.965	Nov 2019	2.313	Dec 2020	-		2.313	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	UARC APL : Laurel, MD	0.000	0.111	Nov 2018	0.890	Nov 2019	0.887	May 2021	-		0.887	Continuing	Continuing	Continuing
TMPC 8.0	WR	NAWC-AD : Patuxent River, MD	0.000	0.358	Nov 2018	0.949	Nov 2019	0.969	Nov 2020	-		0.969	Continuing	Continuing	Continuing
Systems Engineering - TTWCS Improvements (NAV/COMMS)	WR	NSWC : Dahlgren, VA	0.000	1.239	Feb 2019	0.517	Dec 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering-TTWCS Software Support Activity (NAV/COMMS)	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.760	Nov 2018	0.352	Dec 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			0.000	18.886		16.180		12.293		-		12.293	Continuing	Continuing	N/A

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4036 / TTWCS TMPC PPPI
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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			

Remarks
 TMPC 7.0 Implements functionality to support Maritime Strike Tomahawk. Aligns with PU 4034.
 TMPC 8.0 Implements functionality to support JMEWS and additional M-Code capabilities. Aligns with PU 4033 and 4035.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
TMPC 6.0	SS/CPFF	Perspecta : San Jose, CA	0.000	0.887	Dec 2018	0.508	Dec 2019	0.000		-		0.000	0.000	1.395	1.496
TMPC 6.0	SS/CPFF	Leidos : California, MD	0.000	1.896	Nov 2018	0.588	Nov 2019	0.425	Nov 2020	-		0.425	0.000	2.909	1.717
PPPI Development Support	SS/CPFF	Precise : Lexington Park, MD	0.000	0.709	Jun 2019	0.434	Nov 2019	0.033	Nov 2020	-		0.033	0.000	1.176	-
Subtotal			0.000	3.492		1.530		0.458		-		0.458	0.000	5.480	N/A

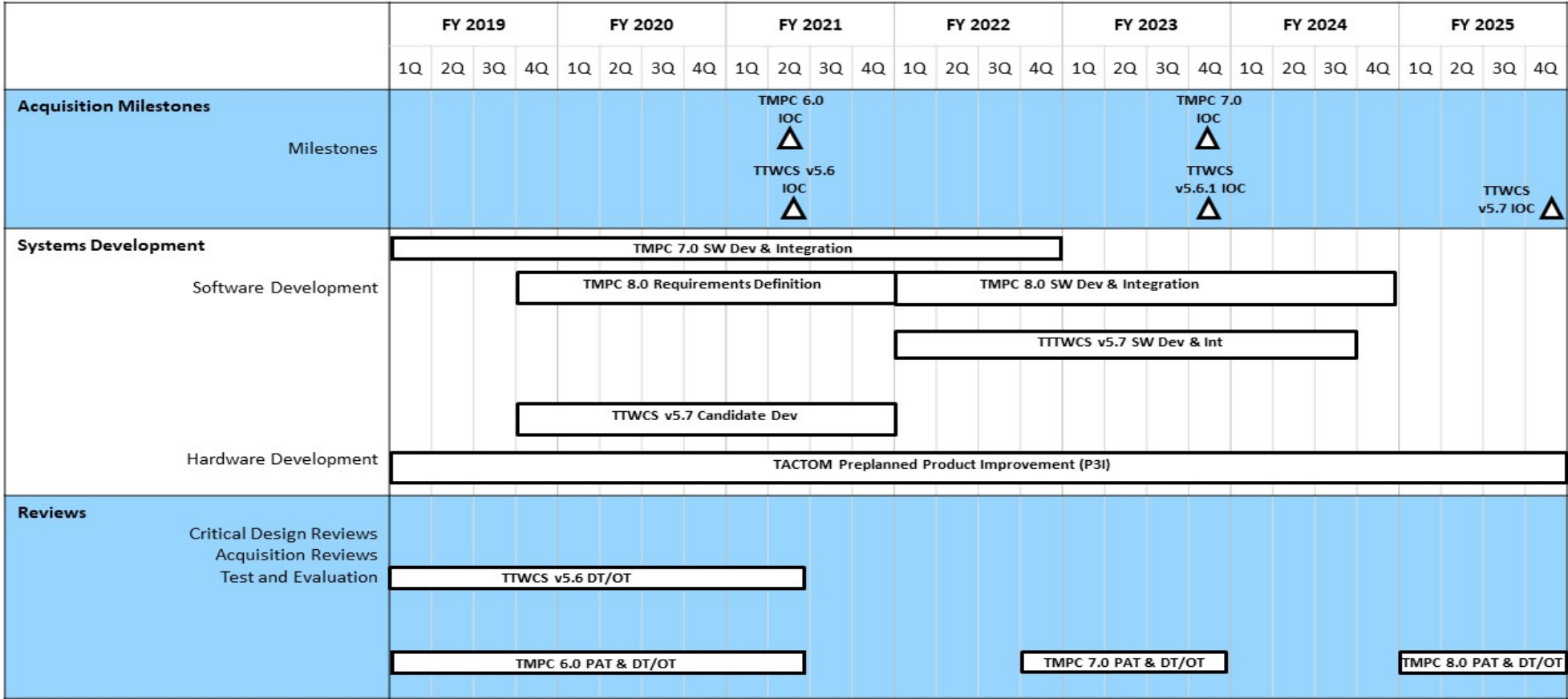
Remarks
 Pre-Planned Product Improvement efforts (PPPI) required to perform nonrecurring engineering activities, systems and software development, integration and testing of capability upgrades.
 TMPC 6.0 Implements functionality to support Missile Modernization; Timeline Improvements; Navigation and Communications Upgrades and M-Code compatibility. Aligns with PU: 4032.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
TTWCS Mod Testing	WR	NSWC PHD : Port Hueneme	0.000	0.102	Feb 2019	0.288	Feb 2020	0.000		-		0.000	0.000	0.390	-
Subtotal			0.000	0.102		0.288		0.000		-		0.000	0.000	0.390	N/A

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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4036 / TTWCS TMPC PPPI
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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 0204229N / Tomahawk Mssn Planning Ctr	Project (Number/Name) 4036 / TTWCS TMPC PPPI

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
TMPC, TTWCS, P3I				
Acquisition Milestones: Milestones: TMPC 6.0 IOC	2	2021	2	2021
Acquisition Milestones: Milestones: TMPC 7.0 IOC	4	2023	4	2023
Acquisition Milestones: Milestones: TTWCS v5.6 IOC	2	2021	2	2021
Acquisition Milestones: Milestones: TTWCS v5.6.1 IOC	4	2023	4	2023
Acquisition Milestones: Milestones: TTWCS v5.7 IOC	4	2025	4	2025
Systems Development: Software Development: TMPC 7.0 SW Dev & Integration	1	2019	4	2022
Systems Development: Software Development: TMPC 8.0 SW Dev & Integration	1	2022	4	2024
Systems Development: Software Development: TMPC 8.0 Requirements Definition	4	2019	4	2021
Systems Development: Software Development: TTWCS v5.7 SW Dev & Int	1	2022	3	2024
Systems Development: Software Development: TTWCS v5.7 Candidate Dev	4	2019	4	2021
Systems Development: Hardware Development: TACTOM Preplanned Product Improvement (P3I)	1	2019	4	2025
Reviews: Test and Evaluation: TTWCS V5.6 Modernized Missile DT/OT	1	2019	2	2021
Reviews: Test and Evaluation: TMPC 6.0 Product Acceptance Testing (PAT) & DT/OT	1	2019	2	2021
Reviews: Test and Evaluation: TMPC 7.0 Product Acceptance Testing (PAT) & DT/OT	4	2022	4	2023
Reviews: Test and Evaluation: TMPC 8.0 Product Acceptance Testing (PAT) & DT/OT	1	2025	4	2025