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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	3,106.024	500.965	549.756	593.353	-	593.353	593.330	546.471	581.376	543.971	Continuing	Continuing
MD01: <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>	2,053.448	295.608	313.562	367.380	-	367.380	351.374	309.375	330.737	289.908	Continuing	Continuing
MC01: <i>Cyber Operations</i>	12.738	17.468	33.012	12.658	-	12.658	21.742	16.403	14.657	14.987	Continuing	Continuing
MT01: <i>C2BMC Test</i>	300.717	53.690	64.624	61.264	-	61.264	65.861	59.880	60.784	63.901	Continuing	Continuing
MX01: <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>	614.876	112.909	114.876	128.482	-	128.482	130.808	138.840	145.446	145.502	Continuing	Continuing
MD40: <i>Program-Wide Support</i>	124.245	21.290	23.682	23.569	-	23.569	23.545	21.973	29.752	29.673	Continuing	Continuing

**Program MDAP/MAIS Code:** 362

**Note**

Increase from FY 2020 to FY 2021 provides Combatant Command (CCMD) requested C2BMC Upgrades for increased Protected Anti-Scintillation Anti-Jam Wideband Net-Centric System (PAAWNS) support, and CCMD requested C2BMC Upgrades for AN-TPY-2 High Altitude Electromagnetic Pulse (HEMP) Hardened Transportable Terminals (HTT) Integration and for initiating Ballistic Missile Defense System Communications Network (BCN) to establish a globally integrated sensor architecture to provide enhanced, dynamic space capabilities, and extend existing BCN network and cybersecurity management to cover the expanded architecture.

The FY 2021 funding request was reduced by \$7.5 million during DWR to reduce Discrimination efforts.

The FY 2021 funding request was reduced by \$1.245 million during DWR to reduce Civilian Labor.

The FY 2021 funding request was reduced by \$1.555 million during DWR to reduce contractor support.

**A. Mission Description and Budget Item Justification**

The Command and Control, Battle Management, and Communications (C2BMC) program is the integrating element of the Ballistic Missile Defense System (BMDS). It is a vital operational system that enables the U.S. President, Secretary of Defense and Combatant Commanders at strategic, regional and operational levels to systematically plan missile defense operations, to collectively see the battle develop, and to dynamically manage designated networked sensors and weapons systems to achieve global and regional mission objectives. Systems linked through C2BMC include Patriot, Terminal High Altitude Area Defense (THAAD), Aegis Ballistic Missile Defense (BMD), Aegis Ashore, Ground-based Midcourse Defense (GMD), Army Integrated Air and Missile Defense Battle Command System (IBCS), and sensors such

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as the Army Navy/Transportable Radar Surveillance and Control-2 (AN/TPY-2) Radar, Sea-Based X-Band Radar (SBX), Long Range Discrimination Radar (LRDR), Homeland Defense, Space-Based Infrared System (SBIRS), and BMDs Overhead Persistent Infrared (OPIR) Architecture (BOA). The C2BMC program also works to increase coalition partners' capabilities and investigates concepts and explores system engineering issues associated with innovative space applications for a missile defense intercept and defeat system. C2BMC begins support to integrate existing sensor elements within Missile Defense Agency and the Services into the Ballistic Missile Defense System Communications Network (BCN) to establish a globally integrated sensor architecture to provide enhanced, dynamic space capabilities, and extend existing BCN network and cybersecurity management to cover the expanded architecture

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
Previous President's Budget	507.817	564.206	534.988	-	534.988
Current President's Budget	500.965	549.756	593.353	-	593.353
Total Adjustments	-6.852	-14.450	58.365	-	58.365
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-33.300			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	18.850			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-6.852	0.000			
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	0.000	0.000	58.365	-	58.365

**Change Summary Explanation**

Decrease in FY 2020 reflects the Congressional decrease for Increment 7 efforts and Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) and an increase for Cybersecurity efforts.

Increase in FY 2021 provides development of additional Post Intercept Assessment (PIA) capability delivering kill assessment data for GMD, integration of a NORTHCOM user node for increased availability and resiliency in support of Homeland Defense operations and the integration of an additional management node providing uninterrupted global mission support while delivering increased resiliency to BMD network system and security. It also supports AN/TPY-2 hardening of Satellite Communications (SATCOM) terminals, and increased Protected Anti-Scintillation Anti-Jam Wideband Net-Centric System (PAAWNS) support to ensure continued communications in the event of high altitude nuclear explosion. The FY 2021 increase also supports the integration of existing MDA and Air Force sensor elements with C2BMC and the Ballistic Missile Defense System Communications Network (BCN) to establish a globally integrated sensor architecture to provide enhanced, dynamic space capabilities, and extend existing BCN network and cybersecurity management to cover the expanded architecture.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency										<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 0400 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	
MD01: <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>	2,053.448	295.608	313.562	367.380	-	367.380	351.374	309.375	330.737	289.908	Continuing	Continuing	
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-			

**Note**

Increase from FY 2020 to FY 2021 provides Combatant Command (CCMD) required C2BMC Upgrades for increased Protected Anti-Scintillation Anti-Jam Wideband Net-Centric System (PAAWNS) support, and C2BMC Upgrades for AN-TPY-2 High Altitude Electromagnetic Pulse (HEMP) Hardened Transportable Terminals (HTT) Integration as well as initiating Ballistic Missile Defense System Communications Network (BCN) to establish a globally integrated sensor architecture to provide enhanced, dynamic space capabilities, and extend existing BCN network and cybersecurity management to cover the expanded architecture.

**A. Mission Description and Budget Item Justification**

Provides incremental development, deployment and operational support of C2BMC capabilities required for BMDS planning, situational awareness, sensor management, and engagement coordination. The FY 2019 National Defense Authorization Act (NDAA) section 869 recognized C2BMC for its implementation of this iterative practice and directed C2BMC's inclusion in a Community of Practice to advise on agile or iterative development.

C2BMC delivers capabilities incrementally with each software build (named as a Spiral), adding to or enhancing the capability of the previous build. C2BMC incremental delivery of Spiral 8.2 provides critical Homeland Defense for increased GMD battlespace, improved threat tracking using multiple sensors communicating via Link 16, enhanced sensor tasking to meet track quality and discrimination timeliness requirements, space situational awareness (SSA) tasking support, and improved cyber capabilities. Enhanced Homeland Defense also integrates the BMDS Overhead Persistent Infrared (OPIR) Architecture (BOA) with the BMDS to enhance system level missile-tracking capabilities through earlier cueing of radars and weapon systems.

European Phased Adaptive Approach (EPAA) Phase 3/Engage-on-Remote (EOR) (Spiral 8.2-3) provides critical sensor management capability, greater engagement flexibility, improved OPIR-based cueing, and enhanced Aegis BMD defended area by enabling Aegis to use Army Navy/Transportable Radar Surveillance and Control-2 (AN/TPY-2) data for EOR engagements, providing a five-fold increase in defended area coverage in the USCENTCOM/USEUCOM area of responsibility compared to individual weapon system organic capability. Spiral 8.2-3 also includes SSA and integrates Mobile Sensor Integration (MSI) Phase 1 and BOA data into the BMDS.

Long Range Discrimination Radar (LRDR) Control for Homeland Defense (Spiral 8.2-5) enables increased homeland and regional defense by providing LRDR sensor management, creation and dissemination of a BMD System track inclusive of LRDR sensor data, hypersonic threat tracking, significant capability expansion of track and reporting Advance Threats for warfighter SSA for the Air Force, implements Link-16 reporting, integration of system level discrimination data, transmission of LRDR-based information to GMD Fire Control (GFC) and other BMDS elements, and operationalization of Space-based Kill Assessment (SKA) hit assessment.

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Future incremental C2BMC capability enhancements will include expanded Regional and Homeland Defense to continue risk reduction, planning, and development efforts including C2BMC tasking of OPIR Enterprise assets, enhanced system-level integrated discrimination functionality with Advanced Discrimination regional weapon system use of Link 16 based system track, transmission of advanced discrimination features, generation of space object data and monitoring of modified Aegis BMD, THAAD, PATRIOT, Regional Engagement coordination.

C2BMC continues to develop incremental improvements to the BMDS to keep pace with emerging threats worldwide by investing in the development, integration and testing of advanced algorithms to improve track and discrimination capabilities, Robust Post Intercept Assessment (PIA) and enhancing use of space based sensor data from sources such as the Space Based Infrared System (SBIRS), using the BMDS OPIR architecture. Related disciplines provide development and deployment support to C2BMC system capabilities. In support of Hypersonic Defense, C2BMC will provide contingency capability to demonstrate, develop and deploy a detection and warning for advanced threats. C2BMC continues Protected Anti-Jam/Anti-Scintillation Wideband Net-Centric System (PAAWNS) modem integration, installations and technical refresh globally of the threat-based communication network modernization against the advanced threat, while maintaining efficiencies in cost.

C2BMC International Partner system engineering ensures friends and allies are integrated to the fullest extent possible with U.S. BMDS capabilities. Collaborative system engineering, testing, and fielding facilitate interoperability with North Atlantic Treaty Organization (NATO) and partner nations such as Israel and Japan. C2BMC works with these nations to define and document international interfaces that are compatible with international standards and traceable to U.S. BMDS requirements. C2BMC participates in test events and live fire exercises hosted by international partners to ensure U.S. missile defense weapons, sensors, and Command and Control (C2) systems are interoperable with international systems. C2BMC maintains and upgrades the U.S./NATO secure data sharing gateways located at Ramstein Air Base, Germany, for missile defense operations and training. C2BMC also supports development of Japan's BMD requirements to ensure interoperability of Japanese and U.S. BMD systems (sensors, shooters, command and control) resulting in an integrated regional, operational, and strategic defense of Japan.

C2BMC Modeling and Simulation (M&S) maintains BMDS simulation/stimulation tools and federated models to support development and verification of deployed C2BMC and BOA Spirals. The BMDS C2BMC Model (BCM) is used for Flight Test pre-mission analysis and exercises to represent a second C2 Suite for Cross-Area of Responsibility (XAOR) functionality, Early Digital Product (EDP) for C2BMC performance assessment, and supports development and integration of GMD, AN/TPY-2, and Aegis software and models. The OPIR sensor M&S is used in the Ground Test Integrated System-level Simulation (GTISS) as the stimulus for BOA. The BCM program provides a cost effective means to assess and explore the performance space of the BMDS beyond what can be physically tested via Flight Tests and Target of Opportunity collections.

C2BMC develops, integrates, and tests advanced algorithms to improve discrimination capabilities and enhance the use of space-based sensor data. In support of MDA's discrimination improvements effort, C2BMC demonstrates, develops, and deploys multiple techniques to improve BMD System ability to identify lethal and non-lethal objects.

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

	FY 2019	FY 2020	FY 2021
<b>Title:</b> C2BMC Development and Deployment	275.431	284.431	327.887
<b>Articles:</b>	-	-	-

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

**Description:** Provides funding for incremental development and deployment of C2BMC capabilities that link sensors and shooters to enable integrated BMDS capabilities, integrate BOA with the BMDS architecture to enhance missile tracking capabilities and enable much earlier cueing of radars and shooters, and fulfill Cybersecurity requirements. The Enterprise Sensors Laboratory (ESL) and Experimentation Laboratory (X-Lab) produce key prototypes for further maturation in the C2BMC capability Spiral development process and enables integrated experimentation for C2BMC, ESL, OPIR products, and other BMDS elements through robust connectivity to simulation frameworks, weapon systems, sensors, and operational assets. Expand capability to track and report Advanced Threats for warfighter Situational Awareness (SA). Expanding Space Situational Awareness (SSA) tasking and reporting to include TPY2, LRDR and Aegis sensors.

Recurring accomplishments include iterative development and procurement cycles for hardware, software, network capability system engineering tasks, and artifacts for technical engineering reviews; participation in test readiness reviews, pre-test engineering and analysis of ground and flight test results, wargames, and exercises in accordance with the BMDS Integrated Master Test Plan (IMTP); site planning, scheduling and hardware acquisition to support planned deployment of C2BMC Spirals and BMDS Overhead Persistent Infrared (OPIR) Architecture (BOA) capabilities; updates and maintenance for C2BMC Model (BCM) BMDS simulation/stimulation (federated model) and verification scenarios for all C2BMC Spirals deployed and under development; Discrimination, operationalization of SKA as part of Post Intercept Assessment (PIA), Robust PIA and C2BMC capabilities; design and installation of operational sharing gateways; and collaboration with international partners to ensure future interoperability; maintain Verification and Validation in support of BMDS capability ground testing and participation in BMDS ground tests.

C2BMC will begin to integrate existing MDA and Service elements with C2BMC and the Ballistic Missile Defense System Communications Network (BCN) to establish a globally integrated sensor architecture to provide enhanced, dynamic space capabilities, and extend existing BCN network and cybersecurity management to cover the expanded architecture

Specific and/or unique accomplishments for each FY are as follows:

**FY 2020 Plans:**

EPAA Phase 3 / EOR (Spiral 8.2-3):

- Maintain ability to develop/deploy capability in response to emergent operational requirements

LRDR for Homeland Defense (Spiral 8.2-5), homeland defense focus:

- Continue iterative software coding, unit testing, and interoperability testing of Spiral 8.2-5 capabilities, including LRDR and hypersonic threat detection and tracking, Space Situational Awareness (SSA), and Overhead Persistent Infrared (OPIR) cueing.
- Initiate iterative software coding, unit testing, and interoperability testing for BMDS integration

FY 2019	FY 2020	FY 2021

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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<ul style="list-style-type: none"> <li>- Support developmental testing and preparation of transfer of the LRDR to the Air Force</li> <li>- Continue deployment of hardware and software to provide LRDR BMDS network connectivity and sensor control nodes</li> <li>- Increase Verification and Validation in support of BMDS capability ground testing and participation in BMDS ground tests</li> </ul> <p>C2BMC Additional and Expanded Regional and Homeland Defense focus:</p> <ul style="list-style-type: none"> <li>- Design and prototyping of the next incremental capability addressing Additional Homeland Defense and Mid-Term Discrimination requirements.</li> <li>- Continue operationalization of Space-based Kill Assessment (SKA) Hit Assessment (HA)</li> <li>- Continue planning and prototyping tasks for Robust BMDS Post Intercept Assessment (PIA)</li> <li>- Initiate design and development of accredited models and simulations (M&amp;S) for C2BMC and BOA spirals for participation in End-to-end Digital Integrated System Simulation (EDISS)</li> <li>- Continue design and development of Ground Test Integrated System-level Simulation (GTISS)</li> </ul> <p><b>FY 2021 Plans:</b></p> <p>EPAA Phase 3 / EOR (Spiral 8.2-3):</p> <ul style="list-style-type: none"> <li>- Continue maintenance of Spiral 8.2-3's ability to develop/deploy capability in response to emergent operational requirements</li> </ul> <p>LRDR for Homeland Defense (Spiral 8.2-5), homeland defense focus:</p> <ul style="list-style-type: none"> <li>- Continue incremental capability development for S8.2-5 in response to emergent operational requirements</li> <li>- Support developmental testing and preparation of transfer of the LRDR to the Air Force</li> <li>- Continue phased deployment of hardware and software to provide LRDR BMDS network connectivity and sensor control nodes</li> <li>- Complete development, integration and operationalization of BOA 7.0 capability to detect and track advanced threats globally</li> <li>- Continue operationalization of Space-based Kill Assessment(SKA) Hit Assessment (HA)</li> </ul> <p>C2BMC Additional and Expanded Regional and Homeland Defense focus:</p> <ul style="list-style-type: none"> <li>- Continue design and prototype of next incremental capability addressing Additional Homeland Defense and Mid-Term Discrimination requirements to receive and utilize initial Advanced Discrimination data from LRDR, inclusive of C2BMC Generation of BMD System Track (with System Level Discrimination Data Integration) for GMD Homeland Defense Engagements and Expanded Regional and Homeland Defense, exploit additional OPIR data via BOA, enhanced Aegis BMD engage on capability, and expanded hypersonic defense tracking and reporting</li> <li>- Continue planning, designing and tasks for Robust BMDS PIA</li> <li>- Continue design and development of, and deliver accredited models and simulations (M&amp;S) for, C2BMC and BOA spirals for participation in End-to-end Digital Integrated System Simulation (EDISS)</li> </ul>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<ul style="list-style-type: none"> <li>- Support two training device development program for distributed and individual training</li> <li>- Continue to support the design and development of Ground Test Integrated System-level Simulation (GTISS) by developing and delivering accredited M&amp;S for BOA spirals</li> <li>- Initiate development of next iteration of BOA which will include addition of new sensors and expanded Advanced Threat Performance</li> <li>- Initiate early technology development to integrate additional advanced sensors into BOA to expand coverage and increase custody of emerging threats</li> <li>- Initiate Management Node to provide uninterrupted mission support by providing geographical separated locations for BMD network and system security</li> <li>- Initiate user node to USNORTHCOM as a Warfighter Involvement Process (WIP) item providing hardware and integration to support Homeland Defense</li> <li>- Initiate integration of sensor elements to provide enhanced, dynamic space capabilities and extend existing Ballistic Missile Defense System Communications Network (BCN) and cybersecurity management to cover expanded architecture</li> <li>- Initiate technical upgrade and refresh for development lab infrastructure and the Joint Early Warning Lab (JEWL)</li> </ul> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase from FY 2020 to FY 2021 reflects increase in development and integration for Space-based Kill Assessment (SKA) Hit Assessment (HA) Post intercept Assessment (PIA) and the integration of a Management Node to a new geographic location as well as a user node for the NORTHCOM warfighter to support Homeland Defense and begins integration of existing MDA and Air Force sensor elements with C2BMC and the Ballistic Missile Defense System Communications Network (BCN) to establish a globally integrated sensor architecture to provide enhanced, dynamic space capabilities, and extend existing BCN network and cybersecurity management to cover the expanded architecture.</p>			
<p><b>Title:</b> C2BMC Communications</p> <p align="right"><b>Articles:</b></p> <p><b>Description:</b> The BMD Communications Network (BCN) ties together an expanding set of sensors and weapons systems to enable the National Command Authority and the commanders at the strategic, theater and tactical levels to optimally engage missile threats. Recurring accomplishments include the following:</p> <ul style="list-style-type: none"> <li>- Provide GMD Communications Network (GCN) Long Haul Communications Transport (LHCT) services and a robust, end-to-end, high availability, operational communications network (COMNET) infrastructure with diverse paths that quickly and unambiguously share information across the global BMDS</li> <li>- Participate in and analyze results from events scheduled in the BMDS IMTP</li> </ul>	20.177	29.131	39.493
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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<ul style="list-style-type: none"> <li>- Provide BMDS communications via leased Defense Information Service Agency (DISA) circuits, and resolve real-time operational issues through DISA's Network Operations and Security Center</li> <li>- Provide effective network management to coordinate and integrate information across diverse equipment platforms, interface with other DoD communications systems, evolve information standards and capabilities, and adhere to the DoD Risk Management Framework (RMF)</li> <li>- Upgrade BCN capability by supporting all DoD teleports to enhance satellite communications</li> </ul> <p>Specific and/or unique accomplishments for each FY are as follows:</p> <p><b>FY 2020 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete installation of hardware circuits for the Ground-Based Midcourse Defense Communication Network Modernization</li> <li>- Continue Protected Anti-Jam/Anti-Scintillation Wideband Net-Centric System (PAAWNS) modem integration and installations</li> <li>- Conduct technical refresh for End-of-Life SATCOM terminals on SBX by transitioning to Military Satellite Communications (MILSATCOM) terminals</li> <li>- Acquire network circuits to support the threat based communication network modernization</li> </ul> <p><b>FY 2021 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete installation of long distance circuit hardware for the Ground-Based Midcourse Defense Communication Network Modernization</li> <li>- Continue technical refresh for End-of-Life SATCOM terminals on SBX by transitioning to Military Satellite Communications (MILSATCOM) terminals</li> <li>- Continue acquiring additional network circuits to support the threat based communication network modernization</li> <li>- Continue PAAWNS modem integration and installations globally</li> <li>- Upgrade and technical refresh of the PAAWNS threat-based communication network against the advanced threat of nuclear capabilities, while maintaining efficiencies in cost</li> <li>- Upgrade and integrate AN-TPY/2 High Altitude Electromagnetic Pulse (HEMP) Hardened Transportable Terminals (HTT) for increased protection of satellite communication systems at relevant sites</li> </ul> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase from FY 2020 to FY 2021 provides Combatant Command (CCMD) required C2BMC Upgrades for increased PAAWNS support, and CCMD required C2BMC upgrades for AN/TPY-2 HEMP HTT.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	295.608	313.562	367.380

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

<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 0603881C: <i>Ballistic Missile Defense Terminal Defense Segment</i>	383.369	306.761	412.627	-	412.627	340.071	302.279	204.986	227.970	Continuing	Continuing
• 0603882C: <i>Ballistic Missile Defense Midcourse Defense Segment</i>	790.316	1,303.716	1,004.305	-	1,004.305	776.125	726.566	767.592	1,068.536	Continuing	Continuing
• 0603884C: <i>Ballistic Missile Defense Sensors</i>	382.759	352.288	281.957	-	281.957	576.699	656.539	574.703	593.592	Continuing	Continuing
• 0603890C: <i>BMD Enabling Programs</i>	614.855	634.449	599.380	-	599.380	552.815	544.582	560.863	582.675	Continuing	Continuing
• 0603892C: <i>AEGIS BMD</i>	724.731	737.269	814.936	-	814.936	674.825	553.402	478.000	449.145	Continuing	Continuing
• 0603904C: <i>Missile Defense Integration and Operations Center (MDIOC)</i>	51.689	56.161	55.356	-	55.356	55.721	57.457	59.798	61.334	Continuing	Continuing
• 0603907C: <i>Sea Based X-Band Radar (SBX)</i>	125.900	128.156	118.318	-	118.318	135.931	131.510	145.582	169.980	Continuing	Continuing
• 0603914C: <i>Ballistic Missile Defense Test</i>	510.292	399.738	378.302	-	378.302	385.910	396.524	394.949	417.261	Continuing	Continuing
• 0603915C: <i>Ballistic Missile Defense Targets</i>	561.349	542.939	536.133	-	536.133	593.939	519.028	520.625	540.675	Continuing	Continuing
• 0604181C: <i>Hypersonic Defense</i>	132.612	390.204	206.832	-	206.832	107.521	111.084	115.487	118.333	Continuing	Continuing
• 0604672C: <i>Homeland Defense Radar-Hawaii</i>	70.735	188.480	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	259.215
• 0604673C: <i>Pacific Discriminating Radar</i>	14.453	6.711	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.164
• 0604873C: <i>Long Range Discrimination Radar (LRDR)</i>	172.705	136.423	137.256	-	137.256	118.787	90.299	60.251	41.726	Continuing	Continuing

**Remarks**

**D. Acquisition Strategy**

A sole source C2BMC contract to Lockheed Martin was awarded 1st quarter FY 2012. The current ordering period is through 1st quarter FY 2025. Major team members to Lockheed are Northrop Grumman, Boeing, Raytheon, and General Dynamics. They are charged with the development, testing, fielding, training, operations and

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>

sustainment, and cyber operations support of the C2BMC system. Additionally, the Defense Information Systems Agency (DISA) supports C2BMC worldwide long-haul communications. C2BMC Program Office government, Federally Funded Research and Development Center/University Affiliated Research Center (FFRDC/UARC), and Contract Support Services (CSS) personnel are also fully integrated as part of the Prime contractor's team to function in an Integrated Product Team environment. Furthermore, a sole source contract Specialized Warfighter Development Contract (SWDC) was awarded to Northrop Grumman in March 2018 (3 year base and 2 one year option periods) for continuation of the systems engineering, software development, test and integration for BMDS Overhead Persistent Infrared Architecture (BOA) and Simultaneous Correlation of Unambiguous Tracks (SCOUT).

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
C2BMC Development and Deployment - Independent Performance Assessment and Analysis -Various	MIPR	Various : Huntsville, AL, Colorado Springs, CO; NCR	1.864	3.736	Oct 2018	2.938	Oct 2019	4.449	Oct 2020	-		4.449	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Aggregated Discrim	Various	Various : Various	19.791	18.517	Oct 2018	14.902	Oct 2019	27.321	Oct 2020	-		27.321	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BMDS C2BMC Model (BCM) - EDISS Integration	SS/CPIF	Lockheed Martin : Huntsville, AL, Colorado Springs, CO; NCR	0.000	0.000		3.107	Oct 2019	2.995	Oct 2020	-		2.995	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BOA OPIR Stimulation M&S - EDISS/GTISS	C/CPAF	SciTec : Newark, NJ	0.250	0.250	Oct 2018	0.711	Oct 2019	2.632	Oct 2020	-		2.632	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BOA OPIR Stimulation M&S - EDISS/GTISS -GOV	MIPR	Sandia National Labs : Albuquerque, NM	0.000	1.317	Nov 2018	2.523	Nov 2019	0.704	Nov 2020	-		0.704	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BOA OPIR Stimulation M&S - EDISS/GTISS -NGC	SS/CPAF	Northrop Grumman Space and Mission Systems : Azusa, CA	0.000	1.615	Nov 2018	3.722	Nov 2019	0.687	Nov 2020	-		0.687	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BOA Simulation Development and Integration- EDISS	SS/CPAF	Northrop Grumman Space and Mission Systems : Boulder, CO	0.000	0.000		6.355	Oct 2019	0.687	Oct 2020	-		0.687	Continuing	Continuing	Continuing
C2BMC Development and Deployment - C2BMC Hardware/Software Development, Integration & Test (I&T)	SS/CPIF	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO	777.460	99.914	Nov 2018	124.987	Dec 2019	126.367	Dec 2020	-		126.367	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Missile Defense Agency</b>											<b>Date:</b> February 2020				
<b>Appropriation/Budget Activity</b> 0400 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>						

<b>Product Development (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
C2BMC Development and Deployment - C2BMC Integration	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	163.886	4.823	Nov 2018	6.819	Nov 2019	2.577	Nov 2020	-		2.577	Continuing	Continuing	Continuing
C2BMC Development and Deployment - C2BMC Mid-Term Discrim-SCOUT	SS/CPFF	Northrop Grumman Space and Mission Systems : Huntsville, AL	41.259	8.969	Oct 2018	7.978	Oct 2019	0.000		-		0.000	0.000	58.206	0.000
C2BMC Development and Deployment - C2BMC Mid-Term Discrim-SCOUT OGA	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	3.117	1.213	Nov 2018	0.713	Nov 2019	0.224	Nov 2020	-		0.224	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Contract Support Services (CSS)	C/CPFF	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	276.703	29.344	Nov 2018	26.022	Nov 2019	28.599	Nov 2020	-		28.599	Continuing	Continuing	Continuing
C2BMC Development and Deployment - ESL/BOA Development	SS/CPAF	Northrop Grumman Space and Mission Systems : Colorado Springs, CO	37.729	10.926	Oct 2018	9.507	Oct 2019	28.411	Oct 2020	-		28.411	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Federally Funded Research & Development Centers / University Affiliated Research Center	MIPR	MITRE, IDA, ORNL, Aerospace, JHU/APL, GTRI : Arlington, VA/ Huntsville, AL/ Colorado Springs, CO	180.866	19.856	Oct 2018	19.741	Oct 2019	17.239	Oct 2020	-		17.239	Continuing	Continuing	Continuing
C2BMC Development and Deployment - IT User Services - IRES	C/CPAF	Jacobs Technical, Inc : AL, AK, CA, CO, HI, NM, VA	1.823	0.099	Mar 2019	6.166	Mar 2020	6.216	Mar 2021	-		6.216	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Missile Defense Agency</b>											<b>Date:</b> February 2020				
<b>Appropriation/Budget Activity</b> 0400 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>						

<b>Product Development (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
C2BMC Development and Deployment - IT User Services - NGC	SS/CPFF	Northrop Grumman Space and Mission Systems : Colorado Springs, CO	9.266	0.000		0.000		0.000		-		0.000	0.000	9.266	0.000
C2BMC Development and Deployment - Independent Performance Assessment and Analysis	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	4.359	5.753	Nov 2018	2.411	Nov 2019	1.020	Nov 2020	-		1.020	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Joint Early Warning Lab (JEWL) and C2BMC Lab Build Out	C/CPAF	Jacobs Technical, Inc : Colorado Springs, CO	0.000	1.239	Mar 2019	1.548	Mar 2020	10.045	Mar 2021	-		10.045	Continuing	Continuing	Continuing
C2BMC Development and Deployment - MDA Civilian, Travel & PCS	Various	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	168.875	19.839	Oct 2018	21.953	Oct 2019	23.477	Oct 2020	-		23.477	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Mobile Sensor Integration Phase II	Various	Various : AL; CO; FL; OH; MA; VA	0.000	33.500	Oct 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Models & Simulation	SS/CPFI	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO; NCR	2.358	3.503	Oct 2018	8.926	Oct 2019	5.367	Oct 2020	-		5.367	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Post Intercept Assessment	C/CPFF	SciTec : Newark, NJ	1.105	1.000	Nov 2018	1.578	Nov 2019	7.874	Nov 2020	-		7.874	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Post Intercept Assessment Hardware	C/CPAF	Northrop Grumman Space and Missile Systems : Colorado Springs, CO	0.713	0.000		0.000		0.000		-		0.000	0.000	0.713	0.000
C2BMC Development and Deployment - Post	SS/CPFI	Lockheed Martin Team : Huntsville,	0.000	0.359	Nov 2018	1.200	Nov 2019	20.920	Nov 2020	-		20.920	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Missile Defense Agency</b>												<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 0400 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>					

<b>Product Development (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Intercept Assessment Integration		AL/Colorado Springs, CO													
C2BMC Development and Deployment - Post Intercept Assessment Prototyping	C/CPFF	Corvid : Huntsville, AL	2.089	3.939	Nov 2018	2.035	Nov 2019	7.874	Nov 2020	-		7.874	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Prior year C2BMC Development and Deployment no longer funded in the FYDP	Various	Various : Various	1.000	0.000		0.000		0.000		-		0.000	0.000	1.000	0.000
C2BMC Development and Deployment - Specialized Warfighter Development Program Management	SS/CPAF	Northrop Grumman Space and Mission Systems : Huntsville, AL	2.031	1.359	Mar 2019	3.500	Mar 2020	0.000		-		0.000	0.000	6.890	0.000
C2BMC Development and Deployment - Spiral Development	MIPR	Sandia, MDA Various : AL; CA; CO; NCR, NM	7.466	0.793	Oct 2018	4.106	Oct 2019	2.202	Oct 2020	-		2.202	0.000	14.567	0.000
C2BMC Development and Deployment - X Lab	SS/CPIF	Lockheed Martin : Huntsville, AL	4.376	3.568	Oct 2018	0.983	Oct 2019	0.000		-		0.000	0.000	8.927	0.000
C2BMC Communications - Communication Equipment and Fielding	MIPR	DISA, PMDCATS, SPAWAR : Springfield, VA	146.936	14.008	Jan 2019	14.721	Jan 2020	28.417	Jan 2021	-		28.417	Continuing	Continuing	Continuing
C2BMC Communications - Communication Leases	MIPR	DISA : Arlington, VA	52.609	6.169	Oct 2018	11.550	Oct 2019	11.076	Oct 2020	-		11.076	Continuing	Continuing	Continuing
C2BMC Communications - Networks Development and Deployment	SS/CPFF	Lockheed Martin Team : Colorado Springs, CO	28.498	0.000		2.860	Nov 2019	0.000		-		0.000	Continuing	Continuing	Continuing
C2BMC Communications - Prior year C2BMC Communications no longer funded in the FYDP	Various	Various : Various	117.019	0.000		0.000		0.000		-		0.000	7.115	124.134	0.000
<b>Subtotal</b>			2,053.448	295.608		313.562		367.380		-		367.380	Continuing	Continuing	N/A

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			

**Remarks**

N/A

<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**

N/A

<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**

N/A

<b>Management Services (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**

N/A

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>
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	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	2,053.448	295.608	313.562	367.380	-	367.380	Continuing	Continuing	N/A

**Remarks**  
 Funding in the All Prior Years column represents a summary of Prior Years Total Costs for active contracts, Military Interdepartmental Purchase Requests, and civilian salaries on the R-3.  
 Award Dates reflect date of first obligation. Additional obligations may incrementally occur throughout the year.



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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
MD01 Command & Control, Battle Management, Communications (C2BMC)	1	2019	4	2025
Spiral 8.2-3 EUCOM/CENTCOM Capability Declaration	1	2019	1	2019
Spiral 8.2-3 NORTHCOM/INDOPACOM Capability Declaration	3	2019	3	2019
Spiral 8.2-5 Homeland Defense Capability Declaration NORTHCOM/INDOPACOM	3	2021	3	2021
Spiral 8.2-5 Homeland Defense Capability Declaration EUCOM/CENTCOM	1	2022	1	2022
Expanded Regional and Homeland Defense Capability Declaration	1	2024	1	2024

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 0400 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MC01 / <i>Cyber Operations</i>		
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
MC01: <i>Cyber Operations</i>	12.738	17.468	33.012	12.658	-	12.658	21.742	16.403	14.657	14.987	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**  
Decrease from FY 2020 to FY 2021 reflects the Congressional add in FY 2020 for cybersecurity.

**A. Mission Description and Budget Item Justification**

Command and Control, Battle Management, and Communications (C2BMC) Cyber Operations sustain the Missile Defense Agency (MDA) Risk Management Framework (RMF) and Security Controls Assessments (SCA)/Controls Validation Testing (CVT) activities, analysis of validation results, risk assessments and reviews of proposed Program Manager/Information System Security Manager (PM/ISSM) Plan of Action and Milestones (POA&Ms) for MDA C2BMC mission systems. Activities in this Project are necessary to comply with the Federal Information Systems Modernization Act (FISMA).

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<b>Title:</b> Network / System Certification and Accreditation (C&A)	17.468	33.012	12.658
<b>Articles:</b>	-	-	-
<p><b>Description:</b> This activity maintains the Assessment and Authorization (A&amp;A) and Certification and Accreditation (C&amp;A) data repository, capturing the RMF documentation (artifacts, validation results, and Information Assurance Risk Assessment results, and Authorizing Official (AO) accreditation decisions) and Plan of Action and Milestones (POA&amp;Ms) on all Missile Defense Agency (MDA) information systems. This activity prepares and submits C&amp;A documentation and accreditation recommendations to the MDA Chief Information Officer (CIO) / Security Controls Assessor and the AO. Leverages Cross Domain Solution (CDS) as single authority implementing standard security policies for C2BMC across the BMDS. Independent Verification and Validation team actions ensure the availability, integrity, authentication, confidentiality, and non-repudiation of the MDA mission, test, and administrative systems.</p> <ul style="list-style-type: none"> <li>- Conduct cybersecurity design, engineering, and architecture planning for C2BMC information technology systems</li> <li>- Plan and test the cybersecurity controls for C2BMC systems</li> <li>- Conduct Security Controls Assessment testing continuous monitoring of C2BMC mission systems and provide POA&amp;Ms to mitigate cybersecurity vulnerabilities</li> </ul> <p>Specific and/or unique accomplishments for each FY are as follows:</p> <p><b>FY 2020 Plans:</b></p> <ul style="list-style-type: none"> <li>- Implement DoD required Endpoint Security Solution to replace current Host Based Security Solution</li> </ul>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MC01 / <i>Cyber Operations</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<ul style="list-style-type: none"> <li>- Continue upgrade and implementation of DoD required Secure Host Baselines for required operating systems</li> <li>- Plan and test virtualization and artificial intelligence capability solutions in relation to cyber resiliency</li> <li>- Provide Cyber Engineering (planning, analysis, and assessment) required to provide cybersecurity assessments of BMDS critical infrastructure Control Systems (CS) operations, selected sensors, weapons, and C2BMC systems</li> <li>- Enhancements to replace manual auditing, security monitoring and data at rest encryption.</li> </ul> <p><b>FY 2021 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete upgrade and implementation of DoD required Secure Host Baselines for required operating systems</li> <li>- Maintain Cyber posture with operating system and partial hardware refresh</li> </ul> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Decrease from FY 2020 to FY 2021 reflects the \$18.85M Congressional add in FY 2020 for cybersecurity enhancements.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	17.468	33.012	12.658

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

N/A

**Remarks**

**D. Acquisition Strategy**

A sole source C2BMC contract to Lockheed Martin was awarded 1st quarter FY 2012. The current ordering period is through 1st quarter FY 2025. Major team members to Lockheed are Northrop Grumman, Boeing, Raytheon, and General Dynamics. They are charged with the development, testing, fielding, training, operations and sustainment, and cyber operations support of the C2BMC system. Additionally, the Defense Information Systems Agency (DISA) supports C2BMC worldwide long-haul communications. C2BMC Program Office government, Federally Funded Research and Development Center/University Affiliated Research Center (FFRDC/UARC), and Contract Support Services (CSS) personnel are also fully integrated as part of the Prime contractor's team to function in an Integrated Product Team environment. Furthermore, a sole source contract Specialized Warfighter Development Contract (SWDC) was awarded to Northrop Grumman in March 2018 (3 year base and 2 one year option periods) for continuation of the systems engineering, software development, test and integration for BMDS Overhead Persistent Infrared Architecture (BOA).

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MC01 / <i>Cyber Operations</i>
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Network / System Certification and Accreditation (C&A) - Civ Cyber Labor	Various	MDA Other : Various	0.928	0.515	Oct 2018	0.387	Oct 2019	0.531	Oct 2020	-		0.531	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Consolidated Contractor Support	Various	MDA : Huntsville, AL; Colorado Springs, CO, NCR	1.025	1.296	Oct 2018	5.137	Oct 2019	1.329	Oct 2020	-		1.329	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Core C2BMC	SS/CPAF	Lockheed Martin : Colorado Springs, CO / Huntsville, AL	2.438	10.609	Jan 2019	22.343	Jan 2020	7.276	Oct 2020	-		7.276	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - IA/ CND Network/System C&A	MIPR	Army, Air Force : Various	6.331	0.000		0.000		0.000		-		0.000	0.000	6.331	0.000
Network / System Certification and Accreditation (C&A) - Information Assurance	C/CPAF	Jacobs Technology : Colorado Springs, CO	1.252	4.925	Mar 2019	3.008	Mar 2020	3.382	Oct 2020	-		3.382	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Lab Infrastructure	SS/CPAF	Northrop Grumman : Colorado Springs, CO	0.764	0.123	Mar 2019	2.137	Mar 2020	0.140	Oct 2020	-		0.140	Continuing	Continuing	Continuing
<b>Subtotal</b>			12.738	17.468		33.012		12.658		-		12.658	Continuing	Continuing	N/A

**Remarks**  
N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	12.738	17.468	33.012	12.658	-	12.658	Continuing	Continuing	N/A

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2021 Missile Defense Agency						<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 0400 / 4			<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>			<b>Project (Number/Name)</b> MC01 / <i>Cyber Operations</i>			
	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>

**Remarks**  
Award Dates reflect date of first obligation. Additional obligations may incrementally occur throughout the year.



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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MC01 / <i>Cyber Operations</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
MC01 Cyber Operations	1	2019	4	2025

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
MT01: <i>C2BMC Test</i>	300.717	53.690	64.624	61.264	-	61.264	65.861	59.880	60.784	63.901	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

N/A

**A. Mission Description and Budget Item Justification**

Command and Control, Battle Management and Communications (C2BMC) Test supports system flight and ground testing, wargames, and exercises as detailed in the Missile Defense Agency (MDA) Integrated Master Test Plan (IMTP) to ensure C2BMC capabilities delivered are consistent with the Prioritized Capabilities List and are interoperable with other Ballistic Missile Defense System (BMDS) components.

MDA gains efficiencies and minimizes laboratory resource requirements (footprint, personnel, and hardware) by utilizing the C2BMC test bed and the Overhead Persistent Infrared Architecture (OPIR) Capabilities Lab test infrastructure as the laboratory environment supporting System Test, Development, and Sustainment. For System Ground and Flight Test, the labs are used for pre-test analysis, test execution and post-test analysis. For Development, the labs are utilized for software verification and validation testing and system integration testing. For Sustainment, the labs are used to assist with root cause determination for issues discovered on the fielded system and validation of any required software patches.

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

	FY 2019	FY 2020	FY 2021
<b>Title:</b> Integrated Master Test Plan	53.690	64.624	61.264
<b>Articles:</b>	-	-	-
<p><b>Description:</b> This activity funds C2BMC participation in BMDS flight and ground testing, wargames and exercises, and resources in accordance with the BMDS IMTP. Recurring accomplishments include:                      Test Execution                      - Assess BMDS interoperability, integration, and functionality in lab and distributed environments, leveraging a complex set of scenarios to test the limits of the C2BMC system. Participate in and analyze results of ground tests and flight tests in accordance with the BMDS IMTP. Support all phases of the MDA Ground Test Concept of Operations (CONOPS) and the MDA Flight Test CONOPS. Provide Flight Test Predictive Analysis support. Generate, test, and distribute federated model compatible scenarios for Ground Test and Flight Test Experimentation test support. Use BMDS C2BMC Model (BCM) to support exercise integration testing activities including test case and scenario checkout.</p>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p>- Utilize the Enterprise Sensors Laboratory (ESL) to plan, coordinate, and provide test operations to demonstrate prototype algorithms through flight tests and United States-launched targets of opportunity. The development plans for algorithm improvements focus on track and measurement level sensor data fusion and feature extraction to improve 3-D track formation utilizing a variety of space, airborne, and terrestrial-based sensors. Results from the tests and experiments are provided back to the algorithms development activity to enable algorithm refinement.</p> <p>- Continue LRDR node integration, testing, and training with new C2BMC Spiral 8.2-5 Homeland Defense baseline changes at the MDIOC. Retain Existing Sensor Data Interfaces and provide LRDR Data for Risk Reduction for GMD; Initial Hypersonic Tracking and Reporting; and Cyber Security Enhancements Risk Management Functions.</p> <p>- Utilize the C2BMC Experimentation Laboratory (X-Lab) to plan, coordinate, and provide test operations to demonstrate maturing C2BMC technologies and software builds within an integrated C2BMC environment through flight tests, ground tests and real-world targets of opportunity before incorporation into formal C2BMC spiral builds. The development plans for C2BMC improvements focus on the BMDS Post Intercept Assessment (PIA) capabilities, architecture improvements, and C2BMC algorithm improvements to mitigate development risk. Results from the tests and experiments are provided back to the C2BMC and X-Lab development activity.</p> <p>- Participate in wargames and exercises using current and future C2BMC architectures to support all requesting combatant commands, NATO partners, and Host Nations allowing warfighters to validate Ballistic Missile Defense (BMD) Techniques, Tactics, and Procedures (TTP) specific to all designated Areas of Operations (AOs) to include current and future C2BMC architectures.</p> <p>- Provide development and upgrades in the C2BMC Testbed (CTB) to support flight and ground tests. Continue Cyber Testing in the CTB to support continuous C2BMC spiral development. Continue C2BMC and NATO planning demonstrations and support to NATO live fire events. Provide Situational Awareness (SA) Node sustainment for the BMDS incremental development to support ongoing planning and cooperation in the development and enhancement of interoperability between U.S. BMD systems and the NATO BMD systems. Provide infrastructure, network, and troubleshooting support to C2BMC Command Center (CCC), to include the BMDS Network Operations and Security Center (BNOSC), System Test and Operations Center (STOC), C2BMC System Support Center (CSSC), BMDS Communications Network (BCN), the Distributed Training system (DTS) and Combined Overhead Persistent Infrared (OPIR) Laboratories (OCL).</p> <p>Specific and/or unique accomplishments for each FY are as follows:</p>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>

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

***FY 2020 Plans:***

- Participate in flight and ground test events to support the BMDS Spiral 8.2-5 and Homeland Defense including LRDR by testing the following capabilities: C2BMC generation of initial BMD System Track (discrimination results by enhanced C2BMC selection); Long Range Discrimination Radar (LRDR) Integration into BMDS; Initial GMD use of LRDR data; Initial Active Sensor Bias Monitoring & Reporting; Retain Existing Sensor Data Interfaces and provide LRDR Data for Risk Reduction for GMD; Initial Hypersonic Tracking and Reporting; and Cyber Security Enhancements Risk Management Functions
- In flight test events: Assess ability to satisfy Aegis remote engagement logic using space sensors and other C2BMC assets. Collect data for Post Intercept Assessment (PIA)/ Space-based Kill Assessment (SKA) algorithm development. Demonstrate Army Navy/Transportable Radar Surveillance and Control-2 (AN/TPY-2) Forward Base Mode (FBM) ability to execute a cued acquisition tasked by C2BMC based on BMDS Overhead Persistent Infrared Architecture (BOA) tracks, and demonstrate C2BMC ability to construct system tracks
- In ground test events: Assess C2BMC incremental capability to perform PIA; assess Advanced Threat Processing (ATP) alternatives for C2BMC system track typing, correlation, and launch event association processes in the presence of advances threats. Demonstrate interoperability with Aegis and collect data to assess Aegis Engage-on-Remote (EoR) capability. Provide Aegis BL 9.C2 EoR and improved sensor processing with BOA 6.1. Assess interoperability of C2BMC S8.2-5, hypersonic threats, AN/TPY-2 FBM CX 4.0, LRDR 1.0, GS 8, XBR 4.1, and Terminal High Altitude Area Defense (THAAD) 4.0; assess C2BMC planning, monitoring, and tasking capabilities effect on Homeland Defense performance; assess SKA and PIA algorithms
- Continue LRDR node integration, testing, and training with new C2BMC Spiral 8.2-5 Homeland Defense baseline changes at the Missile Defense Integration and Operation Center (MDIOC)
- Consolidate and synergize Space-Based Infrared Sensors/BMDS OPIR Architecture (SBIRS/BOA) test lab efforts to plan, coordinate, and provide test operations for BMDS system flight tests and ground tests

***FY 2021 Plans:***

- Participate in flight and ground test events to support fielding of Spiral 8.2-5 and BOA 7.0 for Homeland Defense including LRDR by testing the following capabilities: C2BMC generation of initial BMD System Track (discrimination results by enhanced C2BMC selection); LRDR Integration into BMDS; Initial GMD use of LRDR data; Initial Active Sensor Bias Monitoring and Reporting;
- In flight test events: Continue to collect data for PIA/SKA algorithm development. Continue to demonstrate AN/TPY-2 FBM ability to execute a cued acquisition tasked by C2BMC based on BOA tracks, and demonstrate C2BMC ability to construct system tracks. Demonstrate interoperability of C2BMC S8.2-5 with LRDR and conduct GMD simulated engagement using System Track data from C2BMC that includes LRDR discrimination data.
- In ground test events: Continue to assess C2BMC incremental capability to perform PIA, to include support of SKA Hit Assessment fielding in Increment 6B.2; assess ATP alternatives for C2BMC system track typing, correlation, and launch event

FY 2019	FY 2020	FY 2021

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
association processes in the presence of advanced threats. Continue to demonstrate interoperability with Aegis and collect data to assess Aegis Engage-on-Remote (EoR) capability - Continue to assess interoperability of C2BMC S8.2-5, BOA BBR 7.0 hypersonic threats, AN/TPY-2 FBM CX 4.0, LRDR 1.0.0, GS 8 IR6, XBR 4.1, EKV 23.2/10.2, BV 11.0/8.0, SBR 19-1, THAAD 3.2, and THAAD 4.0; assess C2BMC planning, monitoring, and tasking capabilities effect on Homeland Defense performance. - Complete consolidation of SBIRS/BOA test lab efforts to plan, coordinate, and provide test operations for BMDS system flight tests and ground tests.  <b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> N/A			
<b>Accomplishments/Planned Programs Subtotals</b>	53.690	64.624	61.264

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 0603881C: <i>Ballistic Missile Defense Terminal Defense Segment</i>	383.369	306.761	412.627	-	412.627	340.071	302.279	204.986	227.970	Continuing	Continuing
• 0603882C: <i>Ballistic Missile Defense Midcourse Defense Segment</i>	790.316	1,303.716	1,004.305	-	1,004.305	776.125	726.566	767.592	1,068.536	Continuing	Continuing
• 0603884C: <i>Ballistic Missile Defense Sensors</i>	382.759	352.288	281.957	-	281.957	576.699	656.539	574.703	593.592	Continuing	Continuing
• 0603890C: <i>BMD Enabling Programs</i>	614.855	634.449	599.380	-	599.380	552.815	544.582	560.863	582.675	Continuing	Continuing
• 0603892C: <i>AEGIS BMD</i>	724.731	737.269	814.936	-	814.936	674.825	553.402	478.000	449.145	Continuing	Continuing
• 0603904C: <i>Missile Defense Integration and Operations Center (MDIOC)</i>	51.689	56.161	55.356	-	55.356	55.721	57.457	59.798	61.334	Continuing	Continuing
• 0603907C: <i>Sea Based X-Band Radar (SBX)</i>	125.900	128.156	118.318	-	118.318	135.931	131.510	145.582	169.980	Continuing	Continuing
• 0603914C: <i>Ballistic Missile Defense Test</i>	510.292	399.738	378.302	-	378.302	385.910	396.524	394.949	417.261	Continuing	Continuing

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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**C. Other Program Funding Summary (\$ in Millions)**

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0603915C: <i>Ballistic Missile Defense Targets</i>	561.349	542.939	536.133	-	536.133	593.939	519.028	520.625	540.675	Continuing	Continuing
• 0604181C: <i>Hypersonic Defense</i>	132.612	390.204	206.832	-	206.832	107.521	111.084	115.487	118.333	Continuing	Continuing
• 0604672C: <i>Homeland Defense Radar-Hawaii</i>	70.735	188.480	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	259.215
• 0604673C: <i>Pacific Discriminating Radar</i>	14.453	6.711	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.164
• 0604873C: <i>Long Range Discrimination Radar (LRDR)</i>	172.705	136.423	137.256	-	137.256	118.787	90.299	60.251	41.726	Continuing	Continuing

**Remarks**

**D. Acquisition Strategy**

A sole source C2BMC contract to Lockheed Martin was awarded 1st quarter FY 2012. The current ordering period is through 1st quarter FY 2025. Major team members to Lockheed are Northrop Grumman, Boeing, Raytheon, and General Dynamics. They are charged with the development, testing, fielding, training, operations and sustainment, and cyber operations support of the C2BMC system. Additionally, the Defense Information Systems Agency (DISA) supports C2BMC worldwide long-haul communications. C2BMC Program Office government, Federally Funded Research and Development Center/University Affiliated Research Center (FFRDC/UARC), and Contract Support Services (CSS) personnel are also fully integrated as part of the Prime contractor's team to function in an Integrated Product Team environment. Furthermore, a sole source contract Specialized Warfighter Development Contract (SWDC) was awarded to Northrop Grumman in March 2018 (3 year base and 2 one year option periods) for continuation of the systems engineering, software development, test and integration for BMDS Overhead Persistent Infrared Architecture (BOA).

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Missile Defense Agency</b>											<b>Date:</b> February 2020				
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>				

<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-	-	-	-	-	-	-	-	-	-	-	N/A

**Remarks**  
N/A

<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-	-	-	-	-	-	-	-	-	-	-	N/A

**Remarks**  
N/A

<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Integrated Master Test Plan - BMDS Level Testing GOV	MIPR	Army/Air Force : Various	7.200	3.707	Oct 2018	6.485	Oct 2019	0.782	Oct 2020	-		0.782	Continuing	Continuing	Continuing
Integrated Master Test Plan - Consolidated Contractor Support	Various	MDA : Huntsville, AL; Colorado Springs, CO; NCR	0.000	0.000		0.336	Oct 2019	0.243	Oct 2020	-		0.243	Continuing	Continuing	Continuing
Integrated Master Test Plan - Enterprise Sensors Lab Infrastructure Support	MIPR	Various : VA; OH; AL; NM; CA	13.312	1.667	Oct 2018	2.210	Oct 2019	1.752	Oct 2020	-		1.752	Continuing	Continuing	Continuing
Integrated Master Test Plan - Enterprise Sensors Lab Infrastructure/BOA Infrastructure-BMDS Level Testing	SS/CPAF	Northrop Grumman Corporation : Colorado Springs, CO	42.784	7.585	Oct 2018	1.487	Mar 2020	2.480	Mar 2021	-		2.480	Continuing	Continuing	Continuing

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Integrated Master Test Plan - FFRDC	MIPR	Institute for Defense Analyses (IDA) : Alexandria, VA	0.000	0.000		0.700	Oct 2019	1.557	Oct 2020	-		1.557	Continuing	Continuing	Continuing
Integrated Master Test Plan - Integrated Master Test Plan BMDS Level Testing	SS/IDIQ	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO	122.624	19.203	Jul 2019	21.692	Jul 2020	23.294	Jul 2021	-		23.294	Continuing	Continuing	Continuing
Integrated Master Test Plan - Integrated Master Test Plan BMDS level Testing - Element/System Test Lab Facilities	C/CPAF	Northrop Grumman Corporation : Colorado Springs, CO	6.186	2.843	Mar 2019	12.945	Mar 2020	12.847	Mar 2021	-		12.847	Continuing	Continuing	Continuing
Integrated Master Test Plan - Integrated Master Test Plan BMDS level Testing (Element/System Test Lab Facilities)	C/CPAF	Jacobs Technology, Inc : Huntsville, AL; Colorado Springs, CO	17.910	18.685	Mar 2019	18.769	Mar 2020	18.309	Mar 2021	-		18.309	0.000	73.673	0.000
Integrated Master Test Plan - Prior year IMTP no longer funded in the FYDP	Various	Various : Various	90.701	0.000		0.000		0.000		-		0.000	0.000	90.701	0.000
<b>Subtotal</b>			300.717	53.690		64.624		61.264		-		61.264	Continuing	Continuing	N/A

**Remarks**  
N/A

<b>Management Services (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**  
N/A

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	300.717	53.690	64.624	61.264	-	61.264	Continuing	Continuing	N/A

**Remarks**  
Award Dates reflect date of first obligation. Additional obligations may incrementally occur throughout the year.

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019			FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025		
FTM-45 (AEGIS 5.1, DT Intercept Flight Test)	▲																				
FTI-03 (OTA, OT Intercept Flight Test)	▲																				
Enterprise Sensor Lab Infrastructure Support	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
FTG-11 (OT) (GM, OT Intercept Flight Test)	▲																				
GT-18 Sprint 3 (N/P) (BMDS Ground Test)	◆																				
FS-19 E1 (AEGIS 5.1, DT Interceptor Only Flight Test)		▲																			
FS-19 E2 (AEGIS 5.1, DT Target Only Flight Test)		▲																			
FS-19 E3 (AEGIS 5.1, DT Target Only Flight Test)		▲																			
FS-19 E4 (AEGIS 5.1, DT Intercept Flight Test)		▲																			
GTI-19 Sprint 1 (N/P) (BMDS Ground Test)		◆																			
GTI-19 Sprint 2 (JEON) (BMDS Ground Test)			◆																		
GTD-07b (N/P) (BMDS Ground Test)		◆																			
FTM-31 E1 (AEGIS SBT, DT/OT Intercept Flight Test)						△															
FTM-31 E2 (AEGIS 5.1, DT Intercept Flight Test)			▲																		
FTT-23 (TH, DT Intercept Flight Test)			▲																		
Warfighter TP 07b (BMDS Ground Test)			◆																		
GTI-07c (N/I) (BMDS Ground Test)				◆																	
FTX-39 (LTPO, DT Target Only Flight Test)			▲																		
(EX) JUNIPER COBRA 20				◇	◇																
(EX) GLOBAL LIGHTNING 20				◇	◇																
FTM-32 (AEGIS SBT, DT/OT Intercept Flight Test)					△																
FTP-21 (P8.1.1)(LTPO, DT Intercept Flight Test)								△													
FTP-27 E1 (LTPO, DT/OT Flight Test)					△																
GTI-20 Sprint 2 (JEON) (BMDS Ground Test)					◇																

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019			FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025		
GTI-20 Sprint 1(E/C) (BMDS Ground Test)						◇															
FTM-44 (AEGIS 5.1, DT Intercept Flight Test)						△															
FTP-27 E2 (LTPO, DT/OT Flight Test)						△															
(EX) EAGLE RESOLVE 20						△															
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 19						△															
(EX) KEY RESOLVE 20						△															
(EX) EUROPEAN TEST BED 20						△															
(EX) RESILIENT SHIELD 20						△															
(EX) STEADFAST ALLIANCE 20						◇	◇														
(EX) PACIFIC SENTRY 20						◇	◇	◇													
(EX) Joint Live, Virtual, and Constructive 2019/20-2						◇	◇	◇	◇												
GTD-07b (AA) (BMDS Ground Test)						◇															
(EX) GLOBAL RESPONSE EXERCISE 09						△															
(WG) Demonstration, Table-top Exercises & Experiments 20						◇	◇	◇													
(WG) BMDS Wargames 21						◇	◇	◇	◇	◇											
FTM-30 (AEGIS 5.1, DT/OT Intercept Flight Test)						△															
(EX) AIR AND MISSILE DEFENSE EXERCISE 21						△															
(EX) ULCHI FREEDOM GUARDIAN 20						△															
(EX) GLOBAL RESPONSE EXERCISE 10						△															
GM BVT-03 (GM, DT Interceptor Only Flight Test)									△												
(WG) Multi-National Missile Defense Conference (MNC) 20						◇	◇														
(EX) VIGILANT SHIELD 21						◇	◇														
(EX) KEEN SWORD 21						◇	◇														
(EX) GLOBAL THUNDER 21						◇	◇														

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019			FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025		
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 20								△													
(EX) Joint Project Optic Windmill 2021								◇	◇												
(WG) NIMBLE TITAN 22								◇	◇	◇	◇	◇	◇	◇							
GTI-09 Sprint 1 (E/C) (BMDS Ground Test)								◇													
FTT-21 (TH, DT Intercept Flight Test)								△													
(EX) AUSTERE CHALLENGE 21								◇	◇	◇	◇										
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 20								△													
(EX) EUROPEAN TEST BED 21								△													
(EX) RESILIENT SHIELD 21								△													
(EX) GLOBAL LIGHTNING 21								◇	◇												
(EX) PACIFIC SENTRY 21								◇	◇	◇											
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 21								◇	◇	◇											
GTI-09 Sprint 2 (E/C) (BMDS Ground Test)								◇													
FS-21 E1 (AEGIS 5.1, DT Interceptor Only Flight Test)								△													
FS-21 E2 (AEGIS 5.1, DT Target Only Flight Test)								△													
FS-21 E3 (AEGIS 5.1, DT Target Only Flight Test)								△													
FS-21 E4 (AEGIS 5.1, DT Intercept Flight Test)								△													
(WG) Huntsville Wargames 21								◇	◇												
(WG) Demonstration, Table-top Exercises & Experiments 21								◇	◇	◇											
GTI-ISR (21) (BMDS Ground Test)								◇													
(WG) Space & Missile Defense Symposium 21								△													
(EX) VIGILANT SHIELD 22								◇	◇												
(EX) KEEN EDGE 22								◇	◇	◇											
(EX) Joint Live, Virtual, and Constructive 2021/22-1								◇	◇	◇	◇	◇	◇								

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019			FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025		
FTP-25 (LTPO, OT Intercept Flight Test)											△										
(EX) EPOCH PLANEX 23											△										
GTD-09 (E/C) (BMDS Ground Test)										◇											
(EX) JUNIPER COBRA 22										◇	◇										
(EX) GLOBAL LIGHTNING 22										◇	◇										
JFTM-07 E1 (JAPAN, DT Intercept Flight Test)											△										
JFTM-07 E2 (JAPAN, DT Intercept Flight Test)											△										
GM CTV-03+ (GM, DT Interceptor Only Flight Test)											△										
(EX) EAGLE RESOLVE 22											△										
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 21											△										
(EX) KEY RESOLVE 22											△										
(EX) EUROPEAN TEST BED 22											△										
(EX) RESILIENT SHIELD 22											△										
FTP-18 (I8-3) (LTPO, OT Intercept Flight Test)											△										
(EX) STEADFAST ALLIANCE 22											◇	◇									
(EX) PACIFIC SENTRY 22											◇	◇	◇								
(EX) Joint Live, Virtual, and Constructive 2021/22-2											◇	◇	◇	◇							
(EX) AIR AND MISSILE DEFENSE EXERCISE 22												◇	◇								
GTI-10 Sprint 1 (E/C) (BMDS Ground Test)															◇	◇					
(WG) Demonstration, Table-top Exercises & Experiments 22												◇	◇	◇							
(WG) BMDS Wargames 23												◇	◇	◇	◇	◇					
(EX) ULCHI FREEDOM GUARDIAN 22												△									
(EX) AIR AND MISSILE DEFENSE EXERCISE 23												△									
FTX-40 (AEGIS 5.1, DT Tracking Exercise Flight Test)												△									

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019		FY 2020		FY 2021		FY 2022		FY 2023		FY 2024		FY 2025	
(WG) Multi-National Missile Defense Conference (MNC) 22								◆	◆					
(EX) VIGILANT SHIELD 23								◆	◆					
(EX) KEEN SWORD 23								◆	◆					
(EX) GLOBAL THUNDER 22								◆	◆					
FTG-17 (GM, DT Intercept Flight Test)									△					
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 22									△					
(EX) GLOBAL RESPONSE EXERCISE 11									△					
(EX) GLOBAL RESPONSE EXERCISE 12									△					
GTI-10 Sprint 2 (E/C) (BMDS Ground Test)												◆		
FTM-37 (OT) (AEGIS 5.4.1, OT Intercept Flight Test)									△					
FTX-23 (AEGIS 5.1, DT Target Only Flight Test)									△					
(EX) GLOBAL LIGHTNING 23									◆	◆				
(EX) AUSTERE CHALLENGE 23									◆	◆	◆	◆		
(WG) NIMBLE TITAN 24									◆	◆	◆	◆	◆	◆
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 22									△					
(EX) Joint Project Optic Windmill 2023									◆					
(EX) EUROPEAN TEST BED 23									△					
(EX) KEY RESOLVE 23									△					
(EX) RESILIENT SHIELD 23									△					
GTI-11 Sprint 1 (N/I) (BMDS Ground Test)									◆	◆				
(EX) STEADFAST ARMOUR 23									◆	◆				
(EX) PACIFIC SENTRY 23									◆	◆	◆			
(EX) PACIFIC SENTRY 24									◆	◆	◆			
(WG) Huntsville Wargames 23										△				

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019			FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025		
FTM-38 (AEGIS 5.0, DT/OT Intercept Flight Test)														△							
GTD-10 (E/C) (BMDS Ground Test)																	◇				
GTI-ISR (23) (BMDS Ground Test)														◇							
FTX-38 (AEGIS BL 10 (BMD 6.0) Test)															△						
FTT-24 (TH, DT Intercept Flight Test)														△							
(EX) Joint Live, Virtual, and Constructive 2023/24-1														◇	◇	◇					
(WG) Demonstration, Table-top Exercises & Experiments 23														◇	◇	◇					
(WG) Space & Missile Defense Symposium 23														△							
(EX) ULCHI FREEDOM GUARDIAN 23														△							
(EX) AIR AND MISSILE DEFENSE EXERCISE 24														△							
FTX-28 E1-E3 (TH, DT Target Only Flight Test)														△							
GTI-11 Sprint 2 (N/I) (BMDS Ground Test)														◇	◇						
FTM-43 (AEGIS 5.1, DT/OT Intercept Flight Test)														△							
(WG) Multi-National Missile Defense Conference (MNC) 23														◇	◇						
(EX) GLOBAL THUNDER 23														◇	◇						
(EX) VIGILANT SHIELD 24														◇	◇						
(EX) KEEN EDGE 24														◇	◇	◇					
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 23																△					
FTG-18 (GM, DT/OT Intercept Flight Test)															△						
GTI-12 Sprint 1 (E/C) (BMDS Ground Test)																				◇	
(EX) JUNIPER COBRA 24																◇	◇				
(EX) GLOBAL LIGHTNING 24																◇	◇				
(EX) EAGLE RESOLVE 24																	△				
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 23																	△				

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019			FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025			
(EX) EUROPEAN TEST BED 24																	△					
(EX) KEY RESOLVE 24																	△					
(EX) RESILIENT SHIELD 24																	△					
FTM-40 (AEGIS BL 10 (BMD 6.0) Test)																	△					
(EX) STEADFAST ALLIANCE 24																	◇	◇				
(EX) Joint Live, Virtual, and Constructive 2023/24-2																	◇	◇	◇	◇		
FTM-41 (AEGIS BL 10 (BMD 6.0) Tests)																	△					
GTI-12 Sprint 2 (E/C) (BMDS Ground Test)																						◇
(WG) Demonstration, Table-top Exercises & Experiments 24																	◇	◇	◇			
(WG) BMDS Wargames 25																	◇	◇	◇	◇	◇	
(EX) ULCHI FREEDOM GUARDIAN 24																		△				
GTD-11 (N/I) (BMDS Ground Test)																◇						
(EX) GLOBAL THUNDER 24																			◇	◇		
(WG) Multi-National Missile Defense Conference (MNC) 24																			◇	◇		
GTI-13 Sprint 1 (N/I) (BMDS Ground Test)																			◇			

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
FTM-45 (AEGIS 5.1, DT Intercept Flight Test)	1	2019	1	2019
FTI-03 (OTA, OT Intercept Flight Test)	1	2019	1	2019
Enterprise Sensor Lab Infrastructure Support	1	2019	4	2025
FTG-11 (OT) (GM, OT Intercept Flight Test)	2	2019	2	2019
GT-18 Sprint 3 (N/P) (BMDS Ground Test)	2	2019	2	2019
FS-19 E1 (AEGIS 5.1, DT Interceptor Only Flight Test)	3	2019	3	2019
FS-19 E2 (AEGIS 5.1, DT Target Only Flight Test)	3	2019	3	2019
FS-19 E3 (AEGIS 5.1, DT Target Only Flight Test)	3	2019	3	2019
FS-19 E4 (AEGIS 5.1, DT Intercept Flight Test)	3	2019	3	2019
GTI-19 Sprint 1 (N/P) (BMDS Ground Test)	3	2019	3	2019
GTI-19 Sprint 2 (JEON) (BMDS Ground Test)	4	2019	4	2019
GTD-07b (N/P) (BMDS Ground Test)	3	2019	3	2019
FTM-31 E1 (AEGIS SBT, DT/OT Intercept Flight Test)	3	2020	3	2020
FTM-31 E2 (AEGIS 5.1, DT Intercept Flight Test)	4	2019	4	2019
FTT-23 (TH, DT Intercept Flight Test)	4	2019	4	2019
Warfighter TP 07b (BMDS Ground Test)	4	2019	4	2019
GTI-07c (N/I) (BMDS Ground Test)	1	2020	1	2020
FTX-39 (LTPO, DT Target Only Flight Test)	1	2020	1	2020
(EX) JUNIPER COBRA 20	1	2020	2	2020
(EX) GLOBAL LIGHTNING 20	1	2020	2	2020
FTM-32 (AEGIS SBT, DT/OT Intercept Flight Test)	2	2020	2	2020

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
FTP-21 (P8.1.1)(LTPO, DT Intercept Flight Test)	1	2021	1	2021
FTP-27 E1 (LTPO, DT/OT Flight Test)	2	2020	2	2020
GTI-20 Sprint 2 (JEON) (BMDS Ground Test)	2	2020	2	2020
GTI-20 Sprint 1(E/C) (BMDS Ground Test)	2	2020	2	2020
FTM-44 (AEGIS 5.1, DT Intercept Flight Test)	3	2020	3	2020
FTP-27 E2 (LTPO, DT/OT Flight Test)	2	2020	2	2020
(EX) EAGLE RESOLVE 20	2	2020	2	2020
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 19	2	2020	2	2020
(EX) KEY RESOLVE 20	2	2020	2	2020
(EX) EUROPEAN TEST BED 20	2	2020	2	2020
(EX) RESILIENT SHIELD 20	2	2020	2	2020
(EX) STEADFAST ALLIANCE 20	2	2020	3	2020
(EX) PACIFIC SENTRY 20	2	2020	4	2020
(EX) Joint Live, Virtual, and Constructive 2019/20-2	2	2020	1	2021
GTD-07b (AA) (BMDS Ground Test)	3	2020	3	2020
(EX) GLOBAL RESPONSE EXERCISE 09	3	2020	3	2020
(WG) Demonstration, Table-top Exercises & Experiments 20	3	2020	1	2021
(WG) BMDS Wargames 21	3	2020	3	2021
FTM-30 (AEGIS 5.1, DT/OT Intercept Flight Test)	4	2020	4	2020
(EX) AIR AND MISSILE DEFENSE EXERCISE 21	4	2020	4	2020
(EX) ULCHI FREEDOM GUARDIAN 20	4	2020	4	2020
(EX) GLOBAL RESPONSE EXERCISE 10	4	2020	4	2020
GM BVT-03 (GM, DT Interceptor Only Flight Test)	1	2021	1	2021
(WG) Multi-National Missile Defense Conference (MNC) 20	4	2020	1	2021
(EX) VIGILANT SHIELD 21	4	2020	1	2021

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
(EX) KEEN SWORD 21	4	2020	1	2021
(EX) GLOBAL THUNDER 21	4	2020	1	2021
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 20	1	2021	1	2021
(EX) Joint Project Optic Windmill 2021	1	2021	2	2021
(WG) NIMBLE TITAN 22	1	2021	4	2022
GTI-09 Sprint 1 (E/C) (BMDS Ground Test)	2	2021	2	2021
FTT-21 (TH, DT Intercept Flight Test)	2	2021	2	2021
(EX) AUSTERE CHALLENGE 21	1	2021	4	2021
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 20	2	2021	2	2021
(EX) EUROPEAN TEST BED 21	2	2021	2	2021
(EX) RESILIENT SHIELD 21	2	2021	2	2021
(EX) GLOBAL LIGHTNING 21	2	2021	3	2021
(EX) PACIFIC SENTRY 21	2	2021	4	2021
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 21	2	2021	4	2021
GTI-09 Sprint 2 (E/C) (BMDS Ground Test)	3	2021	3	2021
FS-21 E1 (AEGIS 5.1, DT Interceptor Only Flight Test)	3	2021	3	2021
FS-21 E2 (AEGIS 5.1, DT Target Only Flight Test)	3	2021	3	2021
FS-21 E3 (AEGIS 5.1, DT Target Only Flight Test)	3	2021	3	2021
FS-21 E4 (AEGIS 5.1, DT Intercept Flight Test)	3	2021	3	2021
(WG) Huntsville Wargames 21	3	2021	4	2021
(WG) Demonstration, Table-top Exercises & Experiments 21	3	2021	1	2022
GTI-ISR (21) (BMDS Ground Test)	4	2021	4	2021
(WG) Space & Missile Defense Symposium 21	4	2021	4	2021
(EX) VIGILANT SHIELD 22	4	2021	1	2022
(EX) KEEN EDGE 22	4	2021	2	2022

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
(EX) Joint Live, Virtual, and Constructive 2021/22-1	4	2021	1	2023
FTP-25 (LTPO, OT Intercept Flight Test)	3	2022	3	2022
(EX) EPOCH PLANEX 23	1	2022	1	2022
GTD-09 (E/C) (BMDS Ground Test)	4	2021	4	2021
(EX) JUNIPER COBRA 22	1	2022	2	2022
(EX) GLOBAL LIGHTNING 22	1	2022	2	2022
JFTM-07 E1 (JAPAN, DT Intercept Flight Test)	2	2022	2	2022
JFTM-07 E2 (JAPAN, DT Intercept Flight Test)	2	2022	2	2022
GM CTV-03+ (GM, DT Interceptor Only Flight Test)	2	2022	2	2022
(EX) EAGLE RESOLVE 22	2	2022	2	2022
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 21	2	2022	2	2022
(EX) KEY RESOLVE 22	2	2022	2	2022
(EX) EUROPEAN TEST BED 22	2	2022	2	2022
(EX) RESILIENT SHIELD 22	2	2022	2	2022
FTP-18 (I8-3) (LTPO, OT Intercept Flight Test)	2	2022	2	2022
(EX) STEADFAST ALLIANCE 22	2	2022	3	2022
(EX) PACIFIC SENTRY 22	2	2022	4	2022
(EX) Joint Live, Virtual, and Constructive 2021/22-2	2	2022	1	2023
(EX) AIR AND MISSILE DEFENSE EXERCISE 22	3	2022	4	2022
GTI-10 Sprint 1 (E/C) (BMDS Ground Test)	2	2023	3	2023
(WG) Demonstration, Table-top Exercises & Experiments 22	3	2022	1	2023
(WG) BMDS Wargames 23	3	2022	3	2023
(EX) ULCHI FREEDOM GUARDIAN 22	4	2022	4	2022
(EX) AIR AND MISSILE DEFENSE EXERCISE 23	4	2022	4	2022
FTX-40 (AEGIS 5.1, DT Tracking Exercise Flight Test)	4	2022	4	2022

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
(WG) Multi-National Missile Defense Conference (MNC) 22	4	2022	1	2023
(EX) VIGILANT SHIELD 23	4	2022	1	2023
(EX) KEEN SWORD 23	4	2022	1	2023
(EX) GLOBAL THUNDER 22	4	2022	1	2023
FTG-17 (GM, DT Intercept Flight Test)	1	2023	1	2023
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 22	1	2023	1	2023
(EX) GLOBAL RESPONSE EXERCISE 11	1	2023	1	2023
(EX) GLOBAL RESPONSE EXERCISE 12	1	2023	1	2023
GTI-10 Sprint 2 (E/C) (BMDS Ground Test)	2	2024	2	2024
FTM-37 (OT) (AEGIS 5.4.1, OT Intercept Flight Test)	1	2023	1	2023
FTX-23 (AEGIS 5.1, DT Target Only Flight Test)	1	2023	1	2023
(EX) GLOBAL LIGHTNING 23	1	2023	2	2023
(EX) AUSTERE CHALLENGE 23	1	2023	4	2023
(WG) NIMBLE TITAN 24	1	2023	4	2024
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 22	2	2023	2	2023
(EX) Joint Project Optic Windmill 2023	2	2023	2	2023
(EX) EUROPEAN TEST BED 23	2	2023	2	2023
(EX) KEY RESOLVE 23	2	2023	2	2023
(EX) RESILIENT SHIELD 23	2	2023	2	2023
GTI-11 Sprint 1 (N/I) (BMDS Ground Test)	2	2023	3	2023
(EX) STEADFAST ARMOUR 23	2	2023	3	2023
(EX) PACIFIC SENTRY 23	2	2023	4	2023
(EX) PACIFIC SENTRY 24	2	2023	4	2023
(WG) Huntsville Wargames 23	3	2023	3	2023
FTM-38 (AEGIS 5.0, DT/OT Intercept Flight Test)	3	2023	3	2023

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
GTD-10 (E/C) (BMDS Ground Test)	3	2024	3	2024
GTI-ISR (23) (BMDS Ground Test)	4	2023	4	2023
FTX-38 (AEGIS BL 10 (BMD 6.0) Test)	1	2024	1	2024
FTT-24 (TH, DT Intercept Flight Test)	3	2023	3	2023
(EX) Joint Live, Virtual, and Constructive 2023/24-1	3	2023	1	2024
(WG) Demonstration, Table-top Exercises & Experiments 23	3	2023	1	2024
(WG) Space & Missile Defense Symposium 23	4	2023	4	2023
(EX) ULCHI FREEDOM GUARDIAN 23	4	2023	4	2023
(EX) AIR AND MISSILE DEFENSE EXERCISE 24	4	2023	4	2023
FTX-28 E1-E3 (TH, DT Target Only Flight Test)	4	2023	4	2023
GTI-11 Sprint 2 (N/I) (BMDS Ground Test)	3	2023	4	2023
FTM-43 (AEGIS 5.1, DT/OT Intercept Flight Test)	4	2023	4	2023
(WG) Multi-National Missile Defense Conference (MNC) 23	4	2023	1	2024
(EX) GLOBAL THUNDER 23	4	2023	1	2024
(EX) VIGILANT SHIELD 24	4	2023	1	2024
(EX) KEEN EDGE 24	4	2023	2	2024
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 23	1	2024	1	2024
FTG-18 (GM, DT/OT Intercept Flight Test)	1	2024	1	2024
GTI-12 Sprint 1 (E/C) (BMDS Ground Test)	1	2025	1	2025
(EX) JUNIPER COBRA 24	1	2024	2	2024
(EX) GLOBAL LIGHTNING 24	1	2024	2	2024
(EX) EAGLE RESOLVE 24	2	2024	2	2024
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 23	2	2024	2	2024
(EX) EUROPEAN TEST BED 24	2	2024	2	2024
(EX) KEY RESOLVE 24	2	2024	2	2024

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Missile Defense Agency **Date:** February 2020

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MT01 / <i>C2BMC Test</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
(EX) RESILIENT SHIELD 24	2	2024	2	2024
FTM-40 (AEGIS BL 10 (BMD 6.0) Test)	2	2024	2	2024
(EX) STEADFAST ALLIANCE 24	2	2024	3	2024
(EX) Joint Live, Virtual, and Constructive 2023/24-2	2	2024	1	2025
FTM-41 (AEGIS BL 10 (BMD 6.0) Tests)	3	2024	3	2024
GTI-12 Sprint 2 (E/C) (BMDS Ground Test)	3	2025	3	2025
(WG) Demonstration, Table-top Exercises & Experiments 24	3	2024	1	2025
(WG) BMDS Wargames 25	3	2024	3	2025
(EX) ULCHI FREEDOM GUARDIAN 24	4	2024	4	2024
GTD-11 (N/I) (BMDS Ground Test)	4	2023	4	2023
(EX) GLOBAL THUNDER 24	4	2024	1	2025
(WG) Multi-National Missile Defense Conference (MNC) 24	4	2024	1	2025
GTI-13 Sprint 1 (N/I) (BMDS Ground Test)	4	2024	4	2024

**Note**

FY 2020 United States Indo-Pacific Command (USINDOPACOM) Joint Emerging Operational Needs (JEON) tests are funded in PE 0603914C BMD Test.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 0400 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>		
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
MX01: <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>	614.876	112.909	114.876	128.482	-	128.482	130.808	138.840	145.446	145.502	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

Increase from FY 2020 to FY 2021 provides additional hardware updates for C2BMC and software licenses to support protection of the system from vulnerability and cyber penetration, as well as increased operational sustainment costs in support of Combatant Command (CCMD).

**A. Mission Description and Budget Item Justification**

C2BMC Development Support provides operations engineering, integrated logistics, warfighter integration, deployment, and disposal of the current operational system and/or systems fielded in USSTRATCOM, USNORTHCOM, USINDOPACOM, USEUCOM, and USCENTCOM and the operation of the C2BMC Control Center. This activity provides continuous support of the development, deployment, sustainment of the C2BMC training systems, and updates training material to stay current with fielded capabilities.

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<b>Title:</b> Operations Engineering	95.803	92.212	102.606
<b>Articles:</b>	-	-	-
<p><b>Description:</b> This activity funds C2BMC support of current operational, test, and training systems. Recurring efforts include:</p> <ul style="list-style-type: none"> <li>- On-site maintenance, help-desk support, and developer reach-back support to ensure operational availability</li> <li>- C2BMC Command Center (CCC) provides 24 hours a day, 7 days a week, 365 days a year BMDS Overhead Persistent Infra-Red (OPIR) Architecture (BOA) and C2BMC operations including system and network monitoring, system administration, and network defense against cyber-attacks</li> <li>- Integrated logistics support by providing a secure supply chain; reliability, availability, and maintainability (RAM) engineering; obsolescence engineering; and sparing to ensure operational availability</li> <li>- Cybersecurity engineering providing C2BMC Commercial-off-the-shelf (COTS) software/hardware updates and CCC upgrades that address system vulnerabilities, field quarterly updates to reduce system component vulnerability to cyber-attacks</li> <li>- Information System Security Officers (ISSOs) ensuring C2BMC compliance with latest cybersecurity requirements and policies</li> <li>- System modifications driven by Warfighter Involvement Process (WIP), Continuous Improvement Process (CIP), RAM and obsolescence engineering, and external systems such as Space-Based Infrared Sensors (SBIRS), Ground-based</li> </ul>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>		<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p>Midcourse Defense (GMD) Fire Control (GFC), Aegis, Terminal High Altitude Area Defense (THAAD), Navy Link Monitoring and Management Tool (LMMT), AN/TPY-2, standard Army communications, Defense Information Systems Agency (DISA) fiber networks, and Allied/Coalition interfaces</p> <ul style="list-style-type: none"> <li>- Combatant command (CCMD) integration providing C2BMC training, on-site Subject Matter Experts (SMEs), and surge SME support for real-world events, flight tests, ground tests, exercises, cyber assessments, and wargames</li> <li>- Facility modifications required to house current or future C2BMC equipment and transportation for moving C2BMC equipment</li> <li>- Integrated product support for tactical satellite communications (SATCOM) used in flight tests, hardened SATCOM, and associated shelters</li> <li>- Provide transportation for flight test equipment and SME support and analysis for numerous test, exercise, and real world events</li> <li>- Provide recurring proficiency training to CCMDs and keep training material and systems consistent with operational capabilities</li> </ul> <p>Specific and/or unique accomplishments for each FY are as follow:</p> <p><b>FY 2020 Plans:</b></p> <ul style="list-style-type: none"> <li>- Provides sustainment of fielded EPAA Phase 3/EOR (Spiral 8.2-3) deployed to USEUCOM, USCENTCOM, USNORTHCOM, and USINDOPACOM</li> <li>- Complete decommissioning activities for Medium Range Ballistic Missile (MRBM) Defense/European Phased Adaptive Approach (EPAA) Phase 1 and 2 in USEUCOM and USCENTCOM</li> <li>- Initiate deployment activities for Long Range Discrimination Radar (LRDR) for Homeland Defense (Spiral 8.2-5)</li> </ul> <p><b>FY 2021 Plans:</b></p> <ul style="list-style-type: none"> <li>- Provides sustainment of fielded EPAA Phase 3/EOR (Spiral 8.2-3) deployed to USEUCOM, USCENTCOM, USNORTHCOM, and USINDOPACOM</li> <li>- Provides operational planning for LRDR for Homeland Defense (Spiral 8.2-5)</li> <li>- Initiate hardware updates and software licenses to support protection of the system from vulnerability and operational sustainment</li> <li>- Field NORTHCOM user node and second geographically separated management node</li> </ul> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase from FY 2020 to FY 2021 provides additional C2BMC hardware and software licenses to support protection of the system from vulnerability and cyber penetration, as well as increased operational sustainment costs in support of Combatant Command (CCMD). Increase includes initial operations of FY 2021 fielded USNORTHCOM user node and second geographically separated management node.</p>				
<b>Title:</b> Concurrent Test, Training, and Operations (CTTO)		17.106	22.664	25.876

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p align="right"><i>Articles:</i></p> <p><b>Description:</b> This element provides the development and sustainment of the C2BMC Training Support System (TSS) and the Missions Specific Vendor Plug-in (MSVP) stand alone operator training devices and the Distributed Training System (DTS) for USINDOPACOM, USNORTHCOM, USEUCOM, and USCENTCOM. C2BMC connects all BMDS Elements through virtual and physical networks to facilitate integrated test, training, operations and certification within two coexistent realms. This enables the warfighter to become proficient on current and future software versions at the operational console, increases the developer's capacity to perform a variety of tests and upgrades on the operational BMDS; and decreases recall-to-mission operations times from weeks and days to hours and minutes. Recurring accomplishments include sustaining current training systems for BMDS training events for the Unified Combatant Command developing the next generation training systems, to include the integration of Red Force / Blue Force capability, to keep current with the operational system capabilities.</p> <p>Specific and/or unique accomplishments for each FY are as follows:</p> <p><b>FY 2020 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue modifications and verification testing on BMDS LRDR for Homeland Defense (Spiral 8.2-5) TSS and DTS</li> <li>- Initiate deployment of BMDS LRDR for Homeland Defense (Spiral 8.2-5) TSS and DTS</li> </ul> <p><b>FY 2021 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue modifications and verification testing of BMDS LRDR for Homeland Defense (Spiral 8.2-5) MSVP and DTS</li> <li>- Continue deployment activities of BMDS LRDR for Homeland Defense (Spiral 8.2-5) MSVP and DTS</li> <li>- Continue development/modifications on BMDS Radar MSVP and Spiral Training Systems</li> </ul> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b></p> <p>Increase in funding from FY 2020 to FY 2021 provides MSVP and DTS training system enhancements/new modeling capability and incorporating core C2BMC algorithm changes and new defense designs elements into training devices for improved system representation.</p>	-	-	-
<b>Accomplishments/Planned Programs Subtotals</b>	112.909	114.876	128.482

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 0603881C: <i>Ballistic Missile Defense Terminal Defense Segment</i>	383.369	306.761	412.627	-	412.627	340.071	302.279	204.986	227.970	Continuing	Continuing

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>
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**C. Other Program Funding Summary (\$ in Millions)**

<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 0603882C: <i>Ballistic Missile Defense Midcourse Defense Segment</i>	790.316	1,303.716	1,004.305	-	1,004.305	776.125	726.566	767.592	1,068.536	Continuing	Continuing
• 0603884C: <i>Ballistic Missile Defense Sensors</i>	382.759	352.288	281.957	-	281.957	576.699	656.539	574.703	593.592	Continuing	Continuing
• 0603890C: <i>BMD Enabling Programs</i>	614.855	634.449	599.380	-	599.380	552.815	544.582	560.863	582.675	Continuing	Continuing
• 0603892C: <i>AEGIS BMD</i>	724.731	737.269	814.936	-	814.936	674.825	553.402	478.000	449.145	Continuing	Continuing
• 0603904C: <i>Missile Defense Integration and Operations Center (MDIOC)</i>	51.689	56.161	55.356	-	55.356	55.721	57.457	59.798	61.334	Continuing	Continuing
• 0603907C: <i>Sea Based X-Band Radar (SBX)</i>	125.900	128.156	118.318	-	118.318	135.931	131.510	145.582	169.980	Continuing	Continuing
• 0603914C: <i>Ballistic Missile Defense Test</i>	510.292	399.738	378.302	-	378.302	385.910	396.524	394.949	417.261	Continuing	Continuing
• 0603915C: <i>Ballistic Missile Defense Targets</i>	561.349	542.939	536.133	-	536.133	593.939	519.028	520.625	540.675	Continuing	Continuing
• 0604181C: <i>Hypersonic Defense</i>	132.612	390.204	206.832	-	206.832	107.521	111.084	115.487	118.333	Continuing	Continuing
• 0604672C: <i>Homeland Defense Radar-Hawaii</i>	70.735	188.480	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	259.215
• 0604673C: <i>Pacific Discriminating Radar</i>	14.453	6.711	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.164
• 0604873C: <i>Long Range Discrimination Radar (LRDR)</i>	172.705	136.423	137.256	-	137.256	118.787	90.299	60.251	41.726	Continuing	Continuing

**Remarks**

**D. Acquisition Strategy**

A sole source C2BMC contract to Lockheed Martin was awarded 1st quarter FY 2012. The current ordering period is through 1st quarter FY 2025. Major team members to Lockheed are Northrop Grumman, Boeing, Raytheon, and General Dynamics. They are charged with the development, testing, fielding, training, operations and sustainment, and cyber operations support of the C2BMC system. Additionally, the Defense Information Systems Agency (DISA) supports C2BMC worldwide long-haul communications. C2BMC Program Office government, Federally Funded Research and Development Center/University Affiliated Research Center (FFRDC/UARC),

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>

and Contract Support Services (CSS) personnel are also fully integrated as part of the Prime contractor's team to function in an Integrated Product Team environment. Furthermore, a sole source contract Specialized Warfighter Development Contract (SWDC) was awarded to Northrop Grumman in March 2018 (3 year base and 2 one year option periods) for continuation of the systems engineering, software development, test and integration for BMDS Overhead Persistent Infrared Architecture (BOA). A Small Business Innovation Research (SBIR) Phase III project by Sonalysts plans to include standalone trainer development which will deliver mission training simulation using core Standard Space Trainer (SST).

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Missile Defense Agency</b>												<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 0400 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>						

<b>Product Development (\$ in Millions)</b>				<b>FY 2019</b>		<b>FY 2020</b>		<b>FY 2021 Base</b>		<b>FY 2021 OCO</b>		<b>FY 2021 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Operations Engineering - Operations Engineering - Contract Support Services (CSS)	MIPR	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	0.771	2.586	Oct 2018	0.813	Oct 2019	0.590	Oct 2020	-		0.590	Continuing	Continuing	Continuing
Operations Engineering - Operations Engineering - Indirect Support	MIPR	DISA DECC/DISA TECC : Various	46.928	1.100	Oct 2018	0.000		0.000		-		0.000	0.000	48.028	0.000
Operations Engineering - Operations Engineering - Sustaining Support	C/CPAF	Jacobs Technology : Huntsville, AL; Colorado Springs, CO	1.003	2.100	Mar 2019	1.794	Mar 2020	0.000		-		0.000	0.000	4.897	0.000
Operations Engineering - Operations Engineering - Training Support	C/FPIF	Boeing : Huntsville, AL	0.280	1.056	Oct 2018	1.149	Oct 2019	1.171	Oct 2020	-		1.171	Continuing	Continuing	Continuing
Operations Engineering - Operations Engineering - Unit Personnel, Control System Improvement Sustaining Support	MIPR	Army, Navy, Air Force : Various	7.466	6.039	Oct 2018	9.162	Oct 2019	6.601	Oct 2020	-		6.601	Continuing	Continuing	Continuing
Operations Engineering - Prior year Operations Engineering no longer funded in the FYDP	Various	Various : Various	9.845	0.000		0.000		0.000		-		0.000	0.000	9.845	9.845
Operations Engineering - Unit Personnel, Control System Improvement, Sustaining Support	SS/CPFF	Lockheed Martin Team : Huntsville, AL	427.176	82.922	Dec 2018	79.294	Dec 2019	94.244	Dec 2020	-		94.244	Continuing	Continuing	Continuing
Concurrent Test, Training, and Operations (CTTO) - (Training Enhancements)	SS/CPFF	Sonalysts : Waterford, CT	0.000	0.000		0.000		2.382	Dec 2020	-		2.382	Continuing	Continuing	Continuing
Concurrent Test, Training, and Operations (CTTO) - CTTO/Training Enhancements	MIPR	Aviation and Missile Research Development and	12.217	3.019	Dec 2018	6.904	Dec 2019	6.429	Dec 2020	-		6.429	Continuing	Continuing	Continuing

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
		Engineering Center : Huntsville, AL													
Concurrent Test, Training, and Operations (CTTO) - Prior year CTTO no longer funded in the FYDP	Various	Various : Various	8.443	0.000		0.000		0.000		-		0.000	0.000	8.443	4.610
Concurrent Test, Training, and Operations (CTTO) - Training Enhancements	SS/CPPIF	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO	100.747	14.087	Dec 2018	15.760	Dec 2019	17.065	Dec 2020	-		17.065	Continuing	Continuing	Continuing
<b>Subtotal</b>			614.876	112.909		114.876		128.482		-		128.482	Continuing	Continuing	N/A

**Remarks**

N/A

<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**

N/A

<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**

N/A

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A

**Remarks**  
N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	614.876	112.909	114.876	128.482	-	128.482	Continuing	Continuing	N/A

**Remarks**  
Award Dates reflect date of first obligation. Additional obligations may incrementally occur throughout the year.

**UNCLASSIFIED**

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

<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
MX01 Command & Control, Battle Management, Communications (C2BMC) Development Support	◇	◇	◇	◇	◇	◇	◇

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MX01 / <i>Command &amp; Control, Battle Management, Communications (C2BMC) Development Support</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
MX01 Command & Control, Battle Management, Communications (C2BMC) Development Support	1	2019	4	2025

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency										<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 0400 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>					<b>Project (Number/Name)</b> MD40 / <i>Program-Wide Support</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	
MD40: <i>Program-Wide Support</i>	124.245	21.290	23.682	23.569	-	23.569	23.545	21.973	29.752	29.673	Continuing	Continuing	
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-			

**Note**

Program Wide Support (PWS) is allocated on a pro-rata basis across multiple Agency PEs each fiscal year based on the total Agency budget, and therefore fluctuates per PE by fiscal year.

**A. Mission Description and Budget Item Justification**

PWS contains non-headquarters management costs in support of MDA functions and activities across the entire MDS. These functions include Government Civilians and Contract Support Services. This effort provides integrity and oversight of the MDS as well as supports MDA in the development and evaluation of technologies that will respond to the changing threat. Additionally, PWS includes personnel to support global deployments performing deployment site preparation and activation, and provides facility capabilities for MDA Executing Agent locations worldwide. Other MDA wide costs include: physical and technical security; civilian drug testing; audit readiness; the Science, Technology, Engineering, and Mathematics (STEM) program; legal services and settlements; travel and agency training; office, equipment, vehicle, and warehouse leases; utilities and base operations across multiple geographic locations; commercial and ancillary facility services; management of all facility aspects regardless of lifecycle stage; supplies and maintenance; compliance with statutory environmental requirements; data and unified communications support; materiel and readiness and central property management of equipment; Facilities Sustainment, Restoration and Modernization (FSRM) program, (formerly Real Property Maintenance) to keep the Department's inventory of facilities in good working order; and similar operating expenses. PWS is allocated on a pro-rata basis across most Agency PEs and therefore fluctuates per PE by fiscal year based on the total Agency budget in that fiscal year.

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<b>Title:</b> Program Wide Support	21.290	23.682	23.569
<b>Articles:</b>	-	-	-
<b>Description:</b> PWS contains non-headquarters management costs in support of MDA functions and activities across the entire MDS. These functions include Government Civilians and Contract Support Services. This effort provides integrity and oversight of the MDS as well as supports MDA in the development and evaluation of technologies that will respond to the changing threat. Additionally, PWS includes personnel to support global deployments performing deployment site preparation and activation, and provides facility capabilities for MDA Executing Agent locations worldwide. Other MDA wide costs include: physical and technical security; civilian drug testing; audit readiness; the Science, Technology, Engineering, and Mathematics (STEM) program; legal services and settlements; travel and agency training; office, equipment, vehicle, and warehouse leases; utilities and base operations across multiple geographic locations; commercial and ancillary facility services; management of all facility aspects regardless of lifecycle stage; supplies and maintenance; compliance with statutory environmental requirements; data and			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD40 / <i>Program-Wide Support</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
unified communications support; materiel and readiness and central property management of equipment; Facilities Sustainment, Restoration and Modernization (FSRM) program, (formerly Real Property Maintenance) to keep the Department's inventory of facilities in good working order; and similar operating expenses. PWS is allocated on a pro-rata basis across most Agency PEs and therefore fluctuates per PE by fiscal year based on the total Agency budget in that fiscal year.			
<b><i>FY 2020 Plans:</i></b> - SEE ABOVE.			
<b><i>FY 2021 Plans:</i></b> - SEE ABOVE.			
<b><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i></b> N/A			
<b>Accomplishments/Planned Programs Subtotals</b>	21.290	23.682	23.569

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2021 Missile Defense Agency</b>												<b>Date:</b> February 2020			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>						<b>Project (Number/Name)</b> MD40 / <i>Program-Wide Support</i>			

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total		Cost To Complete		Total Cost	Target Value of Contract
				Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date				
Program Wide Support - Agency Operations Management	Various	Various : Multi: AL, CA, CO, VA	5.596	0.323	Jul 2019	0.358	Jul 2020	0.000		-		0.000	Continuing	Continuing	Continuing		
Program Wide Support - Agency Operations and Support Services	C/CPFF	Various : Multi: AK, AL, CA, CO, HI, VA	3.966	3.958	Jan 2019	7.264	Oct 2019	7.899	Jul 2021	-		7.899	Continuing	Continuing	Continuing		
Program Wide Support - Agency Operations and Support Services (FFP)	C/FFP	Various : Multi: AK, AL, CA, CO, HI, VA	22.388	0.000		0.661	Nov 2019	0.510	Nov 2020	-		0.510	Continuing	Continuing	Continuing		
Program Wide Support - Agency Operations and Support Services Civilian Salaries, Travel, Training	Various	Various : Multi: AL, CA, CO, VA	40.259	17.009	Oct 2018	15.061	Nov 2019	14.580	Oct 2020	-		14.580	2.800	89.709	0.000		
Program Wide Support - Agency Operations, Sustainment and GPC	Various	Various : Multi: AL, CO, VA etc.	0.000	0.000		0.037	Oct 2019	0.050	Nov 2020	-		0.050	Continuing	Continuing	Continuing		
Program Wide Support - FFRDC/UARC	C/CPAF	JHU/APL : AL, VA	0.000	0.000		0.301	Sep 2020	0.530	Dec 2020	-		0.530	Continuing	Continuing	Continuing		
Program Wide Support - Prior year no longer funded in the FYDP	Various	Various : Various	52.036	0.000		0.000		0.000		-		0.000	0.000	52.036	0.000		
<b>Subtotal</b>			124.245	21.290		23.682		23.569		-		23.569	Continuing	Continuing	N/A		

**Remarks**  
N/A

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
		124.245	21.290	23.682	23.569	-	23.569	Continuing	Continuing

**Remarks**  
Award Date reflects date of first obligation. Additional obligations may incrementally occur throughout the year.



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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Missile Defense Agency		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603896C / <i>Ballistic Missile Defense Command and Control, Battle Management &amp; Communication</i>	<b>Project (Number/Name)</b> MD40 / <i>Program-Wide Support</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
MD40 Program-Wide Support	1	2019	4	2025