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Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy									Date: May 2017			
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy I BA 7: Operational Systems Development					R-1 Program Element (Number/Name) PE 0204229N I Tomahawk Mssn Planning Ctr							
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	3,138.577	26.650	91.355	133.617	-	133.617	239.203	212.974	180.642	57.761	Continuing	Continuing
0545: TOMAHAWK	3,138.577	26.650	91.355	133.617	-	133.617	239.203	212.974	180.642	57.761	Continuing	Continuing
Program MDAP/MAIS Code:												
Project MDAP/MAIS Code(s): 289												
A. Mission Description and Budget Item Justification												
Funds support development of the Tomahawk Weapons System (TWS) encompassing Tactical Tomahawk upgrades including initiation of baseline improvements into the Block IV weapon system, 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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total				
Previous President's Budget				25.227	71.355	63.035	-	63.035				
Current President's Budget				26.650	91.355	133.617	-	133.617				
Total Adjustments				1.423	20.000	70.582	-	70.582				
• Congressional General Reductions				-	-							
• Congressional Directed Reductions				-	-							
• Congressional Rescissions				-	-							
• Congressional Adds				-	-							
• Congressional Directed Transfers				-	-							
• Reprogrammings				1.905	0.000							
• SBIR/STTR Transfer				-0.482	0.000							
• Program Adjustments				0.000	20.000	69.954	-	69.954				
• Rate/Misc Adjustments				0.000	0.000	0.628	-	0.628				
Change Summary Explanation												
Technical: FY 2018 funding continues Anti-Access/Area Denial (A2AD) navigation improvements and A2AD communication upgrade baseline improvements as well as incorporate a seeker into the Block IV Tomahawk Weapon System as part of the recertification of the Tactical Tomahawk (TACTOM). Increase in funding provided for the commencement of development activities associated with Military-code (M Code) insertion and the Joint Multiple-Effects Warhead System (JMEWS) into the Tomahawk Weapons System.												

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<p>Schedule:</p> <p>Changed naming convention from ETACTOM to Maritime.</p> <p>Added TMPC Test and Evaluation periods for software versions 5.0.2 and 6.0 to support the 5.0.2 and 6.0 IOC's previously annotated in PB 2017.</p> <p>Changed naming convention of A2AD IPR1 to A2AD SRR to align directly with Systems Engineering Technical Review Process.</p> <p>Changed naming convention of A2AD IPR2 to A2AD PDR to align directly with Systems Engineering Technical Review Process and moved from 3Q 2017 to 2Q 2017.</p> <p>Changed naming convention of A2AD IPR3 to A2AD CDR to align directly with Systems Engineering Technical Review Process and moved it from 3Q 2018 to 1Q 2018.</p> <p>Deleted A2AD SFR from 3Q 2016 due to revised system engineering technical review strategy.</p> <p>Extended A2AD (NAV/Comms) ECPs from 1Q FY 2016 - 4Q FY 2019 to 1Q FY 2016 - 4Q FY2020 to account for ongoing ECP's throughout the projected development program.</p> <p>Changed "Baseline Improvement ECP kit award" to "A2AD (Comms/NAV) kit award".</p> <p>Updated the Maritime Strike Capability schedule due to plans to employ a Rapid Deployment Capability (RDC), in accordance with the DoD 5000.2, resulting in a IOC in 3Q FY 2022 following a Quick Reaction Assessment. This strategy affords the program flexibility in achieving a minimum capability in a timely manner within the confines of a RDC. As a result the following items have been added or shifted:</p> <p>Moved Maritime Strike System DT/OT moved from 1Q FY 2020 - 4Q FY 2021 to 3Q FY 2019 - 4Q FY 2021.</p> <p>Added Maritime Strike Contract Award during 4Q FY 2017 fourth quarter award due to new start budgetary authority.</p> <p>Moved Maritime Strike TTWCS Development from 1Q FY 2017- 4Q FY 2018 to 3Q FY 2017 to 1Q FY 2021 due to new start budgetary authority.</p> <p>Moved Maritime Strike TMPC Development from 1Q FY 2017 - 4Q FY 2018 to 3Q FY 2017 to 4Q FY 2020 due to new start budgetary authority.</p> <p>Added Maritime Strike Software Design from 3Q FY 2017 to 3Q FY 2019.</p>		

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<p>Added Maritime Strike NAVSIL Update from 3Q FY 2017 to 2Q FY 2018.</p> <p>Added Maritime Strike Suite Selected during 3Q FY 2018.</p> <p>Added Maritime Strike Initial Integration Testing during 4Q FY 2018.</p> <p>In accordance with the Maritime Strike Acquisition Strategy and Acquisition Plan the following six events have been added or have shifted.</p> <p>Added Maritime Strike IOC 3Q FY 2022.</p> <p>Added Maritime Strike IOC QRA during 4Q FY 2021.</p> <p>Added Maritime Strike Final Integration Testing during 4Q FY 2019.</p> <p>Moved Maritime Strike Testing from 1Q FY 2020 - 4Q FY 2021 to 3Q FY 2019 to 4Q FY 2021.</p> <p>Added Maritime Strike Production Contract Award 2Q FY 2021.</p> <p>Added Maritime Production 2Q FY 2022 - 4Q FY 2022.</p> <p>Added M-Code development effort required for next-generation GPS security architecture.</p> <p>Added the JMEWS risk reduction and development items required for new the warhead capability program.</p>		

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Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 0545 / TOMAHAWK			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
0545: TOMAHAWK	3,138.577	26.650	91.355	133.617	-	133.617	239.203	212.974	180.642	57.761	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 289												

A. Mission Description and Budget Item Justification

The Tomahawk Weapons System (TWS), formally referred to as Tomahawk Land Attack Missile (TLAM), provides a long range cruise missile attack capability against fixed and mobile targets. This program ensures that the TWS exploits state of the art technology to preserve the efficiency of this proven weapon system, and includes all missile development, mission planning, weapons control system development, and submarine integration development.

The Tactical Tomahawk All-Up-Round (AUR) Block IV missile is a comprehensive baseline upgrade to the TWS that provides the tactical commander a quick reaction response capability as well as improved flexibility, increased accuracy and higher lethality. A five-year multi-year (FY 2004 - FY 2008) production contract was awarded in August 2004 for the production of up to 2,200 Block IV Tomahawk missiles. The essential upgrades of the Block IV missile are: improved guidance, navigation, control and mission computer two-way satellite communications (SATCOM), and a lower production cost as compared to the Block III missile. Block IV provides a Ultra High Frequency SATCOM data link to enable the missile to receive in-flight mission modification messages, to transfer health and status messages and to broadcast Battle Damage Indication messages. Block IV also includes a high anti-jam Global Positioning System (GPS) receiver, navigation improvements, and associated antenna systems. The Tomahawk program also includes development of continuing advances identified under the Tomahawk Baseline IV Operational Requirements Document (ORD), to include development of advanced warheads.

Tactical Tomahawk baseline improvements include the following: 1) Anti-Access / Area Denial (A2AD) upgrades to navigation and communication of the weapon system. These updates will allow for planned missions using Terrain Contour Matching (TERCOM)/ Digital Scene Matching Area Correlation (DSMAC)/ Vertical Update (VUP) without GPS and continued communication of the Tactical Tomahawk AUR to provide Health and Status and to allow missile redirection in-flight respectively. 2) 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 3) M-Code upgrades the Tactical Tomahawk to the next generation GPS satellite constellation required to maintain GPS-provided position, navigation, and timing (PNT) for the missiles and is estimated to be in full operation by FY 2022. The M-code mandate and Public Law restrict the purchase of only M-code-capable GPS User Equipment (MGUE) after FY 2017 unless a waiver is granted by the Secretary of Defense. 4) The design and integration of the Joint Multiple-Effects Warhead System (JMEWS) enables the weapon to utilize multiple lethal effects to address Hard and Deeply Buried Targets (HDBT) while increasing the TWS capabilities against Integrated Air Defense Systems (IADS) and Weapons of Mass Destruction (WMD).

The Theater Mission Planning Center (TMPC) consists of Commercial and Government Off-The-Shelf (COTS/GOTS) software and COTS hardware. TMPC provides targeting, mission planning, strike planning and execution, mission distribution, and operational employment capabilities for the Tomahawk Weapons System. Continuous TMPC software development decreases mission planning time and increases the quality and accuracy of each mission while reducing complexity. TMPC provides mission planning at the theater and operational levels and is designed for high rate mission planning production responsive to national strategic, operational,

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and tactical requirements. TMPC develops and distributes missions for all variants of the Tomahawk Missile; provides command information services for TWS; provides strike planning, execution, coordination, control and reporting, and provides Maritime Component Commanders (MCC) the capability to plan or modify conventional Tomahawk BLK III missions. TMPC has evolved into scalable configurations deployed in four configurations at 186 sites: Cruise Missile Support Activities (CMSAs) (3+1 FMS), Tomahawk Strike Mission Planning Cells (TSMPCs) (3 - C5F, C6F, C7F), Carrier Strike Groups (CSGs) (19 - 10 CVN), Firing Units (FRUs) (84 Surface/57 Submarines), Fleet Training Sites and Labs (19). TMPC is employed in major combat operations and Overseas Contingency Operations. 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, A2AD (Nav/Comms) 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.							
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)			FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Tactical Tomahawk All-Up-Round (AUR) and Tactical Tomahawk Weapons Control System (TTWCS)			23.328	80.328	114.806	0.000	114.806
Articles:			-	-	-	-	-
Description: Continue Anti-Access/Area Denial (A2AD) navigation and communication integration into Block IV weapons system. Continue fleet experimentation and requirements coordination as well as Concept of Operations (CONOPS)/ Concept of Employment development. Continuation of the design and integration of the seeker suite into the Tactical Tomahawk (TACTOM) to be incorporated during recertification. Continuation of the cooperatively funded United States Navy/United Kingdom Joint Multi-Effects Warhead System (JMEWS) / Joint Capability Technology Demonstration (JCTD) and the commencement of fuze technology maturation and risk-reduction. Include significant research and analysis of the worldwide target set capability gaps to include Hard and Deeply Buried Targets and conventional Global Strike targets. In addition, NAWCAD also provides engine power data/analysis in order to determine reserve power available to power potential upgrades to the Tomahawk AUR, such as JMEWS. Commence development of activities associated with Military Global Positioning System User Equipment (MGUE) Insertion.							
FY 2016 Accomplishments: Continuation of A2AD navigation and communications transition and engineering change proposals to include software development, hardware development, systems engineering, integration, system testing and transition documentation. Hardware development will include development and testing of either multiple or multi-band antennas, and continued development and testing of an integrated single box solution radio.							

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
<p>Software development will include continued development and testing of Operationally Embedded Software for incorporation into the missile, as well as development of TTWCS for qualification testing. Update Tomahawk test and evaluation master plan. Continue JMEWS transition, integration, demonstration, and test efforts. Perform target and lethality assessments, engine performance analysis to include high-speed engine feasibility studies and SBIRs, data-fusion studies, campaign planning and mission analysis for potential TACTOM upgrades or new applicable weapons. Continue participation in fleet experimentation and kill chain analysis. Perform Non-Recurring Engineering activities, systems and software development, integration and testing of capability upgrades to address emergent threats, UONS, fleet gaps, and the Tomahawk ORD as directed. Conduct activities ISO Speed to Fleet (S2F) Initiative for Synthetic Guidance IAW program plan. Effort includes Fleet coordination, development of Tactics, Techniques, and Procedures (TTPs), development of Concept of Operations/Concept of Employment (CONOPS/CONEMP), test support and conduct, and development and delivery of networking and targeting software to provide a potential limited operational capability to the Fleet.</p> <p>FY 2017 Plans:</p> <p>Continuation of A2AD navigation and communications transition and engineering change proposals to include software and hardware final development, testing and deliveries of test equipment to supporting weapons control system laboratories; systems engineering reviews; integration, system testing and transition documentation. Hardware development will include development and testing of either multiple or multi-band antennas, testing of an integrated single box solution radio, and initial testing at missile segment level, integration and check out of test and support equipment at supporting labs, and identification/preliminary coordination of the test ship for TTWCS integration and testing. Software development will include continued development and testing of Operationally Embedded Software for incorporation into the missile, as well as development of TTWCS for qualification testing. Update Tomahawk test and evaluation master plan.</p> <p>Commence activities in support of Maritime Strike Tomahawk (MST). Effort includes development of system requirements, specifications, and interfaces; integration of seeker suites; TTWCS, TMPC, and missile software development; and lab and component-level testing. Additionally, coordinate with Fleet stakeholders to develop TTPs and CONEMPs/CONOPs, coordinate with Integrated Warfare Capability teams to develop and assess kill-chains.</p> <p>Continue JMEWS transition, integration, demonstration, and test efforts. Perform target and lethality assessments, engine performance analysis to include high-speed engine feasibility studies and SBIRs, data-fusion studies, campaign planning and mission analysis. Continue participation in fleet experimentation and kill</p>						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
chain analysis. Perform Non-Recurring Engineering activities, systems and software development, integration and testing of capability upgrades to address emergent threats, UONS, fleet gaps, and the Tomahawk ORD as directed.						
Conduct activities in support of Speed to Fleet (S2F) Initiative for Synthetic Guidance in accordance with the program plan. Effort includes Fleet coordination, development of Tactics, Techniques, and Procedures (TTPs), development of Concept of Operations/Concept of Employment (CONOPS/CONEMP), test support and conduct, and development and delivery of networking and targeting software to provide a potential limited operational capability to the Fleet.						
FY 2018 Base Plans: FY 2018 plans include A2AD navigation and communications transition and engineering change proposals for software and hardware development and testing to include system engineering reviews, integration, system testing and transition documentation. Includes the execution of end-to-end Tactical Tomahawk system integration testing with pre-production hardware and software to support navigation and communication upgrades required for production decision point for procurement. Finalize TTWCS v5.6 software build and enter Computer Software Configuration Item (CSCI) build Formal Qualification Testing (FQT). Develop segment test procedures and enter formal segment level testing continuing the software coding of the corrective build after the test discovery phase. Conduct TTWCS test ship certification phase and "fix it" build software development.						
Continue activities in support of Maritime Strike Tomahawk integration. Effort includes refinement of system requirements, specifications, and interfaces; integration engineering, laboratory simulation development, qualification of hardware and software, and captive carry flights of seeker suites by the prime; TTWCS, TMPC, and missile OES software development; lab and component-level testing. Specifically, the following items are planned for FY 2018: seeker software functionality in the Navigation & Guidance System Integration Laboratory (NAVSIL), telemetry system verified in NAVSIL, results from early integration of WCS, TMPC and OES, early integration build of TMPC for ground launch use, ground launch system checkout completed, data from captive flight test on Block IV Tomahawk, simulation updates, conduct TWS ground launch, start WCS and TMPC system qualification testing. Coordinate with fleet stakeholders to develop TTPs and CONEMPs/CONOPs.						
Military-code (M Code) planned activities include Application Specific Integrated Circuit (ASIC) integration with the M Code GPS user equipment initial AGR-M testing, design reviews, requirements definition and decomposition, box-level and system-level specification finalization, interface development, and test planning.						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continue JMEWS transition, integration, demonstration, and test efforts which will include fuze technology maturation and risk-reduction. Perform target and lethality assessments, engine performance analysis to include high-speed engine feasibility studies and SBIRs, data-fusion studies, campaign planning and mission analysis for potential TACTOM upgrades or new applicable weapons. Continue participation in fleet experimentation and kill chain analysis. Perform non-recurring engineering activities, systems and software development, integration and testing of capability upgrades to address emergent threats, UONS, fleet gaps, and the Tomahawk ORD as directed. FY 2018 OCO Plans: N/A						
Title: Theater Mission Planning Center (TMPC) Articles:		3.322	11.027	18.811	0.000	18.811
Description: Development and incorporation of new capabilities into the Theater Mission Planning Center (TMPC) necessary for the employment of the Tomahawk Weapon System (TWS). FY 2016 Accomplishments: Continue Tomahawk Weapon System navigation and accuracy and weapons delivery Circular Error Probable (CEP) studies and assessments necessary to ensure the TWS is properly employed; continued evaluation of TMPC design process to ensure Tactical Tomahawk missile performance characteristics are adequately modeled in TMPC. Continue evaluation of imagery formats resulting from NGA mandated architectural changes. Continue development of A2AD software for targeting and navigation improvements. FY 2017 Plans: Continue Tomahawk Weapon System navigation and accuracy and weapons delivery CEP studies and assessments necessary to ensure the TWS is properly employed; continued evaluation of TMPC design process to ensure Tactical Tomahawk missile performance characteristics are adequately modeled in TMPC. Continue evaluation of imagery formats resulting from nationally mandated architectural changes. Complete development, coding and initial system integration and testing of timeline improvements and A2AD software for TMPC 6.0. TMPC 6.0 includes A2AD navigation and communications improvements required to support the Tomahawk Weapons System (TWS) Modernization program. Initiate system integration into the TMPC mission planning environment in support of the Maritime Strike capability. FY 2018 Base Plans:		-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
<p>Continue Tomahawk Weapon System navigation and accuracy and weapons delivery CEP studies and assessments necessary to ensure the TWS is properly employed; continued evaluation of TMPC design process to ensure Tactical Tomahawk missile performance characteristics are adequately modeled in TMPC. Continue evaluation of imagery formats resulting from nationally mandated architectural and format changes. Commence A2AD navigation and communications integration testing. A2AD navigation and communications improvements required to support the Tomahawk Weapons System (TWS) Modernization program. Complete development, coding, and initial system integration of Maritime Strike Tomahawk capability in support of the Maritime Strike requirement. Initiate requirements definition and preliminary design to support TWS MGUE upgrade. The Military-code (M-Code) upgrade is necessary to enhance TWS GPS signal capability.</p> <p>FY 2018 OCO Plans: N/A</p>					
Accomplishments/Planned Programs Subtotals	26.650	91.355	133.617	0.000	133.617

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• WPN/2101: <i>Tomahawk</i>	202.314	271.905	134.375	91.608	225.983	99.705	100.603	119.079	144.469	Continuing	Continuing
• OPN/5253: <i>Tomahawk Support Equipment</i>	71.245	95.546	73.184	-	73.184	72.852	73.015	74.539	76.023	Continuing	Continuing
• OPN/9020: <i>Initial and Vendor Direct Spares</i>	0.147	0.177	0.311	-	0.311	0.374	0.281	0.231	0.204	Continuing	Continuing
• WPN/6120: <i>Spares and Repair Parts</i>	70.347	39.815	13.518	-	13.518	26.878	29.566	18.408	18.605	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
<p>The TACTOM Weapon System achieved IOC in May 2004. The acquisition strategy involves maintaining production through FY 2017 with final deliveries in FY 2019. With production halting, transition into recertification starting in FY 2019 for half-life missiles. Recertification of TACTOM missiles starting in FY 2019 provides modernization opportunities to improve weapon system performance to include communication and navigation baseline improvements.</p>											

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<p>The Maritime Strike Tomahawk will employ a Rapid Deployment Capability (RDC) acquisition plan, in accordance with the DoD 5000.2, resulting in a IOC in FY 2022 following Quick Reaction Assessment (QRA) and characterization. This strategy affords the program flexibility in achieving a minimum capability in a timely manner. Following a fielding of IOC, further procurements will comply with DoD 5000.2 for programs of record.</p> <p>The M-Code acquisition strategy includes the development, integration, test, qualification and production of a new GPS receiver which will satisfy the M-Code requirement with installations commencing in FY 2022. Initially funded by the United States Air Force commencing in FY 2015, efforts have been underway as part of the Robust Positioning, Navigation and Timing Integrated Technology (RPNT) program and have included the interface and specification development, layout and initial design and testing required to commence integration into the Tomahawk Weapon System commencing in FY 2018.</p> <p>TMPC and TTWCS require periodic hardware and software updates to maintain compliance with 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.</p> <p>Upon completion of the Joint Multiple Effects Warhead System (JMEWS) fuze reduction activities in FY 2019, the program will conduct integration, SETR, and testing activities which will result in two potential procurement/integration into BLK IV process options. Additionally, corresponding updates to the Tactical Tomahawk Weapons Control System (TTWCS) and the Theatre Mission Planning Center(TMPC) will need to be made to properly launch the missile and plan for JMEWS missions. Operational testing and IOC are scheduled for FY 2023.</p> <p><u>E. Performance Metrics</u></p> <p>The Navy seeks to improve the Tomahawk cruise missile attack capability against land and maritime targets through research and development.</p> <p>Examples in the area of the All-Up-Round include development of candidate warheads and sensors that will enhance weapon ability to cover all assigned target types, provide a quick reaction response capability for the weapon system, and improved guidance, navigation, control, mission computer two-way satellite communications, and a high anti-jam GPS receiver all in line with state of the art technology.</p> <p>In the area of the weapons control system, research and development is performed to ensure viability and usability of the system into the future, providing necessary upgrades to meet the Department of Defense Information Technology standards registry to comply with FORCEnet requirements and be Internet Protocol Version 6 ready to remain interoperable within Joint Service Architecture, in order to provide battle-group tactical flexibility and responsiveness needed to enable full wartime capability.</p> <p>In the area of the TMPC, continue research and development in order to provide scalable configurations to deploy where and as needed to provide necessary command and control, development necessary to function with national and tactical imagery architectures, decrease mission planning time, and increase the quality and accuracy of each mission for the TWS.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy												Date: May 2017			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 0545 / TOMAHAWK					
Product Development (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
Systems Engineering - A2AD Improvements Prime Integrator (NAV/ COMMS)	SS/CPFF	Raytheon : Tucson, AZ	2.154	10.024	Feb 2016	12.935	Feb 2017	8.133	Feb 2018	-		8.133	Continuing	Continuing	Continuing
Systems Engineering - TTWCS A2AD Improvements (NAV/ COMMS)	WR	NSWC : Dahlgren, VA	2.650	0.000		0.603	Feb 2017	0.847	Feb 2018	-		0.847	Continuing	Continuing	Continuing
Systems Engineering - Hardware Development- A2AD Improvements (NAV/COMMS)	MIPR	NRO : Chantilly, VA	9.493	12.076	Nov 2015	9.725	Nov 2016	8.470	Nov 2017	-		8.470	Continuing	Continuing	Continuing
Systems Engineering- TTWCS Software Support Activity(NAV/COMMS)	SS/CPFF	LMVF : Valley Forge, PA	0.400	0.717	Apr 2016	2.276	Apr 2017	2.817	Feb 2018	-		2.817	Continuing	Continuing	Continuing
M-Code - TTWCS	WR	NSWC : Dahlgren, VA	0.000	0.000		0.000		0.800	Nov 2017	-		0.800	Continuing	Continuing	Continuing
M-Code - AUR	C/CPFF	Raytheon : Tucson, AZ	0.000	0.000		0.000		11.849	Feb 2018	-		11.849	Continuing	Continuing	Continuing
M-Code- AUR	SS/FFP	Raytheon SAS : El Segundo, CA	0.000	0.000		0.000		6.006	Dec 2017	-		6.006	0.000	6.006	6.006
M-Code	WR	NSWC-IH : Indian Head, MD	0.000	0.000		0.000		0.300	Nov 2017	-		0.300	0.000	0.300	-
M-Code	WR	NUWC-RI : Newport, RI	0.000	0.000		0.000		0.200	Nov 2017	-		0.200	0.000	0.200	-
M-Code	WR	NAWC-AD : Pax River, MD	0.000	0.000		0.000		0.702	Nov 2017	-		0.702	0.000	0.702	-
M-Code - TMPC	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.000		0.000		0.150	Dec 2017	-		0.150	0.000	0.150	0.150
M-Code - TMPC	SS/CPFF	CommGlobal : SanJose, CA	0.000	0.000		0.000		0.600	Dec 2017	-		0.600	Continuing	Continuing	Continuing
Maritime Strike - TMPC	SS/CPFF	CommGlobal : San Jose, CA	0.000	0.000		1.617	Dec 2016	3.430	Dec 2017	-		3.430	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy												Date: May 2017			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr						Project (Number/Name) 0545 / TOMAHAWK			
Product Development (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
Maritime Strike - TMPC	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.000		0.622	Dec 2016	1.879	Dec 2017	-		1.879	Continuing	Continuing	Continuing
Maritime Strike - TMPC	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.000		1.444	Dec 2016	1.953	Dec 2017	-		1.953	Continuing	Continuing	Continuing
Maritime Strike - TMPC	SS/CPFF	Leidos : California, MD	0.000	0.000		2.316	Dec 2016	3.945	Dec 2017	-		3.945	Continuing	Continuing	Continuing
Maritime Strike - TMPC	SS/CPFF	URAC APL : Laurel, MD	0.000	0.000		0.052	Dec 2016	0.045	Dec 2017	-		0.045	Continuing	Continuing	Continuing
Maritime Strike - TMPC	WR	NAWC-AD : Pax River, MD	0.000	0.000		0.267	Nov 2016	0.275	Nov 2017	-		0.275	Continuing	Continuing	Continuing
Maritime Strike - TMPC	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.172	Nov 2016	0.153	Nov 2017	-		0.153	Continuing	Continuing	Continuing
Maritime Strike - AUR	C/CPFF	Raytheon : Tucson, AZ	0.000	0.000		38.500	Jul 2017	52.470	Dec 2017	-		52.470	Continuing	Continuing	Continuing
Maritime Strike	SS/CPFF	UARC APL : Laurel, MD	0.000	0.000		0.500	Dec 2016	0.425	Dec 2017	-		0.425	0.000	0.925	0.925
Maritime Strike - TTWCS	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		6.510	Nov 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Maritime Strike - TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.000		0.500	Dec 2016	2.000	Dec 2017	-		2.000	Continuing	Continuing	Continuing
Maritime Strike - AUR	WR	NAWC-WD : China Lake, CA	0.000	0.000		0.500	Nov 2016	0.000		-		0.000	0.000	0.500	-
JMEWS	WR	NAWC-WD : China Lake, CA	0.000	0.000		0.000		7.000	Nov 2017	-		7.000	0.000	7.000	-
Prior Year Prod Dev cost no longer funded in FYDP	Various	Various : Various	2,660.256	0.000		0.000		0.000		-		0.000	0.000	2,660.256	-
Subtotal			2,674.953	22.817		78.539		114.449		-		114.449	-	-	-
Remarks															
In support of M-Code, increases in FY 2018 are due to efforts associated with GPS Integration and Anti-Jam receiver activities. Funds are required for increased GPS information assurance through modernized cryptography, anti-spoofing, added resiliency and software assurance including the capability for denial of adversary navigation while improving anti-jam performance.															

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Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy												Date: May 2017			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 0545 / TOMAHAWK					
Product Development (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
Systems Engineering - A2AD Improvements Prime Integrator (NAV/COMMS)(Raytheon)- Funds required in FY 2018 for the execution of end-to-end Tactical Tomahawk system integration testing with pre-production hardware and software to support navigation and communication upgrades required for production.															
Systems Engineering - Hardware Development (NRO)- A2AD Improvements (NAV/COMMS)- NRO FY 2018 funds waveform validation in addition to NSA certification and integration of the ground and space segments for the radio.															
Maritime Strike - AUR FY 2018 funds the development and refinement of system and subsystem seeker requirements, specifications, and interfaces; integration engineering, laboratory simulation development, prototyping of hardware and software, and captive carry flights of seeker suites by the Prime.															
PB 2017 RAA increase of \$20M applied to Raytheon product development in support of component level prototype hardware procurement. This effort includes the integration of seeker hardware assemblies as suites, power management analysis and requirements for prototype seeker assemblies, and the development of prototype software builds and software simulation updates.															
FY 2018 JMEWS funding required for fuze technology maturation and risk-reduction prior to commencement of Engineering Manufacturing (EMD) and Development phase.															
FY 2018 required for TTWCS to continue to provides launch capability for both types of modernization efforts, A2AD (Nav/Comms) and Maritime, through an incremental approach to software and hardware upgrades.															
Support (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	ComGlobal : San Jose, CA	2.043	0.000		1.453	Feb 2017	1.637	Feb 2018	-		1.637	Continuing	Continuing	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	Boeing : St. Louis, MO	2.820	0.000		1.031	Feb 2017	0.688	Feb 2018	-		0.688	Continuing	Continuing	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	BAE Systems : San Diego, CA	2.850	0.000		0.237	Feb 2017	0.172	Feb 2018	-		0.172	Continuing	Continuing	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	Leidos : California, MD	3.241	1.319	Feb 2016	1.115	Feb 2017	1.035	Feb 2018	-		1.035	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy												Date: May 2017			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 0545 / TOMAHAWK					
Support (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	UARC APL : Laurel, MD	2.623	0.000		0.237	Feb 2017	0.172	Feb 2018	-		0.172	Continuing	Continuing	Continuing
TLAM MP Analysis - Mission Planning	SS/CPFF	UARC APL : Laurel, MD	0.300	0.845	Feb 2016	1.059	Feb 2017	1.067	Feb 2018	-		1.067	Continuing	Continuing	Continuing
Imagery Format Analysis - Mission Planning	SS/CPFF	Leidos : California, MD	4.166	1.164	Feb 2016	1.424	Feb 2017	1.418	Feb 2018	-		1.418	Continuing	Continuing	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	WR	NAWC-AD : Pax River, MD	1.019	0.000		0.181	Feb 2017	0.192	Feb 2018	-		0.192	Continuing	Continuing	Continuing
Development Support - TTWCS AUR	WR	NSWC : Dahlgren, VA	4.067	0.000		0.505	Feb 2017	0.520	Nov 2017	-		0.520	Continuing	Continuing	Continuing
Development Support - CSS AUR	SS/CPFF	Leidos : California, MD	1.315	0.224	Dec 2015	0.000		0.000		-		0.000	0.000	1.539	1.539
Development Support - Advanced Concepts AUR	WR	NAWC-WD : China Lake, CA	80.435	0.088	Dec 2015	1.507	Feb 2017	1.734	Nov 2017	-		1.734	Continuing	Continuing	Continuing
Development Support - AUR Fleet Representative	SS/CPFF	UARC APL : Laurel, MD	0.146	0.034	Feb 2016	0.300	Feb 2017	0.325	Nov 2017	-		0.325	Continuing	Continuing	Continuing
Development Support - Advanced Concepts AUR	WR	NAWC-AD : Pax River, MD	0.368	0.000		0.097	Feb 2017	0.399	Nov 2017	-		0.399	Continuing	Continuing	Continuing
Development Support - CSS AUR	SS/CPFF	Various : PMA 280 Follow on CSS	0.000	0.111	Mar 2016	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Support - Advanced Concepts AUR	WR	NSWC : Dahlgren, VA	0.000	0.048	Feb 2016	0.000		0.443	Nov 2017	-		0.443	Continuing	Continuing	Continuing
Development Spt - CSS AUR	C/BA	Precise : Lexington Park, MD	0.000	0.000		0.670	Dec 2017	0.982	Dec 2017	-		0.982	0.000	1.652	-
Development Spt - M-Code	C/BA	UARC APL : Laurel, MD	0.000	0.000		0.000		1.347	Dec 2017	-		1.347	0.000	1.347	-
Development Spt - Maritime Strike	WR	NAWC-WD : China Lake, CA	0.000	0.000		0.000		1.010	Nov 2017	-		1.010	0.000	1.010	-
Development Spt - Maritime Strike	WR	NAWC-AD : Pax River, MD	0.000	0.000		0.000		1.010	Nov 2017	-		1.010	0.000	1.010	-

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Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy												Date: May 2017			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 0545 / TOMAHAWK					
Support (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Spt - Maritime Strike	SS/CPFF	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		1.980	Nov 2017	-		1.980	0.000	1.980	1.980
Prior Year Support cost no longer funded in FYDP	Various	Various : Various	274.418	0.000		0.000		0.000		-		0.000	0.000	274.418	-
Subtotal			379.811	3.833		9.816		16.131		-		16.131	-	-	-
Test and Evaluation (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
Maritime Strike	C/CPFF	Raytheon : Tucson, AZ	0.000	0.000		2.000	Dec 2016	0.000	Dec 2017	-		0.000	Continuing	Continuing	Continuing
Maritime Strike	WR	NAWC-AD : China Lake, CA	0.000	0.000		0.500	Dec 2016	1.500	Nov 2017	-		1.500	Continuing	Continuing	Continuing
Maritime Strike	WR	NAWC-WD : Pax River, MD	0.000	0.000		0.500	Dec 2016	0.425	Nov 2017	-		0.425	0.000	0.925	-
Maritime Strike	WR	NSWC : Dahlgren, VA	0.000	0.000		0.000		0.500	Dec 2017	-		0.500	0.000	0.500	-
TTWCS	WR	NSWC-DD : Dahlgren	0.000	0.000		0.000		0.612	Dec 2017	-		0.612	0.000	0.612	-
Prior Year T&E cost no longer funded in FYDP	Various	Various : Various	83.412	0.000		0.000		0.000		-		0.000	0.000	83.412	-
Subtotal			83.412	0.000		3.000		3.037		-		3.037	-	-	-
Remarks FY 2018 Maritime Strike Test and Evaluation funding required for captive carry flight testing and other system level testing in addition to lab and component-level testing.															

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Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy													Date: May 2017		
Appropriation/Budget Activity 1319 / 7							R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>					Project (Number/Name) 0545 / <i>TOMAHAWK</i>			

Management Services (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
Prior Year Mgmt cost no longer funded in FYDP	Various	Various : Various	0.401	0.000		0.000		0.000		-		0.000	0.000	0.401	-
Subtotal			0.401	0.000		0.000		0.000		-		0.000	0.000	0.401	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3,138.577	26.650		91.355		133.617		-		133.617	-	-	-

Remarks

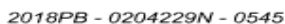
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PE 0204229N: *Tomahawk Mssn Planning Ctr*
Navy

R-1 Line #206

R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning</i> <i>Ctr</i>

Project (Number/Name) 0545 / TOMAHAWK	
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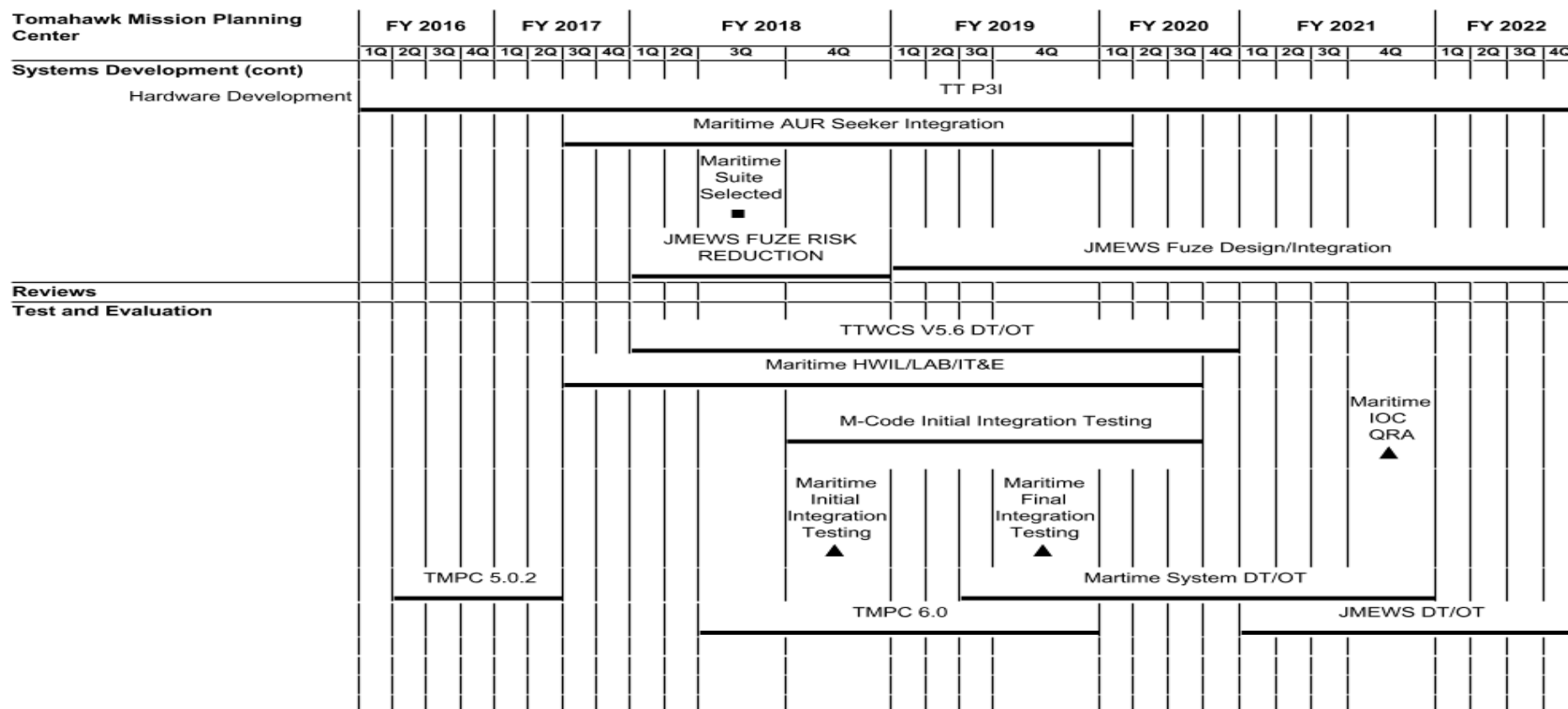
Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy

Date: May 2017

Appropriation/Budget Activity
1319 / 7

R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning</i> <i>Ctr</i>

Project (Number/Name) 0545 / TOMAHAWK	
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2018PB - 0204229N - 0545

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PE 0204229N: *Tomahawk Mssn Planning Ctr*
Navy

R-1 Line #206

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>
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Project (Number/Name)	0545 / TOMAHAWK
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Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy

Date: May 2017

Appropriation/Budget Activity

1319 / 7

R-1 Program Element (Number/Name)

PE 0204229N / Tomahawk Mssn Planning

Ctr

Project (Number/Name)

0545 / TOMAHAWK

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Tomahawk Mission Planning Center				
Acquisition Milestones: Milestones: TMPC 5.0.2 IOC	4	2017	4	2017
Acquisition Milestones: Milestones: TMPC 6.0 IOC	2	2020	2	2020
Acquisition Milestones: Milestones: M-Code Dev Award	2	2018	2	2018
Acquisition Milestones: Milestones: M-Code IOC	4	2022	4	2022
Acquisition Milestones: Milestones: Maritime Strike Contract Award	4	2017	4	2017
Acquisition Milestones: Milestones: Maritime Strike Initial Operational Capability	3	2022	3	2022
Systems Development: Critical Design Reviews: M-CodeTWS SRR	1	2018	1	2018
Systems Development: Critical Design Reviews: M-Code CDR	2	2019	2	2019
Systems Development: Critical Design Reviews: M-Code TMPC CDR	1	2018	1	2018
Systems Development: Software Development: A2AD Navigation	1	2016	4	2017
Systems Development: Software Development: A2AD Navigation/Communications ECPs	1	2016	4	2020
Systems Development: Software Development: Maritime Strike- TTWCS Development	3	2017	1	2021
Systems Development: Software Development: Maritime Strike- TMPC Development	3	2017	4	2020
Systems Development: Software Development: Maritime Strike Software Design	3	2017	3	2019
Systems Development: Software Development: Maritime Strike NAVSIL Update	3	2017	2	2018
Systems Development: Software Development: JMEWS TTWCS/TMPC Dev	1	2019	4	2022
Systems Development: Acquisition Reviews: A2AD - OTRR	4	2019	4	2019
Systems Development: Acquisition Reviews: A2AD - SRR	3	2016	3	2016
Systems Development: Acquisition Reviews: A2AD - PDR	2	2017	2	2017
Systems Development: Acquisition Reviews: A2AD Modernization Blk IV Fleet Release	4	2020	4	2020

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Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy

Date: May 2017

Appropriation/Budget Activity

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R-1 Program Element (Number/Name)

PE 0204229N / Tomahawk Mssn Planning
Ctr

Project (Number/Name)

0545 / TOMAHAWK

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Systems Development: Acquisition Reviews: A2AD - CDR	1	2018	1	2018
Tomahawk Mission Planning Center - Page 2				
Systems Development (cont): Hardware Development: TT Preplanned Product Improvement (P3I)	1	2016	4	2022
Systems Development (cont): Hardware Development: Maritime Strike - AUR Seeker Integration	3	2017	1	2020
Systems Development (cont): Hardware Development: Maritime Strike Suite Selected	3	2018	3	2018
Systems Development (cont): Hardware Development: JMEWS FUZE RISK REDUCTION	1	2018	4	2018
Systems Development (cont): Hardware Development: JMEWS Warhead and Fuze Design/Integration	1	2019	4	2022
Test and Evaluation: TTWCS V5.6 Modernized Missile DT/OT	1	2018	4	2020
Test and Evaluation: Maritime Strike - HWIL/LAB/Integration Testing	3	2017	3	2020
Test and Evaluation: M-Code Initial Integration Testing/Qual	4	2018	3	2020
Test and Evaluation: Maritime Strike IOC QRA	4	2021	4	2021
Test and Evaluation: Maritime Strike Initial Integration Testing	4	2018	4	2018
Test and Evaluation: Maritime Strike Final Integration Testing	4	2019	4	2019
Test and Evaluation: Maritime Strike Testing	3	2019	4	2021
Test and Evaluation: TMPC 5.0.2	2	2016	2	2017
Test and Evaluation: TMPC 6.0	3	2018	4	2019
Test and Evaluation: JMEWS DT/OT	1	2021	4	2022
Tomahawk Mission Planning Center - Page 3				
Production Milestones: Contract Awards: A2AD (COMMS/NAV) Kit Award	2	2018	2	2018
Production Milestones: Contract Awards: MGUE Production Contract Award	1	2021	1	2021
Production Milestones: Contract Awards: Maritime Strike Production Contract Award	2	2021	2	2021
Production Milestones: Contract Awards: JMEWS Integration Contract Award	1	2019	1	2019

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Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy			Date: May 2017		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr		Project (Number/Name) 0545 / TOMAHAWK	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
Production Milestones: Contract Awards: JMEWS Production Contract Award		2	2022	2	2022
TACTOM Modernization Deliveries: M-Code Production		1	2022	4	2022
TACTOM Modernization Deliveries: Maritime Strike Production		2	2022	4	2022
TACTOM Modernization Deliveries: A2AD (COMMS/NAV) Production		2	2019	4	2022