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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy	Date: February 2018
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Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr
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COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	3,165.116	49.149	133.617	282.395	-	282.395	223.615	170.316	50.586	52.233	Continuing	Continuing
0545: TOMAHAWK	3,165.116	49.149	133.617	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3,347.882
4032: A2AD	0.000	0.000	0.000	4.835	-	4.835	4.144	0.000	0.000	0.000	0.000	8.979
4033: M-Code	0.000	0.000	0.000	29.013	-	29.013	26.267	7.951	3.400	3.600	Continuing	Continuing
4034: Maritime Strike	0.000	0.000	0.000	202.450	-	202.450	133.980	102.822	0.000	0.000	0.000	439.252
4035: JMEWS	0.000	0.000	0.000	22.708	-	22.708	41.226	45.543	37.021	30.765	Continuing	Continuing
4036: TTWCS TMPC PPPI	0.000	0.000	0.000	23.389	-	23.389	17.998	14.000	10.165	17.868	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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	91.355	133.617	239.203	-	239.203
Current President's Budget	49.149	133.617	282.395	-	282.395
Total Adjustments	-42.206	0.000	43.192	-	43.192
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	6.600	0.000			
• SBIR/STTR Transfer	-0.467	0.000			
• Program Adjustments	-20.000	0.000	0.000	-	0.000

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1319: Research, Development, Test & Evaluation, Navy I BA 7: Operational Systems Development		PE 0204229N I Tomahawk Mssn Planning Ctr			
• Rate/Misc Adjustments	0.000	0.000	43.192	-	43.192
• Congressional Directed Reductions Adjustments	-28.339	-	-	-	-
Change Summary Explanation					
The FY 2019 funding request was reduced by \$1.469 million to reflect the Department of Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.					
FY 2019 decrease of \$1.725 due to rate and purchase inflation changes.					
FY 2019 increase due to Maritime Strike Tomahawk (MST) acceleration.					
As a part of PB 2019, the A2AD project (PU 4032), M-Code ACAT IVT program (PU 4033), Maritime Strike RDC (PU 4034), JMEWS ACAT III program (PU 4035), TMPC ACAT II program (PU 4036), TTWCS ACAT III program (PU 4036) and PPPI efforts (PU 4036) have been separated from the Tomahawk Mission Planning Center Project unit 0545.					
Technical: Not applicable; all funding within Project Unit 0545 has been moved to separate project units to display individual program and project cost, schedule, and performance.					
Schedule:					
Proj: 0545 A2AD schedule changes are associated with enhanced detail required to independently display program cost, schedule, and performance within the R-4 exhibit.					
Added A2AD Parking Lot Test 2Q 2018					
Added M-Code ASR 4Q FY2017					
Added JMEWS ASR 1Q FY2018					
A2AD NAV moved from 1Q FY2016 to 4Q FY2017 to 1Q FY2018 to 4Q FY2018					
Changed naming convention of A2AD (NAV/COMMS) ECPs to A2AD ECPs/Integration					
Added M-Code EMD Phase 1 2Q FY2018					

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<p>Added A2AD Kit Award Lot-1 2Q FY2018</p> <p>Proj: 4032 A2AD schedule changes are associated with enhanced detail required to independently display program cost, schedule, and performance within the R-4 exhibit.</p> <p>Moved A2AD OTRR from 4Q FY2019 to 4Q FY2020 in accordance with A2AD Acquisition Strategy Acquisition Plan</p> <p>Added A2AD Functional Ground Test 3Q FY2019</p> <p>Added A2AD Operational Test (OT)4Q FY2020</p> <p>Added A2AD Kit Award Lot-2 2Q FY2019</p> <p>Added A2AD Kit Award Lot-3 2Q FY2020</p> <p>Added A2AD Kit Award Lot-4 2Q FY2021</p> <p>Added A2AD Kit Award Lot-5 2Q FY2022</p> <p>Added A2AD Kit Award Lot-6 2Q FY2023</p> <p>Proj: 4033 M-Code schedule changes are associated with enhanced details required to independently display program cost, schedule, and performance within the R-4 exhibit.</p> <p>Added MS B 1Q FY2019</p> <p>Added MS C 1Q FY2021</p> <p>Added M-Code Fleet Release</p> <p>Added M-Code OTRR 2Q FY2023</p> <p>Added M-Code TTWCS SW Dev 1Q FY2019 to 4Q FY2023</p> <p>Added M-Code DT 1Q FY2019 to 4Q FY2020</p>		

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<p>Added M-Code OT 1Q FY2021 to 2Q FY2023</p> <p>Added M-Code EMD Award Phase II 2Q FY2019</p> <p>Added M-Code LRIP LOT-1 1Q FY2021</p> <p>Added M-Code LRIP LOT-2 1Q FY2022</p> <p>Added M-Code LRIP LOT-3 1Q FY2023</p> <p>Proj: 4034 Maritime Strike schedule changes are associated with enhanced details required to independently display program cost, schedule, and performance within the R-4 exhibit.</p> <p>Added Maritime Target EOC 4Q FY2019</p> <p>Added Maritime Strike QRA 2Q FY2021</p> <p>Added Maritime Strike Modeling and Simulation 1Q FY2019 to 3Q FY2021</p> <p>Moved Maritime TTWCS Dev from 3Q FY2017 to 1Q FY2021 to 1Q FY2019 to 2Q FY2021</p> <p>Moved Maritime SW Design from 3Q FY2017 to 3Q FY2019 to 1Q FY2019 to 3Q FY2019</p> <p>Added MST Simulation Capability 1Q FY2020</p> <p>Added MST Ready for Ground Launches 3Q FY2020</p> <p>Added MST Ready for QRA 2Q FY2021</p> <p>Added MST Initial Fielding 4Q FY2021</p> <p>Deleted Maritime IOC QRA</p> <p>Added Maritime QRA 2Q FY2021 to 4Q FY2021</p>		

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<p>Moved Maritime Final Integration Testing from 4Q FY2019 to 1Q FY2020</p> <p>Added MST Integrated Product & Test Contract Award 2Q FY2019</p> <p>Added Maritime Production Contract Option 1 3Q FY2020</p> <p>Moved Maritime Production Contract Option 2 from 2Q FY2021 to 3Q FY2021</p> <p>Added Maritime Production Contract Option 3 3Q FY2022</p> <p>Added Maritime Production Contract Award 3Q 2023</p> <p>Changed naming convention of Maritime Strike Production to Maritime Production Deliveries</p> <p>Moved Maritime Production Deliveries from 2Q FY2022 to 4Q FY2022 to 3Q FY2021 to 4Q FY2023.</p> <p>Proj: 4035 JMEWS schedule changes are associated with enhanced details required to independently display program cost, schedule, and performance within the R-4 exhibit.</p> <p>Added MS B 2Q FY2019</p> <p>Added MS C 1Q FY2023</p> <p>Changed naming convention from JMEWS Fuze Design/Integration to JMEWS Warhead, Fuze, Target Design Integration</p> <p>Added JMEWS PDR 1Q FY2020</p> <p>Added JMEWS CDR 4Q FY2020</p> <p>Changed naming convention from JMEWS Integration Contract Award to JMEWS EMD Contract Award</p> <p>Added JMEWS Long-Lead Energetics Award 1Q FY2022</p>		

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<p>Proj: 4036 TTWCS TMPC PPPI schedule changes are associated with enhanced details required to independently display program cost, schedule, and performance within the R-4 exhibit.</p> <p>Moved TMPC 6.0 IOC from 2Q FY2020 to 4Q FY2020</p> <p>Added TMPC 7.0 IOC 4Q FY2021</p> <p>Added TMPC 7.0 SW Dev & Integration 1Q FY2019 to 4Q FY2020</p> <p>Added TMPC 8.0 SW Dev & Integration 1Q FY2020 to 4Q FY2022</p> <p>Added TT Preplanned Product Improvement (P3I) 1Q FY2019 to 4Q FY2023</p> <p>Deleted TMPC 6.0</p> <p>Added TMPC 6.0 Production Acceptance Test (PAT)& DT/OT 1Q FY2019 to 4Q FY2020</p> <p>Added TMPC 7.0 PAT & DT/OT 1Q FY2020 to 4Q FY2021</p> <p>Added TMPC 8.0 Requirements Definition 2Q FY2019 to 4Q FY2019</p> <p>Added TMPC 8.0 PAT & DT/OT 3Q FY2022 to 4Q FY2023</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0545: TOMAHAWK	3,165.116	49.149	133.617	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3,347.882
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 required to maintain reliable GPS-provided position, navigation, and timing (PNT) for the missiles and is estimated to be available for operations in FY 2023. 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 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.

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<p>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 187 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) (143 - 85 Surface / 58 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).</p> <p>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.</p>						
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Tactical Tomahawk All-Up-Round (AUR) and Tactical Tomahawk Weapons Control System (TTWCS)		44.512	121.986	0.000	0.000	0.000
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. Continue development of activities associated with Military Global Positioning System User Equipment (MGUE) Insertion. In addition, the 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 in an A2AD environment.						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)			FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<p>FY 2018 Plans:</p> <p>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.</p> <p>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), modeling and simulation requirements defined, procure seeker hardware for test and integration, conduct Maritime Targeting Capability (MTC) flight test to affirm results of HWIL, and bench top mock-up for component integration. Coordinate with fleet stakeholders to develop TTPs and CONEMPs/CONOPs.</p> <p>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.</p> <p>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.</p> <p>FY 2019 Base Plans:</p>							

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A						
FY 2019 OCO Plans: N/A						
FY 2018 to FY 2019 Increase/Decrease Statement: Decrease of \$121.986M from FY 2018 to FY 2019 due to the A2AD project (PU 4032), M-Code ACAT IVT program (PU 4033), Maritime Strike RDC (PU 4034), JMEWS ACAT III program (PU 4035),TTWCS ACAT III program (PU 4036) and PPPI efforts (PU 4036) being separated from the Tomahawk Mission Planning Center Project unit 0545.						
Title: Theater Mission Planning Center (TMPC)		4.637	11.631	0.000	0.000	0.000
Articles:		-	-	-	-	-
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 2018 Plans: Continue TWS 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 Tomahawk missile performance characteristics are adequately modeled in TMPC; and continue evaluation of imagery formats resulting from nationally mandated architectural and format changes. Commence A2AD navigation and communications integration testing required to support the TWS Modernization program. Complete requirements and design and commence initial coding of Maritime Strike Tomahawk capability in support of the Maritime Strike requirement. Initiate requirements definition and preliminary design to support TWS Global Positioning System (GPS) Military-code (M-Code) upgrade necessary to enhance TWS GPS navigation and guidance.						
FY 2019 Base Plans: N/A						
FY 2019 OCO Plans: N/A						
FY 2018 to FY 2019 Increase/Decrease Statement:						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Decrease of \$11.631M from FY 2018 to FY 2019 due to the TMPC ACAT II program (PU 4036) being separated from the Tomahawk Mission Planning Center Project unit 0545.									
Accomplishments/Planned Programs Subtotals					49.149	133.617	0.000	0.000	0.000

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

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• WPN/2101: <i>Tomahawk</i>	297.505	234.461	98.570	-	98.570	98.115	130.981	210.305	265.712	1,983.683	16,473.952
• OPN/5253: <i>Tomahawk Support Equipment</i>	67.062	73.184	92.890	-	92.890	79.187	81.059	83.612	84.201	Continuing	Continuing
• OPN/9020: <i>Initial and Vendor Direct Spares</i>	0.181	0.311	0.365	-	0.365	0.185	0.180	0.199	0.219	Continuing	Continuing
• WPN/6120: <i>Spares and Repair Parts</i>	39.815	13.518	25.096	-	25.096	23.801	19.575	18.707	22.499	Continuing	Continuing

Remarks

D. Acquisition Strategy

The TACTOM Weapon System achieved IOC in May 2004. The acquisition strategy involves maintaining production through FY 2018 with final deliveries in FY 2020. 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.

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 2021 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.

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. The acquisition strategy also includes M-Code upgrades to the Tactical Tomahawk Weapons Control System (TTWCS) and requires upgrades to the Theater Mission Planning Center (TMPC). 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.

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<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 risk reduction activities in FY 2019, the program will enter the Engineering and Manufacturing Development (EMD) phase and conduct integration, System Engineering Technical Reviews (SETR), and testing activities. 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. Procurement of energetics material is required before Milestone C for first LRIP lot. Operational testing is 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, research and development is performed in order to provide scalable configurations to deploy where and as needed to provide necessary command and control, conduct development necessary to function with national and tactical imagery architectures, support new TWS capabilities, 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: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	12.178	13.247	Feb 2017	8.133	Feb 2018	0.000		-		0.000	0.000	33.558	Continuing
Systems Engineering - TTWCS A2AD Improvements (NAV/ COMMS)	WR	NSWC : Dahlgren, VA	2.650	0.615	Feb 2017	0.847	Feb 2018	0.000		-		0.000	0.000	4.112	Continuing
Systems Engineering - Hardware Development- A2AD Improvements (NAV/COMMS)	MIPR	NRO : Chantilly, VA	21.569	12.345	Nov 2016	8.470	Nov 2017	0.000		-		0.000	0.000	42.384	Continuing
Systems Engineering- TTWCS Software Support Activity(NAV/COMMS)	SS/CPFF	LMVF : Valley Forge, PA	1.117	1.661	Apr 2017	2.817	Feb 2018	0.000		-		0.000	0.000	5.595	Continuing
M-Code - TTWCS	WR	NSWC : Dahlgren, VA	0.000	0.000		0.800	Nov 2017	0.000		-		0.000	0.000	0.800	Continuing
M-Code - AUR	C/CPFF	Raytheon : Tucson, AZ	0.000	0.000		11.849	Feb 2018	0.000		-		0.000	0.000	11.849	Continuing
M-Code- AUR	SS/FFP	Raytheon SAS : El Segundo, CA	0.000	0.000		6.006	Dec 2017	0.000		-		0.000	0.000	6.006	Continuing
M-Code	WR	NSWC-IH : Indian Head, MD	0.000	0.000		0.300	Nov 2017	0.000		-		0.000	0.000	0.300	Continuing
M-Code	WR	NUWC-RI : Newport, RI	0.000	0.000		0.200	Nov 2017	0.000		-		0.000	0.000	0.200	Continuing
M-Code	WR	NAWC-AD : Pax River, MD	0.000	0.000		0.702	Nov 2017	0.000		-		0.000	0.000	0.702	Continuing
M-Code - TMPC	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.000		0.250	Dec 2017	0.000		-		0.000	0.000	0.250	Continuing
M-Code - TMPC	SS/CPFF	CommGlobal : SanJose, CA	0.000	0.000		0.500	Dec 2017	0.000		-		0.000	0.000	0.500	Continuing
Maritime Strike - TMPC	SS/CPFF	CommGlobal : San Jose, CA	0.000	0.530	Dec 2016	2.103	Dec 2017	0.000		-		0.000	0.000	2.633	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	0.622	Dec 2016	0.600	Dec 2017	0.000		-		0.000	0.000	1.222	Continuing
Maritime Strike - TMPC	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.435	Dec 2016	0.462	Dec 2017	0.000		-		0.000	0.000	0.897	Continuing
Maritime Strike - TMPC	SS/CPFF	Leidos : California, MD	0.000	0.999	Dec 2016	0.823	Dec 2017	0.000		-		0.000	0.000	1.822	Continuing
Maritime Strike - TMPC	SS/CPFF	UARC APL : Laurel, MD	0.000	0.375	Dec 2016	0.000		0.000		-		0.000	0.000	0.375	Continuing
Maritime Strike - TMPC	WR	NAWC-AD : Pax River, MD	0.000	0.126	Nov 2016	0.606	Nov 2017	0.000		-		0.000	0.000	0.732	Continuing
Maritime Strike - TMPC	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing
Maritime Strike - AUR	C/CPFF	Raytheon : Tucson, AZ	0.000	9.400	Jul 2017	59.650	Dec 2017	0.000		-		0.000	0.000	69.050	Continuing
Maritime Strike	SS/CPFF	UARC APL : Laurel, MD	0.000	0.000		0.425	Dec 2017	0.000		-		0.000	0.000	0.425	Continuing
Maritime Strike - TTWCS	WR	NSWC-DD : Dahlgren, VA	0.000	0.977	Nov 2016	0.000		0.000		-		0.000	0.000	0.977	Continuing
JMEWS - TMPC	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing
Maritime Strike - TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	1.132	Dec 2016	2.000	Dec 2017	0.000		-		0.000	0.000	3.132	Continuing
JMEWS - TMPC	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing
Maritime Strike - AUR	WR	NAWC-WD : China Lake, CA	0.000	0.521	Nov 2016	0.000		0.000		-		0.000	0.000	0.521	Continuing
JMEWS - TMPC	SS/CPFF	Leidos : California, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing
Maritime Strike - BRAT Dev	MIPR	AFRL : Dayton, OH	0.000	0.230	Jun 2017	0.000		0.000		-		0.000	0.000	0.230	Continuing
JMEWS - TMPC	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	WR	NAWC-WD : China Lake, CA	0.000	0.000		7.000	Nov 2017	0.000		-		0.000	0.000	7.000	Continuing
Prior Year Prod Dev cost no longer funded in the FYDP	Various	Various : Various	2,660.256	0.000		0.000		0.000		-		0.000	0.000	2,660.256	-
Subtotal			2,697.770	43.215		114.543		0.000		-		0.000	0.000	2,855.528	N/A
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	0.170	Feb 2017	0.900	Feb 2018	0.000		-		0.000	0.000	3.113	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	Boeing : St. Louis, MO	2.820	0.000		0.000	Feb 2018	0.000		-		0.000	0.000	2.820	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	BAE Systems : San Diego, CA	2.850	0.000		0.000	Feb 2018	0.000		-		0.000	0.000	2.850	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	Leidos : California, MD	4.560	0.441	Feb 2017	1.482	Feb 2018	0.000		-		0.000	0.000	6.483	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	SS/CPFF	UARC APL : Laurel, MD	2.623	0.000		0.000	Feb 2018	0.000		-		0.000	0.000	2.623	Continuing
TLAM MP Analysis - Mission Planning	SS/CPFF	UARC APL : Laurel, MD	1.145	0.321	Feb 2017	1.067	Feb 2018	0.000		-		0.000	0.000	2.533	Continuing
Imagery Format Analysis - Mission Planning	SS/CPFF	Leidos : California, MD	5.330	0.670	Feb 2017	1.618	Feb 2018	0.000		-		0.000	0.000	7.618	Continuing
A2AD Improvements (NAV/COMMS) - Mission Planning upgrade	WR	NAWC-AD : Pax River, MD	1.019	0.005	Feb 2017	1.220	Feb 2018	0.000		-		0.000	0.000	2.244	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018				
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Support - TTWCS AUR	WR	NSWC : Dahlgren, VA	4.067	0.000		0.520	Nov 2017	0.000		-		0.000	0.000	4.587	Continuing	
Development Support - CSS AUR	SS/CPFF	Leidos : California, MD	1.539	0.000		0.000		0.000		-		0.000	0.000	1.539	Continuing	
Development Support - Advanced Concepts AUR	WR	NAWC-WD : China Lake, CA	80.523	1.544	Feb 2017	1.734	Nov 2017	0.000		-		0.000	0.000	83.801	Continuing	
Development Support - AUR Fleet Representative	SS/CPFF	UARC APL : Laurel, MD	0.180	0.317	Feb 2017	0.325	Nov 2017	0.000		-		0.000	0.000	0.822	Continuing	
Development Support - Advanced Concepts AUR	WR	NAWC-AD : Pax River, MD	0.368	0.385	Feb 2017	0.399	Nov 2017	0.000		-		0.000	0.000	1.152	Continuing	
Development Support - Advanced Concepts AUR	WR	NSWC : Dahlgren, VA	0.048	0.348	Feb 2017	0.443	Nov 2017	0.000		-		0.000	0.000	0.839	Continuing	
Development Spt - CSS AUR	C/BA	Precise : Lexington Park, MD	0.000	0.180	Dec 2017	0.982	Dec 2017	0.000		-		0.000	0.000	1.162	Continuing	
Development Spt - M-Code	C/BA	UARC APL : Laurel, MD	0.000	0.000		1.347	Dec 2017	0.000		-		0.000	0.000	1.347	Continuing	
M-Code AUR	WR	NUWC-NPT : Newport, RI	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code AUR	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code AUR	WR	NSWC-IH : Indian Head, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code TWS	C/BA	Precise : Lexington Park, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code TTWCS	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code TTWCS	C/BA	UARC APL : Laurel, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	
M-Code TTWCS	SS/CPFF	LMBM : Baltimore, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing	

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 TTWCS	WR	NUWC-NPT : Newport, RI	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing
Development Spt - Maritime Strike	WR	NUWC-NPT : Newport, RI	0.000	0.188	Jun 2017	0.000		0.000		-		0.000	0.000	0.188	Continuing
Development Spt - Maritime Strike	WR	NAWC-WD : China Lake, CA	0.000	0.000		1.010	Nov 2017	0.000		-		0.000	0.000	1.010	Continuing
Development Spt - Maritime Strike	SS/CPFF	NSWC-DD : Dahlgren, VA	0.000	0.500	Jun 2017	1.980	Nov 2017	0.000		-		0.000	0.000	2.480	Continuing
Development Spt - Maritime Strike	WR	NAWC-AD : Pax River, MD	0.000	0.865	Jun 2017	1.010	Nov 2017	0.000		-		0.000	0.000	1.875	Continuing
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	Continuing
Subtotal			383.533	5.934		16.037		0.000		-		0.000	0.000	405.504	N/A
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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		0.000		0.000		-		0.000	0.000	0.000	Continuing
Maritime Strike	WR	NAWC-AD : China Lake, CA	0.000	0.000		1.500	Nov 2017	0.000		-		0.000	0.000	1.500	Continuing
Maritime Strike	WR	NAWC-WD : Pax River, MD	0.000	0.000		0.425	Nov 2017	0.000		-		0.000	0.000	0.425	Continuing
Maritime Strike	WR	NSWC : Dahlgren, VA	0.000	0.000		0.500	Dec 2017	0.000		-		0.000	0.000	0.500	Continuing
TTWCS	WR	NSWC-DD : Dahlgren	0.000	0.000		0.612	Dec 2017	0.000		-		0.000	0.000	0.612	Continuing
M-Code	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing
A2AD Improvements (NAV/COMMS)	SS/CPFF	NSWC-IHD : Indian Head, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	Continuing

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Remarks

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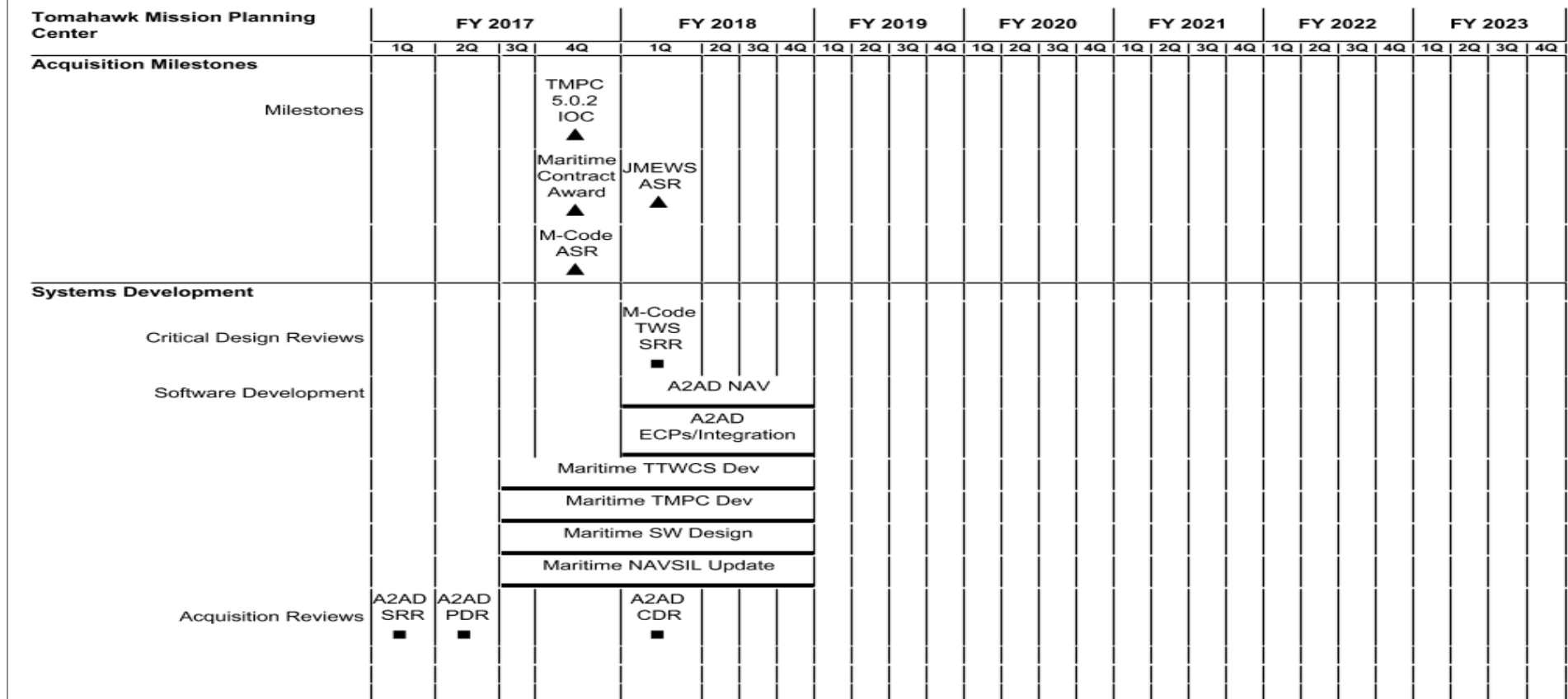
Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy

Date: February 2018

Appropriation/Budget Activity
1319 / 7

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

Project (Number/Name)
0545 / *TOMAHAWK*



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PE 0204229N: *Tomahawk Mssn Planning Ctr*
Navy

R-1 Line #222

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

Project (Number/Name) 0545 / TOMAHAWK	
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PE 0204229N: *Tomahawk Mssn Planning Ctr*
Navy

R-1 Line #222

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

Project (Number/Name)
0545 / TOMAHAWK

[illegible]

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 0545 / TOMAHAWK	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Tomahawk Mission Planning Center</i>				
Acquisition Milestones: Milestones: TMPC 5.0.2 IOC	4	2017	4	2017
Acquisition Milestones: Milestones: Maritime Strike Contract Award	4	2017	4	2017
Acquisition Milestones: Milestones: JMEWS Acquisition Strategy Review	1	2018	1	2018
Acquisition Milestones: Milestones: M-Code Acquisition Strategy Review	4	2017	4	2017
Systems Development: Critical Design Reviews: M-CodeTWS SRR	1	2018	1	2018
Systems Development: Software Development: A2AD Navigation	1	2018	4	2018
Systems Development: Software Development: A2AD ECPs/Integration	1	2018	4	2018
Systems Development: Software Development: Maritime Strike- TTWCS Development	3	2017	4	2018
Systems Development: Software Development: Maritime Strike- TMPC Development	3	2017	4	2018
Systems Development: Software Development: Maritime Strike Software Design	3	2017	4	2018
Systems Development: Software Development: Maritime Strike NAVSIL Update	3	2017	4	2018
Systems Development: Acquisition Reviews: A2AD - SRR	1	2017	1	2017
Systems Development: Acquisition Reviews: A2AD - PDR	2	2017	2	2017
Systems Development: Acquisition Reviews: A2AD - CDR	1	2018	1	2018
<i>Tomahawk Mission Planning Center - Page 2</i>				
Systems Development (cont): Hardware Development: TT Preplanned Product Improvement (P3I)	1	2017	4	2018
Systems Development (cont): Hardware Development: Maritime Strike - AUR Seeker Integration	3	2017	4	2018
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

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy

Date: February 2018

Appropriation/Budget Activity

1319 / 7

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
Test and Evaluation: TTWCS V5.6 Modernized Missile DT/OT	1	2018	4	2018
Test and Evaluation: Maritime Strike - HWIL/LAB/Integration Testing	3	2017	4	2018
Test and Evaluation: Maritime Strike Initial Integration Testing	4	2018	4	2018
Test and Evaluation: TMPC 5.0.2	1	2017	2	2017
Test and Evaluation: TMPC 6.0	3	2018	4	2018
Test and Evaluation: A2AD Parking Lot Test	2	2018	2	2018
Tomahawk Mission Planning Center - Page 3				
Production Milestones: Contract Awards: M-Code EMD Phase I	2	2018	2	2018
Production Milestones: Contract Awards: A2AD Kit Award Lot-1	2	2018	2	2018

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4032 / A2AD			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
4032: A2AD	0.000	0.000	0.000	4.835	-	4.835	4.144	0.000	0.000	0.000	0.000	8.979
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 289												
A. Mission Description and Budget Item Justification This project funds Anti-Access / Area Denial (A2AD) 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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	
Title: Anti-Access/Area Denial							0.000	0.000	4.835	0.000	4.835	
Articles:							-	-	-	-	-	
FY 2018 Plans: N/A												
FY 2019 Base Plans: FY 2019 plans include A2AD(NAV/COMMS) identification of the kit bill of materials, logistics, fabrication, assembly, integration, test, and documentation of prototype kits for the Functional Ground Test (FGT), flight test, and associated procedures. Includes the completion of the FGT and technical assessments of data collected. Continue program management and engineering support for navigation and communication system upgrades completion of the Engineering Change Proposal (ECP). Continue technical engineering support to the Integrated Single Box Solution (ISBS) radio developer and Advanced Communication Architecture (ACA) Network Service Provider. Complete the AUR System Verification Review (SVR) and Operational Test Readiness Review (OTRR).												
FY 2019 OCO Plans: N/A												
FY 2018 to FY 2019 Increase/Decrease Statement:												

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018	
Appropriation/Budget Activity 1319 / 7				R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4032 / A2AD			
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)											
				FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total			
FY 2019 funding was realigned from 0545 project unit. PU 4032 A2AD efforts decrease from FY 2018 \$19.957M to FY 2019 \$4.835M due to the completion of the A2AD CDR in FY 2018 and the commencement of the project's testing efforts in FY 2019.											
Accomplishments/Planned Programs Subtotals				0.000	0.000	4.835	0.000	4.835			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• WPN 2101: <i>Tomahawk</i>	297.505	234.461	98.570	-	98.570	98.115	130.981	210.305	265.712	1,983.683	16,473.952
• OPN 5253: <i>Tomahawk Support Equipment</i>	67.062	73.184	92.890	-	92.890	79.187	81.059	83.612	84.201	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.181	0.311	0.365	-	0.365	0.185	0.180	0.199	0.219	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	39.815	13.518	25.096	-	25.096	23.801	19.575	18.707	22.499	Continuing	Continuing
Remarks											
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 will be incorporated during missile recertification scheduled to begin in FY 2019.											
E. Performance Metrics The Navy seeks to improve the Tomahawk cruise missile attack capability against land and maritime targets through research and development.											
Examples in the area of the All-Up-Round include development of improved navigation, control, and mission computer two-way satellite communications, all in line with state of the art technology.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy													Date: February 2018		
Appropriation/Budget Activity 1319 / 7							R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4032 / A2AD				
Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Prime Integrator (NAV/COMMS)	SS/CPFF	Raytheon : Tucson, AZ	0.000	0.000		0.000		0.750	Nov 2018	-		0.750	0.000	0.750	-
Hardware Development- A2AD Improvements (NAV/COMMS)	MIPR	NRO : Chantilly, VA	0.000	0.000		0.000		2.585	Nov 2018	-		2.585	0.000	2.585	-
Subtotal			0.000	0.000		0.000		3.335		-		3.335	0.000	3.335	N/A
Remarks FY 2019 A2AD Product Development funding required to continue hardware development to include the development of either multiple or multi-band antennas, for the integrated single box solution radio.															
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Development Support	WR	NAWC-AD : Pax River, MD	0.000	0.000		0.000		0.350	Nov 2018	-		0.350	0.000	0.350	-
Subtotal			0.000	0.000		0.000		0.350		-		0.350	0.000	0.350	N/A
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Test & Evaluation	WR	NAWC-WD : China Lake, CA	0.000	0.000		0.000		0.625	Nov 2018	-		0.625	0.000	0.625	-
A2AD Test & Evaluation	SS/CPFF	Raytheon : Tucson, AZ	0.000	0.000		0.000		0.525	Dec 2018	-		0.525	0.000	0.525	-
Subtotal			0.000	0.000		0.000		1.150		-		1.150	0.000	1.150	N/A
Remarks FY 2019 A2AD Test and Evaluation funding required for prototype kits for the Functional Ground Test (FGT), flight test, and associated procedures.															

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy										Date: February 2018			
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>					Project (Number/Name) 4032 / A2AD			
	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		4.835		-		4.835	0.000	4.835	N/A
Remarks													

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PE 0204229N: *Tomahawk Mssn Planning Ctr*
Navy

R-1 Line #222

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

4032 / A2AD

2019PB - 0204229N - 4032

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>	Project (Number/Name) 4032 / A2AD	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
A2AD				
Acquisition Milestones: Milestones: A2AD Recert Cut-In	3	2019	3	2019
Acquisition Milestones: Milestones: A2AD Modernization Blk IV Fleet Release	4	2020	4	2020
Systems Development: Software Development: A2AD Navigation/Communications ECPs/Integration	1	2019	4	2020
Reviews: Acquisition Reviews: A2AD - OTRR	4	2020	4	2020
Test and Evaluation: A2AD Functional Ground Test	3	2019	3	2019
Test and Evaluation: A2AD Operational Test	4	2020	4	2020
Production Milestones: Contract Awards: A2AD Kit Award Lot-2	2	2019	2	2019
Production Milestones: Contract Awards: A2AD Kit Award Lot-3	2	2020	2	2020
Production Milestones: Contract Awards: A2AD Kit Award Lot-4	2	2021	2	2021
Production Milestones: Contract Awards: A2AD Kit Award Lot-5	2	2022	2	2022
Production Milestones: Contract Awards: A2AD Kit Award Lot-6	2	2023	2	2023
Deliverables: A2AD (COMMS/NAV) Production Deliveries	2	2019	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4033 / M-Code			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
4033: M-Code	0.000	0.000	0.000	29.013	-	29.013	26.267	7.951	3.400	3.600	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The M-Code ACAT IVT 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 2023. 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.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)								FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: M-Code <div>Articles:</div> FY 2018 Plans: N/A FY 2019 Base Plans: Continuation of Military-code (M Code) planned activities include performing engineering, design, fabrication, procurement, integration, testing, evaluation, and management. Engineering and design activities include requirements finalization, TWS interface development & finalization, and System Engineering Technical Reviews (SETR). Other FY19 plans include updating the Life Cycle Support Plan (LCSP); continuing design & certification of the Application Specific Integrated Circuit (ASIC) chip; fabrication, integration, testing and evaluation (IT&E) of the ASIC chip into the upgraded Anti-jam GPS Receiver (AGR-5); beginning stages of IT&E of the AGR-5 into subsystem components and the All-Up-Round (AUR) missile. FY19 will also 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 Modeling & Simulation (M&S) testing events. Finally, utilize a satellite simulator, to simulate the M-Code transmissions and software. FY 2019 OCO Plans: N/A FY 2018 to FY 2019 Increase/Decrease Statement: FY 2019 funding was realigned from 0545 project unit. PU 4033 M-Code increase from FY 2018 \$22.0M to FY 2019 \$29.0M required to continue design & certification of the Application Specific Integrated Circuit (ASIC) chip; fabrication, integration, testing and evaluation (IT&E) of the ASIC chip into the upgraded Anti-jam GPS Receiver								0.000	0.000	29.013	0.000	29.013
								-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018	
Appropriation/Budget Activity 1319 / 7				R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4033 / M-Code			

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
(AGR-5); beginning stages of IT&E of the AGR-5 into subsystem components and the AUR missile. In addition, Test and Evaluation events 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.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	29.013	0.000	29.013

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2019 Base</u>	<u>FY 2019 OCO</u>	<u>FY 2019 Total</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• WPN 2101: <i>Tomahawk</i>	297.505	234.461	98.570	-	98.570	98.115	130.981	210.305	265.712	1,983.683	16,473.952
• OPN 5253: <i>Tomahawk Support Equipment</i>	67.062	73.184	92.890	-	92.890	79.187	81.059	83.612	84.201	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.181	0.311	0.000	0.365	0.365	0.185	0.180	0.199	0.219	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	39.815	13.518	25.096	-	25.096	23.801	19.575	18.707	22.499	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
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. The acquisition strategy also includes M-Code upgrades to the Tactical Tomahawk Weapons Control System (TTWCS) and requires updates to the Theater Mission Planning Center (TMPC). 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.											
E. Performance Metrics											
The Navy seeks to improve the Tomahawk cruise missile attack capability against land and maritime targets through research and development.											
Examples in the area of the All-Up-Round include development of a high anti-jam GPS receiver in line with state of the art technology.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	0.000		0.000		19.195	Dec 2018	-		19.195	Continuing	Continuing	Continuing
M-Code - AUR	SS/FFP	Raytheon : Raytheon SAS: El Segundo, CA	0.000	0.000		0.000		3.485	Dec 2018	-		3.485	Continuing	Continuing	Continuing
M-Code - TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.000		0.000		0.946	Nov 2018	-		0.946	Continuing	Continuing	Continuing
M-Code - TTWCS	SS/CPFF	LMBM : Baltimore, MD	0.000	0.000		0.000		0.161	Nov 2018	-		0.161	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		23.787		-		23.787	Continuing	Continuing	N/A
Remarks															
FY 2019 M-Code product development funding required to continue design & certification of the Application Specific Integrated Circuit (ASIC) chip; fabrication, integration, testing and evaluation (IT&E) of the ASIC chip into the upgraded Anti-jam GPS Receiver (AGR-5); beginning stages of IT&E of the AGR-5 into subsystem components and the AUR missile.															
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	0.000		0.000		0.133	Nov 2018	-		0.133	Continuing	Continuing	Continuing
M-Code Development Support	WR	NUWC-NPT : Newport, RI	0.000	0.000		0.000		0.886	Nov 2018	-		0.886	Continuing	Continuing	Continuing
M-Code Development Support	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		1.468	Nov 2018	-		1.468	Continuing	Continuing	Continuing
M-Code Development Support	WR	NSWC-IH : Indian Head, VA	0.000	0.000		0.000		0.697	Nov 2018	-		0.697	Continuing	Continuing	Continuing
M-Code Development Support	SS/CPFF	UARC APL : Laurel, MD	0.000	0.000		0.000		1.318	Nov 2018	-		1.318	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		4.502		-		4.502	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4033 / M-Code					
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Test & Evaluation	WR	NAWC-AD : Patuxent River	0.000	0.000		0.000		0.362	Nov 2018	-		0.362	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		0.362		-		0.362	Continuing	Continuing	N/A
Remarks FY 2019 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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	WR	NAWC-AD : Patuxent River	0.000	0.000		0.000		0.362	Nov 2018	-		0.362	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		0.362		-		0.362	Continuing	Continuing	N/A
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	0.000		0.000		29.013		-		29.013	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy

Date: February 2018

Appropriation/Budget Activity
1319 / 7

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

Project (Number/Name)
4033 / *M-Code*

M-CODE	FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Acquisition Milestones																												
Milestones									MS B ▲								MS C ▲											M-Code Fleet Release ▲
Systems Development																												
Critical Design Reviews																												
Software Development																												
Acquisition Reviews																												
Test and Evaluation																												
Production Milestones																												
Contract Awards																												
Deliveries																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy			Date: February 2018
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	1	2019	1	2019
Acquisition Milestones: Milestones: Milestone C	1	2021	1	2021
Acquisition Milestones: Milestones: M-Code Fleet Release	4	2023	4	2023
Systems Development: Critical Design Reviews: M-Code CDR	3	2019	3	2019
Systems Development: Critical Design Reviews: M-Code OTRR	2	2023	2	2023
Systems Development: Software Development: M-Code TTWCS Software Development	1	2019	4	2023
Systems Development: Test and Evaluation: M-Code Developmental Test	1	2019	4	2020
Systems Development: Test and Evaluation: M-Code Operational Test	1	2021	2	2023
Production Milestones: Contract Awards: M-Code EMD Award Phase II	2	2019	2	2019
Production Milestones: Deliveries: M-Code LRIP - LOT-1	1	2021	1	2021
Production Milestones: Deliveries: M-Code LRIP - LOT-2	1	2022	1	2022
Production Milestones: Deliveries: M-Code LRIP - LOT-3	1	2023	1	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4034 / Maritime Strike			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
4034: Maritime Strike	0.000	0.000	0.000	202.450	-	202.450	133.980	102.822	0.000	0.000	0.000	439.252
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Maritime Strike Tomahawk Articles: FY 2018 Plans: N/A FY 2019 Base Plans: Continuation of activities in support of Maritime Strike Tomahawk (MST). Effort includes development of system requirements, specifications, and interfaces; integration of seeker suites, culminating in a mature hardware design with software algorithm preliminary design architecture. Continue TTWCS, TMPC, and missile software development; captive carriage flights and sensor capture events, and lab and component-level testing. Award contract for integration and test. Commence integration and testing of mature hardware design with software functionality qualification of hardware and software, missile OES software development, laboratory development of Modeling and Simulation capabilities in the lab for missile performance and algorithm maturity, and simulation updates. In addition, procure Engineering Development Models (EDMs) for the purpose of parallel testing and reducing risk while allowing for procurement of hardware components required to build kits for full system end to end testing in FY 2020. FY 2019 OCO Plans: N/A FY 2018 to FY 2019 Increase/Decrease Statement: FY 2019 funding was realigned from 0545 project unit. Increase in MST from FY 2018 \$73.0M to FY 2019 \$202.5M associated with development of system requirements, specifications, and interfaces; integration of seeker suites, culminating in a mature hardware design with software algorithm preliminary design architecture. Funding will procure Engineering Development Models (EDMs) for the purpose of parallel testing and reducing								0.000	0.000	202.450	0.000	202.450
								-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018	
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
risk while allowing for procurement of hardware components required to build kits for full system end to end testing in FY 2020. In addition, FY 2019 funding for Test and Evaluation will commence integration and testing of mature hardware design with software functionality qualification of hardware and software, missile OES software development, laboratory development of Modeling and Simulation capabilities in the lab for missile performance and algorithm maturity, and simulation updates.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	202.450	0.000	202.450

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• WPN 2101: <i>Tomahawk</i>	297.505	234.461	98.570	-	98.570	98.115	130.981	210.305	265.712	1,983.683	16,473.952
• OPN 5253: <i>Tomahawk Support Equipment</i>	67.062	73.184	92.890	-	92.890	79.187	81.059	83.612	84.201	Continuing	Continuing
• OPN 9120: <i>Initial and Vendor Direct Spares</i>	0.181	0.311	0.365	-	0.365	0.185	0.180	0.199	0.219	Continuing	Continuing
• WPN 6120: <i>Spares and Repair Parts</i>	39.815	13.518	25.096	-	25.096	23.801	19.575	18.707	22.499	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
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 Q4 FY 2021 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.											
E. Performance Metrics											
The Navy seeks to improve the Tomahawk cruise missile attack capability against land and maritime targets through research and development.											
Examples in the area of the All-Up-Round include development of a seeker that will enhance weapon ability to cover all assigned target types in line with state of the art technology.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4034 / Maritime Strike					
Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 - AUR	C/CPFF	Raytheon : Tucson, AZ	0.000	0.000		0.000		183.200	Dec 2018	-		183.200	0.000	183.200	-
Maritime Strike - AUR	WR	NAWCWD : China Lake, CA	0.000	0.000		0.000		1.400	Nov 2018	-		1.400	0.000	1.400	-
Maritime Strike- TTWCS	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.000		0.000		3.300	Dec 2018	-		3.300	0.000	3.300	-
Maritime Strike- TTWCS	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		7.200	Nov 2018	-		7.200	0.000	7.200	-
Maritime Strike- TTWCS	WR	NUWC-DN : Newport, RI	0.000	0.000		0.000		0.700	Nov 2018	-		0.700	0.000	0.700	-
Subtotal			0.000	0.000		0.000		195.800		-		195.800	0.000	195.800	N/A
Remarks															
FY 2019 Maritime Strike funding includes development of system requirements, specifications, and interfaces; integration of seeker suites, culminating in a mature hardware design with software algorithm preliminary design architecture. Funding will procure Engineering Development Models (EDMs) for the purpose of parallel testing and reducing risk while allowing for procurement of hardware components required to build kits for full system end to end testing in FY 2020. Increase to TTWCS Product Development accelerates TTWCS IOC by one year (FY 2021).															
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Development Support	WR	NAWC-WD : China Lake	0.000	0.000		0.000		3.400	Nov 2018	-		3.400	0.000	3.400	-
Martime Strike Development Support	SS/CPFF	UARC APL : Laurel, MD	0.000	0.000		0.000		0.450	Dec 2018	-		0.450	0.000	0.450	-
Maritime Strike Development Support	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		0.500	Nov 2018	-		0.500	0.000	0.500	-
Maritime Strike Development Support	WR	NAWC-AD : Pax River, MD	0.000	0.000		0.000		0.300	Nov 2018	-		0.300	0.000	0.300	-
Subtotal			0.000	0.000		0.000		4.650		-		4.650	0.000	4.650	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr						Project (Number/Name) 4034 / Maritime Strike			
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 Test and Evaluation	WR	NAWC-WD : China Lake	0.000	0.000		0.000		1.500	Nov 2018	-		1.500	0.000	1.500	-
Maritime Strike Test and Evaluation	WR	NAWC-AD : Pax River	0.000	0.000		0.000		0.250	Nov 2018	-		0.250	0.000	0.250	-
Maritime Strike Test and Evaluation	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		0.250	Nov 2018	-		0.250	0.000	0.250	-
Subtotal			0.000	0.000		0.000		2.000		-		2.000	0.000	2.000	N/A
Remarks FY 2019 Test and Evaluation Maritime Strike funding required to commence integration and testing of mature hardware design with software functionality qualification of hardware and software, missile OES software development, laboratory development of Modeling and Simulation capabilities in the lab for missile performance and algorithm maturity, and simulation updates.															
			Prior Years	FY 2017	FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals			0.000	0.000	0.000		202.450		-		202.450	0.000	202.450	N/A	
Remarks 															

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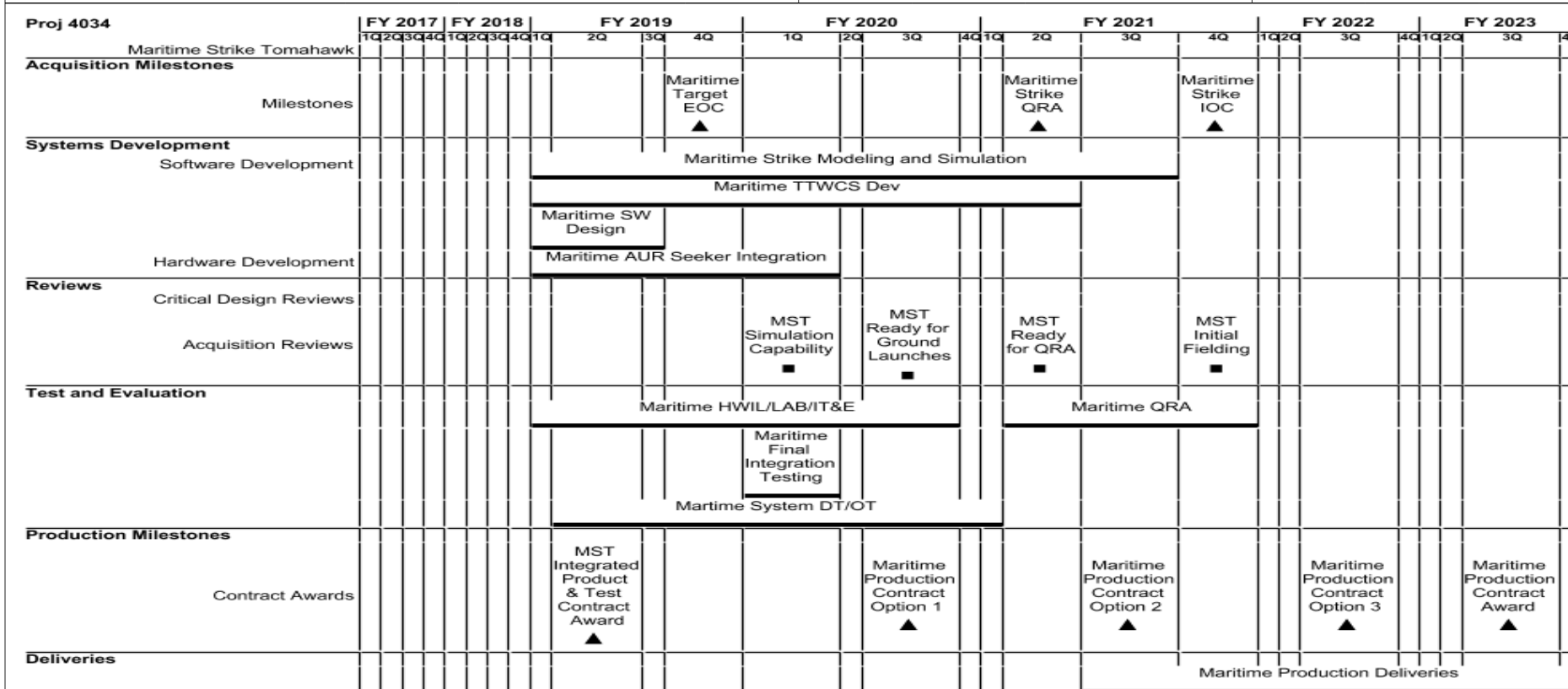
Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy

Date: February 2018

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 2019 Navy			Date: February 2018
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
<i>Proj 4034</i>				
Acquisition Milestones: Milestones: Maritime Target Capability Early Operational Capability	4	2019	4	2019
Acquisition Milestones: Milestones: Maritime Strike Initial Operational Capability	4	2021	4	2021
Acquisition Milestones: Milestones: Maritime Strike QRA	2	2021	2	2021
Systems Development: Software Development: Maritime Strike Modeling and Simulation	1	2019	3	2021
Systems Development: Software Development: Maritime Strike- TTWCS Development	1	2019	2	2021
Systems Development: Software Development: Maritime Strike Software Design	1	2019	3	2019
Systems Development: Hardware Development: Maritime Strike - AUR Seeker Integration	1	2019	1	2020
Reviews: Acquisition Reviews: Maritime Strike Simulation Capability	1	2020	1	2020
Reviews: Acquisition Reviews: Maritime Strike Ready for Ground Launches	3	2020	3	2020
Reviews: Acquisition Reviews: Maritime Strike Ready for QRA	2	2021	2	2021
Reviews: Acquisition Reviews: Maritime Strike Initial Fielding	4	2021	4	2021
Test and Evaluation: Maritime Strike - HWIL/LAB/Integration Testing	1	2019	3	2020
Test and Evaluation: Maritime Strike QRA	2	2021	4	2021
Test and Evaluation: Maritime Strike Final Integration Testing	1	2020	1	2020
Test and Evaluation: Maritime Strike Testing	2	2019	1	2021
Production Milestones: Contract Awards: MST Integrated Product & Test Contract Award	2	2019	2	2019
Production Milestones: Contract Awards: Maritime Strike Production Contract Award LRIP-1	3	2020	3	2020

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy			Date: February 2018		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr		Project (Number/Name) 4034 / Maritime Strike	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
Production Milestones: Contract Awards: Maritime Strike Production Contract Award LRIP-2		3	2021	3	2021
Production Milestones: Contract Awards: Maritime Strike Production Contract Award LRIP-3		3	2022	3	2022
Production Milestones: Contract Awards: Maritime Strike Production Contract Award LRIP-4		3	2023	3	2023
Deliveries: Maritime Strike Production Deliveries		3	2021	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / <i>Tomahawk Mssn Planning Ctr</i>				Project (Number/Name) 4035 / JMEWS			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
4035: JMEWS	0.000	0.000	0.000	22.708	-	22.708	41.226	45.543	37.021	30.765	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).												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)							FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	
Title: JMEWS							0.000	0.000	22.708	0.000	22.708	
Articles:							-	-	-	-	-	
FY 2018 Plans: N/A												
FY 2019 Base Plans: JMEWS planned activities include completion of the fuze risk reduction efforts, and completing Milestone B to enter the Engineering and Manufacturing Development phase. Fuze risk reduction will culminate in sled testing. Initial Engineering and Manufacturing Design (EMD) efforts include continuation of hardware and software development, performing fuze and warhead integration, performing subscale testing required to improve lethality modeling capabilities, and system engineering reviews. Update Tomahawk Test and Evaluation Master Plan.												
FY 2019 OCO Plans: N/A												
FY 2018 to FY 2019 Increase/Decrease Statement: FY 2019 funding was realigned from 0545 project unit. Increase in JMEWS from FY 2018 \$7.0M to FY 2019 \$22.7M due to product development efforts required to complete fuze risk reduction efforts culminating in sled testing. Initial Engineering and Manufacturing Design (EMD) efforts include continuation of hardware and software development, performing fuze and warhead integration, performing subscale testing required to improve lethality modeling capabilities, and system engineering reviews.												
Accomplishments/Planned Programs Subtotals							0.000	0.000	22.708	0.000	22.708	

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 7				R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4035 / JMEWS				
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost	
• WPN 2101: Tomahawk	297.505	234.461	98.570	-	98.570	98.115	130.981	210.305	265.712	1,983.683	16,473.952	
• OPN 5253: Tomahawk Support Equipment	67.062	73.184	92.890	-	92.890	79.187	81.059	83.612	84.201	Continuing	Continuing	
• OPN 9020: Initial and Vendor Direct Spares	0.181	0.311	0.000	0.365	0.365	0.185	0.180	0.199	0.219	Continuing	Continuing	
• WPN 6120: Spares and Repair Parts	39.815	13.518	25.096	-	25.096	23.801	19.575	18.707	22.499	Continuing	Continuing	
Remarks												
D. Acquisition Strategy												
Upon completion of the Joint Multiple Effects Warhead System (JMEWS) fuze risk reduction activities in FY 2019, the program will enter the Engineering and Manufacturing Development (EMD) phase and conduct integration, Systems Engineering Technical Review (SETR), and testing activities. 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. Procurement of energetics material is required before Milestone (MS) C for first LRIP lot. Operational testing is scheduled for FY 2023.												
E. Performance Metrics												
The Navy seeks to improve the Tomahawk cruise missile attack capability against land targets through research and development.												
Examples in the area of the All-Up-Round include development of candidate warheads that will enhance weapon ability to cover all assigned target types in line with state of the art technology.												

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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/CPFF	Raytheon : Tucson, AZ	0.000	0.000		0.000		15.500	Dec 2018	-		15.500	Continuing	Continuing	Continuing
JMEWS	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.000		1.100	Nov 2018	-		1.100	Continuing	Continuing	Continuing
JMEWS	WR	NAWC-WD : China Lake, CA	0.000	0.000		0.000		5.000	Nov 2018	-		5.000	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		21.600		-		21.600	Continuing	Continuing	N/A
Remarks FY 2019 JMEWS product development efforts are required to complete fuze risk reduction efforts to culminate in sled testing.															
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	0.000		0.000		0.500	Nov 2018	-		0.500	Continuing	Continuing	Continuing
JMEWS Development Support	WR	NSWC-IH : Indian Head, MD	0.000	0.000		0.000		0.300	Nov 2018	-		0.300	Continuing	Continuing	Continuing
JMEWS Development Support	WR	NSWC-DD : Dahlgren, VA	0.000	0.000		0.000		0.308	Nov 2018	-		0.308	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		1.108		-		1.108	Continuing	Continuing	N/A
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	0.000		0.000		22.708		-		22.708	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy

Date: February 2018

Appropriation/Budget Activity
1319 / 7

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

Project (Number/Name)
4035 / JMEWS

JMEWS		FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023										
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q							
Acquisition Milestones																																				
Milestones										MS B ▲																	MS C ▲									
Systems Development													JMEWS TTWCS SW Dev																							
Hardware Development										JMEWS FUZE RISK REDUCTION																										
												JMEWS Warhead,Fuze,Target Design Integration																								
Reviews																																				
Critical Design Reviews																																				
Acquisition Reviews													JMEWS PDR ▲			JMEWS CDR ▲																				
Test and Evaluation																																				
Production Milestones																																				
Contract Awards													JMEWS EMD Contract Award ▲							JMEWS Long-Lead Energetics Award ▲						JMEWS Production Contract Award ▲										
Deliveries																																				

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy			Date: February 2018
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	2019	2	2019
Acquisition Milestones: Milestones: Milestone C	1	2023	1	2023
Systems Development: Software Development: JMEWS TTWCS SW Dev	4	2019	4	2023
Systems Development: Hardware Development: JMEWS FUZE RISK REDUCTION	1	2019	3	2019
Systems Development: Hardware Development: JMEWS Warhead,Fuze,Target Design Integration	3	2019	1	2023
Reviews: Acquisition Reviews: JMEWS PDR	1	2020	1	2020
Reviews: Acquisition Reviews: JMEWS CDR	4	2020	4	2020
Test and Evaluation: JMEWS DT	4	2020	1	2023
Test and Evaluation: JMEWS OT	2	2023	4	2023
Production Milestones: Contract Awards: JMEWS EMD Contract Award	3	2019	3	2019
Production Milestones: Contract Awards: JMEWS Long-Lead Energetics Award	1	2022	1	2022
Production Milestones: Contract Awards: JMEWS Production Contract Award	1	2023	1	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr				Project (Number/Name) 4036 / TTWCS TMPC PPPI			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
4036: TTWCS TMPC PPPI	0.000	0.000	0.000	23.389	-	23.389	17.998	14.000	10.165	17.868	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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).

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 187 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) (143 - 85 Surface / 58 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, 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.

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy				Date: February 2018		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0204229N / Tomahawk Mssn Planning Ctr		Project (Number/Name) 4036 / TTWCS TMPC PPPI		
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Theater Mission Planning Center (TMPC) Articles:		0.000	0.000	20.664	0.000	20.664
		-	-	-	-	-
FY 2018 Plans: N/A						
FY 2019 Base Plans: Continue TWS 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 Tomahawk missile performance characteristics are adequately modeled in TMPC; and continue evaluation of imagery formats resulting from nationally mandated architectural and format changes. Conduct A2AD navigation and communications system product acceptance testing (PAT) at the TWS level required to support the TWS Modernization program. Conduct software development and start system integration and testing of Maritime Strike Tomahawk capability. Conduct requirements definition for the TWS GPS M-Code upgrade necessary to enhance TWS GPS navigation and guidance. Conduct requirements definition and preliminary design to support TWS Joint Multiple Effects Warhead System (JMEWS) transition, demonstration and test efforts.						
FY 2019 OCO Plans: N/A						
FY 2018 to FY 2019 Increase/Decrease Statement: FY 2019 funding was realigned from 0545 project unit. Increase from FY 2018 of \$11.6M to FY 2019 of \$23.2M funds JMEWS initial requirements definition for insertion into the Tomahawk Weapon System.						
Title: Tactical Tomahawk Weapons Control System (TTWCS) Articles:		0.000	0.000	2.725	0.000	2.725
		-	-	-	-	-
FY 2018 Plans: N/A						
FY 2019 Base Plans: Continue TTWCS software development efforts necessary to enable Tomahawk navigation and communications modernization. Conduct integration and functional testing for TTWCS v5.6 which includes A2AD navigation and modernization improvements. Correct and verify software deficiencies found in segment testing and develop						

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy								Date: February 2018			
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<p>final software "fix-it" build for system level test events. Continue TTWCS ship test, ship certifications and prepare for operational test events.</p> <p><i>FY 2019 OCO Plans:</i> N/A</p> <p><i>FY 2018 to FY 2019 Increase/Decrease Statement:</i> FY 2019 funding was realigned from 0545 project unit. Funding levels associated with the TTWCS program have remained stable from FY 2018 to FY 2019 and are required to conduct development efforts to provide launch capability to A2AD (Nav/Comms) and conduct PPPI engineering activities, system and software development, integration and testing of capability upgrades to address emergent threats, UONS, fleet gaps, and the Tomahawk ORD.</p>					
Accomplishments/Planned Programs Subtotals	0.000	0.000	23.389	0.000	23.389

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2019 Base</u>	<u>FY 2019 OCO</u>	<u>FY 2019 Total</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• OPN 5253: <i>Tomahawk Support Equipment</i>	67.062	73.184	92.890	-	92.890	79.187	81.059	83.612	84.201	Continuing	Continuing
• OPN 9020: <i>Initial and Vendor Direct Spares</i>	0.181	0.311	0.374	-	0.374	0.281	0.231	0.204	0.000	Continuing	Continuing
• WPN 2101: <i>Tomahawk</i>	297.505	234.461	98.570	-	98.570	98.115	130.981	210.305	265.712	1,983.683	16,473.952
• WPN 6120: <i>Spares and Repair Parts</i>	62.383	110.255	135.688	-	135.688	133.450	131.911	143.868	146.315	Continuing	Continuing
Remarks											
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.											
E. Performance Metrics											
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											

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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>
<p>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, research and development is performed in order to provide scalable configurations to deploy where and as needed to provide necessary command and control, conduct development necessary to function with national and tactical imagery architectures, support new TWS capabilities, 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: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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	Vencore : San Jose, CA	0.000	0.000		0.000		5.675	Dec 2018	-		5.675	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.000		0.000		2.407	Dec 2018	-		2.407	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.000		0.000		2.040	Dec 2018	-		2.040	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	Leidos : California, MD	0.000	0.000		0.000		5.703	Dec 2018	-		5.703	Continuing	Continuing	Continuing
TMPC 7.0	SS/CPFF	UARC APL : Laurel, MD	0.000	0.000		0.000		0.111	Nov 2018	-		0.111	Continuing	Continuing	Continuing
TMPC 7.0	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.000		0.614	Nov 2018	-		0.614	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	Vencore : San Jose, CA	0.000	0.000		0.000		0.362	Dec 2018	-		0.362	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	Tapestry : St. Louis, MO	0.000	0.000		0.000		0.328	Nov 2018	-		0.328	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	BAE Systems : San Diego, CA	0.000	0.000		0.000		0.328	Nov 2018	-		0.328	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	Leidos : California, MD	0.000	0.000		0.000		0.618	Nov 2018	-		0.618	Continuing	Continuing	Continuing
TMPC 8.0	SS/CPFF	UARC APL : Laurel, MD	0.000	0.000		0.000		0.084	Nov 2018	-		0.084	Continuing	Continuing	Continuing
TMPC 8.0	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.000		0.277	Nov 2018	-		0.277	Continuing	Continuing	Continuing
Systems Engineering - TTWCS A2AD Improvements (NAV/ COMMS)	WR	NSWC : Dahlgren, VA	0.000	0.000		0.000		1.180	Dec 2018	-		1.180	Continuing	Continuing	Continuing
Systems Engineering-TTWCS Software Support Activity(NAV/COMMS)	SS/CPFF	LMVF : Valley Forge, PA	0.000	0.000		0.000		0.785	Dec 2018	-		0.785	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		0.000		20.512		-		20.512	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
Remarks TMPC 7.0 - Implements functionality to support Maritime Strike Tomahawk. Aligns with PU 4034. TMPC 8.0 - Implements functionality to support GPS M-Code and JMEWS. Aligns with PU 4033 and 4035. FY 2019 funding increase supports the acceleration of the Maritime Strike TWS capability under TMPC 7.0. FY 2019 TTWCS funding required 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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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 6.0	SS/CPFF	Vencore : San Jose, CA	0.000	0.000		0.000		0.988	Dec 2018	-		0.988	0.000	0.988	0.988	
TMPC 6.0	SS/CPFF	Leidos : California, MD	0.000	0.000		0.000		1.129	Nov 2018	-		1.129	0.000	1.129	0.910	
PPPI Development Support	WR	NAWC-WD : China Lake, CA	0.000	0.000		0.000		0.760	Nov 2018	-		0.760	Continuing	Continuing	Continuing	
Subtotal			0.000	0.000		0.000		2.877		-		2.877	Continuing	Continuing	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 to address emergent threats, UONS, fleet gaps, and the Tomahawk ORD. TMPC 6.0 - Missile Modernization; Timeline Improvements; Communications Upgrades, deploys to all sites, IOC 4th Qtr FY20. Aligns with PU 4032.																
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			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	0.000		0.000		23.389		-		23.389	Continuing	Continuing	N/A

Remarks																
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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy

Date: February 2018

Appropriation/Budget Activity

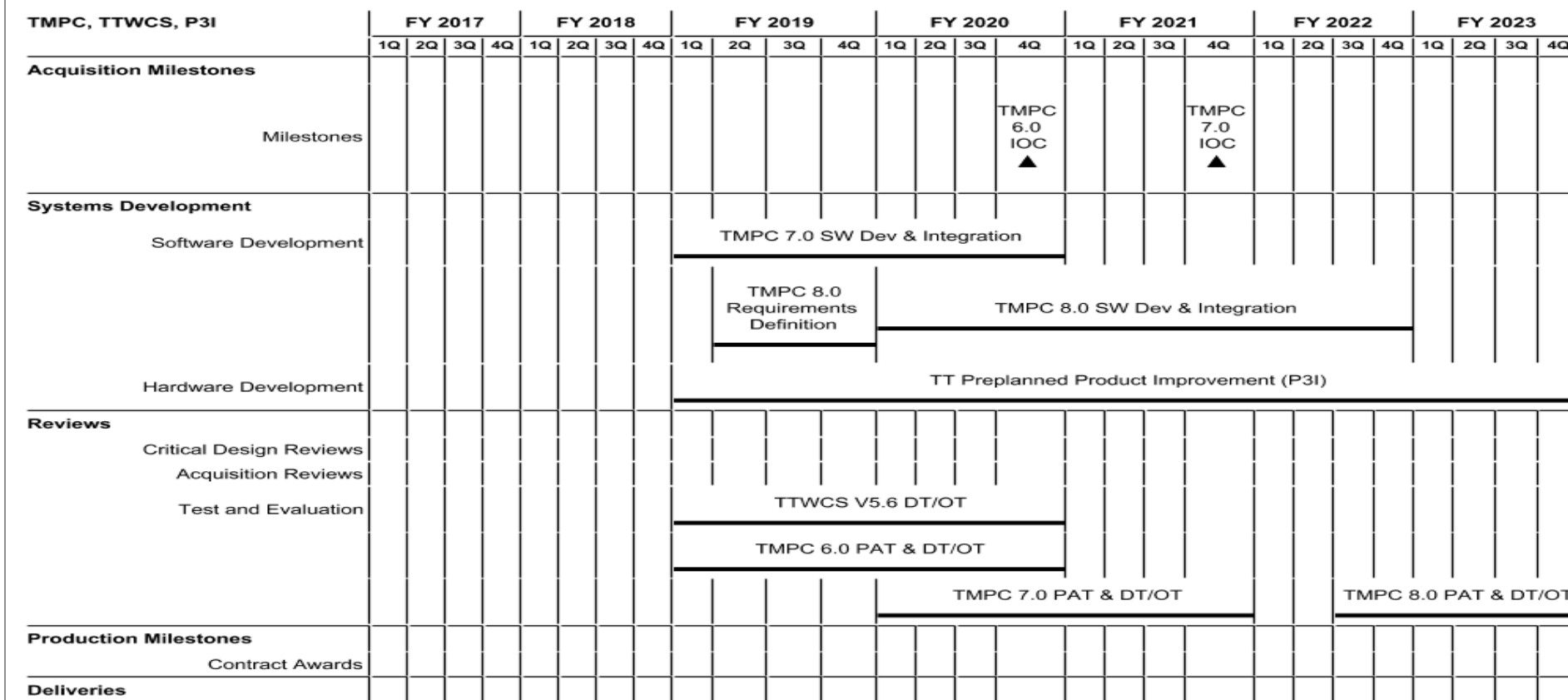
1319 / 7

R-1 Program Element (Number/Name)

PE 0204229N / Tomahawk Mssn Planning
Ctr

Project (Number/Name)

4036 / TTWCS TMPC PPPI



2019PB - 0204229N - 4036

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy			Date: February 2018
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>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>TMPC, TTWCS, P3I</i>				
Acquisition Milestones: Milestones: TMPC 6.0 IOC	4	2020	4	2020
Acquisition Milestones: Milestones: TMPC 7.0 IOC	4	2021	4	2021
Systems Development: Software Development: TMPC 7.0 SW Dev & Integration	1	2019	4	2020
Systems Development: Software Development: TMPC 8.0 SW Dev & Integration	1	2020	4	2022
Systems Development: Software Development: TMPC 8.0 Requirements Definition	2	2019	4	2019
Systems Development: Hardware Development: TT Preplanned Product Improvement (P3I)	1	2019	4	2023
Reviews: Test and Evaluation: TTWCS V5.6 Modernized Missile DT/OT	1	2019	4	2020
Reviews: Test and Evaluation: TMPC 6.0 Product Acceptance Testing (PAT) & DT/OT	1	2019	4	2020
Reviews: Test and Evaluation: TMPC 7.0 Product Acceptance Testing (PAT) & DT/OT	1	2020	4	2021
Reviews: Test and Evaluation: TMPC 8.0 Product Acceptance Testing (PAT) & DT/OT	3	2022	4	2023