Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Missile Defense Agency											Date: May 2021	
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603896C *I Ballistic Missile Defense Command and Control, Battle Management & Communication*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	3,606.989	550.513	645.741	603.448	-	603.448	-	-	-	-	-	-
MD01: *Command & Control, Battle Management, Communications (C2BMC)*	2,349.056	316.770	417.583	380.218	-	380.218	-	-	-	-	-	-
MC01: *Cyber Operations*	30.206	32.649	12.658	10.537	-	10.537	-	-	-	-	-	-
MT01: *C2BMC Test*	354.407	63.395	61.264	65.341	-	65.341	-	-	-	-	-	-
MX01: *Command & Control, Battle Management, Communications (C2BMC) Development Support*	727.785	114.017	128.482	125.086	-	125.086	-	-	-	-	-	-
MD40: *Program-Wide Support*	145.535	23.682	25.754	22.266	-	22.266	-	-	-	-	-	-
Program MDAP/MAIS Code: 362												

Note

The decrease from FY 2021 to FY 2022 reflects the following:
- Completion of FY 2021 cruise missile defense Congressional plus up effort
- Space C2 Integration support efforts and C2BMC development and Deployment program office support efficiencies
- Delay in the initiation of L-200 threat mitigation and Robust Post-Interceptor Assessment (PIA)
- Delay in schedule of fielding the site modifications of Combatant Command (CCMD) required Command and Control, Battle Management and Communications (C2BMC) upgrades for two of the three AN/TPY-2 High Altitude Electromagnetic Pulse (HEMP) Hardened Transportable Terminal (HTT) sites
- Completion of US Northern Command (USNORTHCOM) user node
- Completion of the Management Node that provides uninterrupted mission support to geographical separated locations for Ballistic Missile Defense (BMD) network system security
- Completion of upgrade and implementation of DoD required Secure Host Baselines for required operating systems

A. Mission Description and Budget Item Justification

The Command and Control, Battle Management, and Communications (C2BMC) program is the integrating element of the Missile Defense System (MDS). 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 as the

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Missile Defense Agency	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603896C *I Ballistic Missile Defense Command and Control, Battle Management & Communication*

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. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	549.756	593.353	593.330	-	593.330
Current President's Budget	550.513	645.741	603.448	-	603.448
Total Adjustments	0.757	52.388	10.118	-	10.118
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-40.965			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	93.353			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-8.404	0.000			
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	9.161	0.000	10.118	-	10.118

Change Summary Explanation

The increase in FY 2021 provides the enacted congressional net increase of $52.4 million. $50.0 million increase provides for the development of innovative command and control techniques and technology to accelerate integration of non-traditional sensors for missile defense. $36.2 million increase provides for acceleration of indications and warning capability against cruise missiles and asymmetric threats. $5.0 million increase provides for cybersecurity upgrades to protect against the cybersecurity threat environment. $2.2 million increase provides for DWR MDA manpower restoration. $41.0 million reduction reflects the Congressional decrease for Increment 7 and Increment 9 development efforts.

The increase in FY 2022 provides systems engineering activities and algorithm development to support Layered Homeland Defense efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	Project (Number/Name) MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
MD01: *Command & Control, Battle Management, Communications (C2BMC)*	2,349.056	316.770	417.583	380.218	-	380.218	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The decrease from FY 2021 to FY 2022 reflects the following:
- Completion of FY 2021 cruise missile defense Congressional plus up effort
- Space C2 Integration support and C2BMC development and Deployment program office support efficiencies
- Delay in the initiation of L-200 threat mitigation and Robust Post-Interceptor Assessment (PIA)
- Delay in schedule of fielding the site modifications of Combatant Command (CCMD) required C2BMC upgrades for two of the three AN/TPY-2 High Altitude Electromagnetic Pulse (HEMP) Hardened Transportable Terminal (HTT) sites
- Completion of USNORTHCOM user node
- Completion of the Management Node that provides uninterrupted mission support to geographical separated locations for Ballistic Missile Defense (BMD) network system security

A. Mission Description and Budget Item Justification

Provides incremental development, deployment, and operational support of C2BMC capabilities required for MDS 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 Domain Awareness (SDA) tasking support, and improved cyber capabilities. Enhanced Homeland Defense also integrates the BMDS Overhead Persistent Infrared (OPIR) Architecture (BOA) with the MDS 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 US Central Command (USCENTCOM) and US European Command (USEUCOM) area of responsibility compared to individual weapon system organic capability. Spiral 8.2-3 also includes SDA and integrates Mobile Sensor Integration (MSI) Phase 1 and BOA data into the MDS.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

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 SDA; implements Link-16 reporting, integration of system level discrimination data, transmission of LRDR-based information to GMD Fire Control (GFC) and other MDS elements; and operationalization of Space-based Kill Assessment (SKA) hit assessment for Homeland Defense.

Expanded Regional and Homeland Defense Increment 7 (Spiral 8.2-7) will provide BMDS System Track (BST) with System Level Discrimination Integration for GMD engagements; Expanded Active Sensor Bias Monitoring and Full Reporting; Refined Space and Intelligence Data; Expanded Hypersonic Tracking and Link-16 Reporting.

Cruise Missile Defense accelerates capabilities against cruise missiles and asymmetric threats by providing performance assessments of advanced cruise missiles, leveraging C2BMC Enterprise Sensor Processing Node (ESPN) to track and report on advanced threats, and establishes a new suite for 24 hours a day, 7 days a week testing of new ground processing algorithms to detect and report on long range cruise missiles. This capability will demonstrate a design with non-traditional sensors and networks, with the potential for limited leave behind capability.

The classified effort will provide the development of innovative command and control (C2) techniques and technology to accelerate integration of non-traditional sensors for missile defense.

Layered Homeland Defense (LHD) provides the Warfighter with the capability to use additional layers of missile defense by developing and testing auto-engagement coordination logic with multiple weapon systems (GMD, Aegis, THAAD). C2BMC provides engagement planning, sensor tasking and resource management, track handling, system discrimination solutions, warfighter decision aids, and integrated battle management allowing multiple engagement opportunities and weapon system deconfliction across the threat flight trajectory.

C2BMC continues to develop incremental improvements to the MDS to keep pace with emerging threats worldwide by investing in the development, integration, and testing of advanced algorithms to improve track and discrimination capabilities 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 allies and partners are integrated to the fullest extent possible with U.S. MDS 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. MDS requirements. C2BMC participates in test events and live fire exercises hosted by international partners to ensure U.S. missile defense weapons, sensors, and C2 systems are

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
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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, C2) resulting in an integrated regional, operational, and strategic defense of Japan.

C2BMC Modeling and Simulation (M&S) maintains MDS 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 MDS 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 2020	FY 2021	FY 2022
Title: C2BMC Development and Deployment	286.176	291.890	305.210
Articles:	-	-	-
Description: Provides funding for incremental development and deployment of C2BMC capabilities that link sensors and shooters to enable integrated MDS capabilities, integrate BOA with the MDS 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 enable integrated experimentation for C2BMC, ESL, OPIR products, and other MDS 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. Expanding Space Domain Awareness (SDA) 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 MDS Integrated Master Test Plan (IMTP); site planning, scheduling, and hardware acquisition to support planned deployment of C2BMC Spirals and BOA capabilities; updates and maintenance for C2BMC Model (BCM) MDS simulation/stimulation (federated model) and verification scenarios for all C2BMC Spirals deployed and under development; Discrimination, operationalization of SKA Hit Assessment, and C2BMC capabilities; design and installation of operational sharing gateways; and collaboration with international			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
partners to ensure future interoperability; and maintain Verification and Validation in support of MDS capability ground testing and participation in MDS ground tests. C2BMC will 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. 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. The expanded sensor architecture will integrate ground-based radars from the U.S. Space Force Space Surveillance Network (SSN), orchestrated by C2BMC, and develop algorithms to fuse and/or correlate the data provided by these sensors in support of missile defense and space C2 missions. Specific and/or unique accomplishments for each FY are as follows: ***FY 2021 Plans:*** EPAA Phase 3 / EOR (Spiral 8.2-3): - Continue maintenance of Spiral 8.2-3's ability to develop/deploy capability in response to emergent operational requirements LRDR for Homeland Defense (Spiral 8.2-5), homeland defense focus: - Continue incremental capability development for S8.2-5 in response to emergent operational requirements - Support developmental testing and preparation of transfer of the LRDR to the Air Force - Continue phased deployment of hardware and software to provide LRDR MDS network connectivity and sensor control nodes - Continue development, integration, and operationalization of BOA 7.0 capability to detect and track advanced threats globally - Continue operationalization of Space-based Kill Assessment (SKA) Hit Assessment (HA) C2BMC Additional and Expanded Regional and Homeland Defense focus: - Continue design and development of, and deliver accredited models and simulations (M&S) for, C2BMC and BOA spirals for participation in End-to-end Digital Integrated System Simulation (EDISS) - Support two training device development program for distributed and individual training			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- Continue to support the design and development of Ground Test Integrated System-level Simulation (GTISS) by developing and delivering accredited M&S for BOA spirals - Initiate development of next iteration of BOA which will include addition of new sensors and expanded Advanced Threat Performance - Initiate early technology development to integrate additional advanced sensors into BOA to expand coverage and increase custody of emerging threats - Initiate Management Node to provide uninterrupted mission support by providing geographical separated locations for BMD network and system security - Initiate and complete user node to USNORTHCOM as a Warfighter Involvement Process (WIP) item providing hardware and integration to support Homeland Defense - 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 - Initiate technical upgrade and refresh for development lab infrastructure and the Joint Early Warning Lab (JEWL) - Perform cybersecurity upgrades to the C2BMC development environment Space C2 Sensor Integration - Establish early connectivity to Eglin C-Band Radar, Millstone, ALTAIR, and Space Fence SSN sensors through existing network paths to conduct early opportunity integration and Joint risk reduction testing with the U.S. Space Force - Initiate BCN connectivity process between C2BMC and the above SSN sensors, as well as the Ground-Based Radar-Kwajalein (GBR-K) radar - Expand C2BMC architecture to support C2BMC Global tasking of SSN sensors - Initiate software development to integrate and test SSN sensors as part of S8.2-5 spiral development - Conduct studies to evaluate and optimize trades in support of delivering integrated Space C2 and missile defense capabilities			
FY 2022 Plans: LRDR for Homeland Defense (Spiral 8.2-5), homeland defense focus: - Complete incremental capability development for S8.2-5 in response to emergent operational requirements - Complete phased deployment of hardware and software to provide LRDR MDS network connectivity and sensor control nodes - Complete development, integration, and operationalization of BOA 7.0 capability to detect and track advanced threats globally - Complete development and testing of Space-based Kill Assessment (SKA) Hit Assessment (HA) - Begin sustainment of S8.2-5 capabilities C2BMC Additional and Expanded Regional and Homeland Defense focus:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- Continue design and development of, and deliver accredited models and simulations (M&S) for, C2BMC and BOA spirals for participation in End-to-end Digital Integrated System Simulation (EDISS) - Support two training device development and fielding programs for distributed and individual training - Continue to support the design and development of Ground Test Integrated System-level Simulation (GTISS) by developing and delivering accredited M&S for BOA spirals - Continue development of next iteration of BOA which will include addition of new sensors and expanded Advanced Threat Performance - Continue development to integrate additional advanced sensors into BOA to expand coverage and increase custody of emerging threats - 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 - Continue technical upgrade and refresh for development lab infrastructure and the Joint Early Warning Lab (JEWL) C2BMC Layered Homeland Defense focus: - Begin system engineering activities to support Layered Homeland Defense including requirements, design, and operational concept development - Start algorithm development to support enhanced engagement planning, battle management, and decision aids Space C2 Integration - Initiate development and test of source and system track algorithms in support of Space C2 sensor orchestration - Continue development, integration, and test of the Eglin C-Band Radar, Millstone, ALTAIR, Space Fence, and GBR-K sensors into C2BMC - Initiate development of Space Domain Awareness sensor integration of a UEWR sensor in support of Joint Space C2/MD missions - Support interface development and test for the Millstone, ALTAIR, Space Fence, Eglin C-Band, and UEWR radars as their U.S. Space Force upgrade paths near IOC - Initiate early operational testing of the above SSN sensors with C2BMC serving as the sensor orchestrator and track processor - Conduct studies to evaluate and optimize trades in support of delivering integrated Space C2 and missile defense capabilities ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in FY 2022 provides systems engineering activities and algorithm development to support Layered Homeland Defense efforts.			
Title: C2BMC Communications	30.594	39.493	35.265

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
Articles:	-	-	-

Description: 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:
- 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 MDS
- Participate in and analyze results from events scheduled in the MDS IMTP
- Provide MDS communications via leased Defense Information Service Agency (DISA) circuits, and resolve real-time operational issues through DISA's Network Operations and Security Center
- 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)
- Upgrade BCN capability by supporting all DoD teleports to enhance satellite communications
- Continue technical refresh for End-of-Life SATCOM terminals on SBX by transitioning to Military Satellite Communications (MILSATCOM) terminals
- Continue acquiring additional network circuits to support the threat based communication network modernization
- Continue PAAWNS modem integration and installations globally

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

FY 2021 Plans:
- Complete installation of long distance circuit hardware for the Ground-Based Midcourse Defense Communication Network Modernization
- Continue acquiring additional network circuits to support the threat based communication network modernization
- Continue PAAWNS modem integration and installations globally
- Upgrade and technical refresh of the PAAWNS threat based communication network against the advanced threat of nuclear capabilities, while maintaining efficiencies in cost
- 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

FY 2022 Plans:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- Continue upgrade and technical refresh of the PAAWNS threat based communication network against the advanced threat of nuclear capabilities, while maintaining efficiencies in cost - Continue upgrade and integration of AN-TPY/2 HEMPHTTs for increased protection of satellite communication systems at relevant sites ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease from FY 2021 to FY 2022 reflects a delay in schedule of fielding site modifications of Combatant Command (CCMD) required C2BMC upgrades for AN/TPY-2 HEMP HTT sites.			
Title: Classified ***Articles:*** ***Description:*** Provides for the development of innovative command and control techniques and technology to accelerate integration of non-traditional sensors for missile defense. Leverage advanced processing nodes, innovative fusion techniques, and advanced capabilities for enhanced tracking and reporting. Specific and/or unique accomplishments for each FY are as follows: ***FY 2021 Plans:*** - SEE ABOVE ***FY 2022 Plans:*** - SEE ABOVE ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 reflects the completion of Classified Congressional plus up efforts planned in FY 2021.	0.000 -	50.000 -	39.743 -
Title: Cruise Missile Defense for Homeland ***Articles:*** ***Description:*** Accelerates capability against cruise missiles and asymmetric threats. Provides performance assessment of advanced cruise missiles, leverages Command and Control, Battle Management, and Communications Enterprise Sensor Processing. Node to track and report on advanced threats, and establishes a new suite for 24 hours a day, 7 days a week, 365 days a year testing of new ground processing algorithms to detect and report on long range cruise missiles, and will demonstrate a design with non-traditional sensors and networks, with the potential for limited leave behind capability. Specific and/or unique accomplishments for each FY are as follows:	0.000 -	36.200 -	0.000 -

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Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: - SEE ABOVE ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 reflects the completion of FY 2021 Cruise Missile Defense Congressional plus up efforts.			
Accomplishments/Planned Programs Subtotals	316.770	417.583	380.218

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0603881C: *Ballistic Missile Defense Terminal Defense Segment*	295.312	312.317	277.949	-	277.949	-	-	-	-	-	-
• 0603882C: *Ballistic Missile Defense Midcourse Defense Segment*	1,275.414	1,219.261	745.144	-	745.144	-	-	-	-	-	-
• 0603884C: *Ballistic Missile Defense Sensors*	348.356	265.803	224.750	-	224.750	-	-	-	-	-	-
• 0603890C: *BMD Enabling Programs*	630.196	616.455	595.301	-	595.301	-	-	-	-	-	-
• 0603892C: *AEGIS BMD*	722.582	877.336	732.512	-	732.512	-	-	-	-	-	-
• 0603904C: *Missile Defense Integration and Operations Center (MDIOC)*	54.783	55.356	52.403	-	52.403	-	-	-	-	-	-
• 0603907C: *Sea Based X-Band Radar (SBX)*	137.604	118.318	147.241	-	147.241	-	-	-	-	-	-
• 0603914C: *Ballistic Missile Defense Test*	398.939	365.208	362.906	-	362.906	-	-	-	-	-	-
• 0603915C: *Ballistic Missile Defense Targets*	545.764	536.133	553.334	-	553.334	-	-	-	-	-	-
• 0604181C: *Hypersonic Defense*	386.528	272.632	247.931	-	247.931	-	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0604672C: *Homeland Defense Radar-Hawaii*	181.569	133.000	0.000	-	0.000	-	-	-	-	-	-
• 0604673C: *Pacific Discriminating Radar*	2.921	0.000	0.000	-	0.000	-	-	-	-	-	-
• 0604873C: *Long Range Discrimination Radar (LRDR)*	131.135	138.317	133.335	-	133.335	-	-	-	-	-	-

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) and Simultaneous Correlation of Unambiguous Tracks (SCOUT).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C2BMC Development and Deployment - Independent Performance Assessment and Analysis -Various	MIPR	Various : Huntsville, AL, Colorado Springs, CO; NCR	5.600	3.365	Oct 2019	4.449	Oct 2020	1.886	Oct 2021	-		1.886	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Aggregated Discrim	Various	Various : AL; CO; FL; OH; MA; VA	38.308	15.543	Oct 2019	27.321	Oct 2020	12.443	Oct 2021	-		12.443	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	9.186	Oct 2019	2.995	Oct 2020	3.797	Oct 2021	-		3.797	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BOA OPIR Stimulation M&S - EDISS/ GTISS	C/CPAF	SciTec : Newark, NJ	0.500	0.083	Oct 2019	2.632	Oct 2020	2.575	Oct 2021	-		2.575	Continuing	Continuing	Continuing
C2BMC Development and Deployment - BOA OPIR Stimulation M&S - EDISS/ GTISS -GOV	MIPR	Sandia National Labs : Albuquerque, NM	1.317	0.928	Nov 2019	0.704	Nov 2020	0.000		-		0.000	0.000	2.949	0.000
C2BMC Development and Deployment - BOA OPIR Stimulation M&S - EDISS/ GTISS -NGC	SS/CPAF	Northrop Grumman Space and Mission Systems : Azusa, CA	1.615	3.467	Nov 2019	0.687	Nov 2020	0.000		-		0.000	0.000	5.769	0.000
C2BMC Development and Deployment - BOA Simulation Development and Integration- EDISS	SS/CPAF	Northrop Grumman Space and Mission Systems : Boulder, CO	0.000	0.000		0.687	Oct 2020	0.000		-		0.000	0.000	0.687	0.000
C2BMC Development and Deployment - C2BMC Hardware/Software Development, Integration & Test (I&T)	SS/CPIF	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO	877.374	112.597	Dec 2019	124.499	Dec 2020	130.327	Dec 2021	-		130.327	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C2BMC Development and Deployment - C2BMC Integration	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	168.709	7.918	Nov 2019	2.577	Nov 2020	7.263	Nov 2021	-		7.263	Continuing	Continuing	Continuing
C2BMC Development and Deployment - C2BMC Mid-Term Discrim-SCOUT	SS/CPFF	Northrop Grumman Space and Mission Systems : Huntsville, AL	50.228	5.331	Oct 2019	0.000		0.000		-		0.000	0.000	55.559	0.000
C2BMC Development and Deployment - C2BMC Mid-Term Discrim-SCOUT OGA	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	4.330	2.500	Nov 2019	0.224	Nov 2020	0.000		-		0.000	0.000	7.054	0.000
C2BMC Development and Deployment - Contract Support Services (CSS)	C/CPFF	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	306.047	34.092	Nov 2019	28.599	Nov 2020	25.375	Nov 2021	-		25.375	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Cybersecurity Upgrades - Development	SS/CPIF	Lockheed Martin : Huntsville, AL; Colorado Springs, CO	0.000	0.000		4.968	Jan 2021	0.000		-		0.000	0.000	4.968	0.000
C2BMC Development and Deployment - ESL/BOA Development	SS/CPAF	Northrop Grumman Space and Mission Systems : Colorado Springs, CO	48.655	5.000	Oct 2019	28.411	Oct 2020	24.215	Oct 2021	-		24.215	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	200.722	16.210	Oct 2019	17.239	Oct 2020	15.368	Oct 2021	-		15.368	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C2BMC Development and Deployment - IT User Services - IRES	C/CPAF	Jacobs Technical, Inc : AL, AK, CA, CO, HI, NM, VA	1.922	6.008	Mar 2020	6.216	Mar 2021	6.057	Mar 2022	-		6.057	Continuing	Continuing	Continuing
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	10.112	0.000		1.020	Nov 2020	0.865	Nov 2021	-		0.865	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	1.239	6.456	Mar 2020	3.680	Mar 2021	1.019	Mar 2022	-		1.019	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Layered Homeland Defense (Prime)	SS/CPIF	Lockheed Martin : Huntsville, AL	0.000	0.000		0.000		20.634	Nov 2021	-		20.634	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Layered Homeland Defense - Contract Support Services (CSS)	C/CPFF	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	0.000	0.000		0.000		6.082	Nov 2021	-		6.082	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Layered Homeland Defense Planner	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	0.000	0.000		0.000		4.634	Nov 2021	-		4.634	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Layered Homeland Defense Prototyping	C/CPFF	Corvid : Huntsville, AL	0.000	0.000		0.000		13.628	Nov 2021	-		13.628	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C2BMC Development and Deployment - M&S EDISS/ GTISS - Industry	C/CPAF	Boeing : Huntsville, AL	0.000	4.064	Dec 2019	0.000		0.000		-		0.000	0.000	4.064	4.064
C2BMC Development and Deployment - MDA Civilian, Travel & PCS	Various	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	188.714	20.027	Oct 2019	23.477	Oct 2020	20.919	Oct 2021	-		20.919	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Mobile Sensor Integration Phase II	Various	Various : AL; CO; FL; OH; MA; VA	33.500	0.000		0.000		0.000		-		0.000	0.000	33.500	0.000
C2BMC Development and Deployment - Models & Simulation	SS/CPIF	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO; NCR	5.861	8.021	Oct 2019	5.367	Oct 2020	3.720	Oct 2021	-		3.720	Continuing	Continuing	Continuing
C2BMC Development and Deployment - OGA Communications Development	MIPR	USAF/SAF : Various	0.000	14.389	May 2020	0.000		0.000		-		0.000	0.000	14.389	0.000
C2BMC Development and Deployment - Post Intercept Assessment	C/CPFF	SciTec : Newark, NJ	2.105	1.578	Nov 2019	0.500	Nov 2020	0.000		-		0.000	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 Intercept Assessment Integration	SS/CPIF	Lockheed Martin Team : Huntsville, AL/Colorado Springs, CO	0.359	0.872	Nov 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
C2BMC Development and Deployment - Post Intercept Assessment Prototyping	C/CPFF	Corvid : Huntsville, AL	6.028	2.220	Nov 2019	0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
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	3.390	2.540	Mar 2020	3.436	Mar 2021	0.000		-		0.000	0.000	9.366	0.000
C2BMC Development and Deployment - Spiral Development	MIPR	Sandia, MDA Various : AL; CA; CO; NCR, NM	8.259	0.221	Oct 2019	2.202	Oct 2020	0.575	Oct 2021	-		0.575	Continuing	Continuing	Continuing
C2BMC Development and Deployment - X Lab	SS/CPIF	Lockheed Martin : Huntsville, AL	7.944	3.560	Oct 2019	0.000		3.828	Oct 2021	-		3.828	Continuing	Continuing	Continuing
C2BMC Communications - Communication Equipment and Fielding	MIPR	DISA, PMDCATS, SPAWAR : Springfield, VA	160.944	23.995	Jan 2020	28.417	Jan 2021	30.459	Jan 2022	-		30.459	Continuing	Continuing	Continuing
C2BMC Communications - Communication Leases	MIPR	DISA : Arlington, VA	58.778	6.599	Oct 2019	11.076	Oct 2020	4.806	Oct 2021	-		4.806	Continuing	Continuing	Continuing
C2BMC Communications - Networks Development and Deployment	SS/CPFF	Lockheed Martin Team : Colorado Springs, CO	28.498	0.000		0.000		0.000		-		0.000	0.000	28.498	0.000
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
Classified - Classified Program	MIPR	USAF/SAF : Various	0.000	0.000		50.000	Feb 2021	39.743	Feb 2022	-		39.743	0.000	89.743	0.000
Cruise Missile Defense for Homeland - Cruise Missile Defense for Homeland	MIPR	USAF/SAF : Various	0.000	0.000		36.200	Jan 2021	0.000		-		0.000	0.000	36.200	0.000
		Subtotal	2,349.056	316.770		417.583		380.218		-		380.218	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks															
N/A															

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2,349.056	316.770		417.583		380.218		-		380.218	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.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

Significant Event Complete ▲ Significant Event Planned △ Milestone Decision Complete ★ Milestone Decision Planned ☆ Element Test Complete ◆ Element Test Planned ◇ System Level Test Complete ● System Level Test Planned ○ Complete Activity ✦ Planned Activity ✧

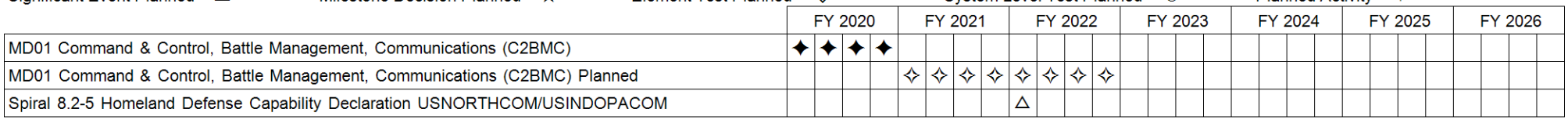

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD01 / *Command & Control, Battle Management, Communications (C2BMC)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
MD01 Command & Control, Battle Management, Communications (C2BMC)	1	2020	4	2020
MD01 Command & Control, Battle Management, Communications (C2BMC) Planned	1	2021	4	2022
Spiral 8.2-5 Homeland Defense Capability Declaration USNORTHCOM/ USINDOPACOM	1	2022	1	2022

Note

Based on the OUSD(C) FY 2022 President's Budget Submission Guidance, fiscal years covered in the justification material will include FY 2020 through FY 2022. Planned entries in the R4 may continue past FY 2022, out-years will be addressed in future budget submissions.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MC01 / *Cyber Operations*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
MC01: *Cyber Operations*	30.206	32.649	12.658	10.537	-	10.537	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Decrease from FY 2021 to FY 2022 reflects completion of upgrade and implementation of DoD required Secure Host Baselines for required operating systems, realignment of cybersecurity upgrades to the C2BMC development environment to MD01 Development and Deployment, and realignment of upgrades and implementation of latest DoD required ACAS (Assured Compliance Assessment Solution), ESS (Endpoint Security Services) and Cyber Security increments within the C2BMC Test Bed (CTB) to MT01 Integrated Master Test Plan.

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) and Cybersecurity Tools 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)	FY 2020	FY 2021	FY 2022
Title: Network / System Certification and Accreditation (C&A)	32.649	12.658	10.537
Articles:	-	-	-
Description: This activity maintains the Assessment and Authorization (A&A) and Certification and Accreditation (C&A) data repository, capturing the RMF documentation (artifacts, validation results, Information Assurance Risk Assessment results, and Authorizing Official (AO) accreditation decisions) and Plan of Action and Milestones (POA&Ms) on all Missile Defense Agency (MDA) information systems. This activity prepares and submits C&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. - Conduct cybersecurity design, engineering, and architecture planning for C2BMC information technology systems - Plan and test the cybersecurity controls for C2BMC systems - Conduct Security Controls Assessment testing continuous monitoring of C2BMC mission systems and provide POA&Ms to mitigate cybersecurity vulnerabilities			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MC01 / *Cyber Operations*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
Specific and/or unique accomplishments for each FY are as follows: ***FY 2021 Plans:*** - Complete upgrade and implementation of DoD required Secure Host Baselines for required operating systems - Maintain Cyber posture with operating system and partial hardware refresh ***FY 2022 Plans:*** - Maintain Cyber posture and support next Increment cyber integration, testing, and fielding into operations - Support Agile and Development Operations (DevOps) development with cyber integration - Develop Advanced Persistent Threat and Heuristics capabilities with Tier 2 Cybersecurity Service Provider (CSSP) ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease from FY 2021 to FY 2022 reflects completion of upgrade and implementation of DoD required Secure Host Baselines for required operating systems, realignment of cybersecurity upgrades to the C2BMC development environment to MD01 Development and Deployment, and realignment of upgrades and implementation of latest DoD required ACAS (Assured Compliance Assessment Solution), ESS (Endpoint Security Services) and Cyber Security increments within the C2BMC Test Bed (CTB) to MT01 Integrated Master Test Plan.			
Accomplishments/Planned Programs Subtotals	32.649	12.658	10.537

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).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MC01 / *Cyber Operations*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Network / System Certification and Accreditation (C&A) - Civ Cyber Labor	Various	MDA Other : Various	1.443	0.420	Oct 2019	0.531	Oct 2020	0.620	Oct 2021	-		0.620	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Consolidated Contractor Support	Various	MDA : Huntsville, AL; Colorado Springs, CO, NCR	2.321	1.431	Oct 2019	1.329	Oct 2020	1.212	Oct 2021	-		1.212	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Core C2BMC	SS/CPAF	Lockheed Martin : Colorado Springs, CO / Huntsville, AL	13.047	19.615	Jan 2020	7.276	Oct 2020	8.124	Oct 2021	-		8.124	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	6.177	6.519	Mar 2020	3.382	Oct 2020	0.000		-		0.000	0.000	16.078	0.000
Network / System Certification and Accreditation (C&A) - Lab Infrastructure	SS/CPAF	Northrop Grumman : Colorado Springs, CO	0.887	4.664	Mar 2020	0.140	Oct 2020	0.581	Oct 2021	-		0.581	Continuing	Continuing	Continuing
		Subtotal	30.206	32.649		12.658		10.537		-		10.537	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	30.206	32.649		12.658		10.537		-		10.537	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	Project (Number/Name) MC01 / *Cyber Operations*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

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

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MC01 / *Cyber Operations*

Significant Event Complete ▲ Significant Event Planned △ | Milestone Decision Complete ★ Milestone Decision Planned ☆ | Element Test Complete ◆ Element Test Planned ◇ | System Level Test Complete ● System Level Test Planned ○ | Complete Activity ✦ Planned Activity ✧

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
MC01 Cyber Operations	✦	✦	✦	✦																								
MC01 Cyber Operations Planned					✧	✧	✧	✧	✧	✧	✧	✧																

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MC01 / *Cyber Operations*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
MC01 Cyber Operations	1	2020	4	2020
MC01 Cyber Operations Planned	1	2021	4	2022

Note

Based on the OUSD(C) FY 2022 President's Budget Submission Guidance, fiscal years covered in the justification material will include FY 2020 through FY 2022. Planned entries in the R4 may continue past FY 2022, out-years will be addressed in future budget submissions.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	Project (Number/Name) MT01 / *C2BMC Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
MT01: *C2BMC Test*	354.407	63.395	61.264	65.341	-	65.341	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Increase from FY 2021 to FY 2022 provides upgrades and implementation of latest DoD required ACAS (Assured Compliance Assessment Solution), ESS (Endpoint Security Services), movement of Cyber Security increments within the C2BMC Test Bed (CTB) from budget project MC01 to align with the Financial Management Regulation (FMR) definition of cyber testing, and additional flight/ground test support.

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 Missile Defense System (MDS) 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 2020	FY 2021	FY 2022
Title: Integrated Master Test Plan	63.395	61.264	65.341
Articles:	-	-	-
Description: This activity funds C2BMC participation in MDS flight and ground testing, wargames and exercises, and resources in accordance with the MDS IMTP. Recurring accomplishments include: Test Execution - Assess MDS 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 MDS 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- 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. - 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). 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. - 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. Results from the tests are provided back to the C2BMC and X-Lab development activity. - 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. - Continue development, sustainment, and upgrades in the C2BMC Testbed (CTB) to support MDA IMTP Events (flight and ground tests). Continue Cyber Testing in the CTB to support continuous C2BMC spiral development. Continue Hardware in the Loop (HWIL) testing, C2BMC, and NATO planning exchanges, demonstrations, and support to NATO live fire events. Maintain Situational Awareness Nodes (Turkey, Romania, and Poland) in accordance with U.S. and Host nation Bi-lateral Agreements. Continue to enhance 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). Specific and/or unique accomplishments for each FY are as follows: ***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 MDS; Initial GMD use of LRDR data; Initial Active Sensor Bias Monitoring and Reporting			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- 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 performance, to include support of SKA Hit Assessment fielding in Increment 6B.2; assess ATP alternatives for C2BMC system track typing, correlation, and launch event 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 Baseline Release (BBR) 7.0, 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 MDS system flight tests and ground tests			
FY 2022 Plans: - Participate in flight and ground test events to support fielding of Spiral 8.2-5 and BOA 7.0 for Homeland Defense by testing the following capabilities: Initial MDS Integration with IBCS, Additional Hit Assessment using SKA, Additional Integration of External Mobile Sensor (MSI Phase IIA) - In flight test events: Continue to collect data for SKA algorithm development. Collect data in support of Hypersonic Tracking capability - In ground test events: Continue to assess C2BMC incremental capability performance, to include support of SKA Hit Assessment fielding; assess alternatives for C2BMC system track typing, correlation, and launch event 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 Baseline Release (BBR) 7.0, AN/TPY-2 FBM CX 4.0, LRDR 1.0.1, GS 8B, XBR 4.1.1, EKV 23.2/11.0, IBCS 4.6, PDB 8.1, SBR 19-1, and THAAD 4.0; assess C2BMC planning, monitoring, and tasking capabilities effect on Homeland Defense performance - In cyber events: Assess C2BMC and BOA BBR cyber security in Cooperative Vulnerability and Penetration Assessment (CVPA) events in the lab and operational asset environments; and Adversarial Assessment (AA) events in the operational asset environment prior to fielding			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- Continue upgrades and implementation of latest DoD required ACAS (Assured Compliance Assessment Solution), ESS (Endpoint Security Services), and Cyber Security increments within the C2BMC Test Bed (CTB) ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase from FY 2021 to FY 2022 provides upgrades and implementation of latest DoD required ACAS, ESS, and Cyber Security increments within the CTB as realigned from budget project MC01 to align with the FMR definition of cyber testing, and additional flight/ground test support.			
Accomplishments/Planned Programs Subtotals	63.395	61.264	65.341

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0603881C: *Ballistic Missile Defense Terminal Defense Segment*	295.312	312.317	277.949	-	277.949	-	-	-	-	-	-
• 0603882C: *Ballistic Missile Defense Midcourse Defense Segment*	1,275.414	1,219.261	745.144	-	745.144	-	-	-	-	-	-
• 0603884C: *Ballistic Missile Defense Sensors*	348.356	265.803	224.750	-	224.750	-	-	-	-	-	-
• 0603890C: *BMD Enabling Programs*	630.196	616.455	595.301	-	595.301	-	-	-	-	-	-
• 0603892C: *AEGIS BMD*	722.582	877.336	732.512	-	732.512	-	-	-	-	-	-
• 0603904C: *Missile Defense Integration and Operations Center (MDIOC)*	54.783	55.356	52.403	-	52.403	-	-	-	-	-	-
• 0603907C: *Sea Based X-Band Radar (SBX)*	137.604	118.318	147.241	-	147.241	-	-	-	-	-	-
• 0603914C: *Ballistic Missile Defense Test*	398.939	365.208	362.906	-	362.906	-	-	-	-	-	-
• 0603915C: *Ballistic Missile Defense Targets*	545.764	536.133	553.334	-	553.334	-	-	-	-	-	-
• 0604181C: *Hypersonic Defense*	386.528	272.632	247.931	-	247.931	-	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0604672C: *Homeland Defense Radar-Hawaii*	181.569	133.000	0.000	-	0.000	-	-	-	-	-	-
• 0604673C: *Pacific Discriminating Radar*	2.921	0.000	0.000	-	0.000	-	-	-	-	-	-
• 0604873C: *Long Range Discrimination Radar (LRDR)*	131.135	138.317	133.335	-	133.335	-	-	-	-	-	-

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).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Master Test Plan - Consolidated Contractor Support	Various	MDA : Huntsville, AL; Colorado Springs, CO; NCR	0.000	0.223	Oct 2019	0.243	Oct 2020	0.247	Oct 2021	-		0.247	Continuing	Continuing	Continuing
Integrated Master Test Plan - Enterprise Sensors Lab Infrastructure Support	MIPR	Various : VA; OH; AL; NM; CA	14.979	2.210	Oct 2019	1.752	Oct 2020	2.099	Oct 2021	-		2.099	Continuing	Continuing	Continuing
Integrated Master Test Plan - Enterprise Sensors Lab Infrastructure/BOA Infrastructure-MDS Level Testing	SS/CPAF	Northrop Grumman Corporation : Colorado Springs, CO	50.369	1.224	Mar 2020	2.480	Mar 2021	2.250	Mar 2022	-		2.250	Continuing	Continuing	Continuing
Integrated Master Test Plan - FFRDC	MIPR	Institute for Defense Analyses (IDA) : Alexandria, VA	0.000	0.350	Oct 2019	1.557	Oct 2020	0.988	Oct 2021	-		0.988	Continuing	Continuing	Continuing
Integrated Master Test Plan - Information Assurance - Test Lab Infrastructure	C/CPAF	Jacobs Technology, Inc : Colorado Springs, CO	0.000	0.000		0.000		5.182	Oct 2021	-		5.182	Continuing	Continuing	Continuing
Integrated Master Test Plan - Integrated Master Test Plan MDS Level Testing	SS/IDIQ	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO	141.827	20.904	Jul 2020	23.294	Jul 2021	19.484	Jul 2022	-		19.484	Continuing	Continuing	Continuing
Integrated Master Test Plan - Integrated Master Test Plan MDS level Testing - Element/System Test Lab Facilities	C/CPAF	Northrop Grumman Corporation : Colorado Springs, CO	9.029	13.992	Mar 2020	12.847	Mar 2021	14.749	Mar 2022	-		14.749	Continuing	Continuing	Continuing
Integrated Master Test Plan - Integrated Master Test Plan MDS level Testing (Element/System Test Lab Facilities)	C/CPAF	Jacobs Technology, Inc : Huntsville, AL; Colorado Springs, CO	36.595	23.115	Mar 2020	18.309	Mar 2021	19.035	Mar 2022	-		19.035	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Master Test Plan - MDS Level Testing GOV	MIPR	Army/Air Force : Various	10.907	1.377	Oct 2019	0.782	Oct 2020	1.307	Oct 2021	-		1.307	Continuing	Continuing	Continuing
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
		Subtotal	354.407	63.395		61.264		65.341		-		65.341	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	354.407	63.395		61.264		65.341		-		65.341	Continuing	Continuing	N/A

Remarks

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

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

Significant Event Complete ▲ Significant Event Planned △ | Milestone Decision Complete ★ Milestone Decision Planned ☆ | Element Test Complete ◆ Element Test Planned ◇ | System Level Test Complete ● System Level Test Planned ○ | Complete Activity ✦ Planned Activity ✧

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
GTI-07c (N/I) (MDS Ground Test)	✦																											
FTX-39 (LTPO, DT Target Only Flight Test)	▲																											
(EX) JUNIPER COBRA 20	✦	✦																										
Enterprise Sensor Lab Infrastructure Support	✦	✦	✦	✦																								
(EX) Joint Live, Virtual, and Constructive 2019/2020	✦	✦	✦	✦	✦																							
GTI-20 Sprint 1(E/C) (MDS Ground Test)		✦																										
FTP-27 E2 (LTPO, DT/OT Flight Test)		▲																										
(EX) EAGLE RESOLVE 20		▲																										
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 19		▲																										
(EX) RESILIENT SHIELD 20		▲																										
(EX) GLOBAL LIGHTNING 20		✦	✦																									
(EX) GLOBAL RESPONSE EXERCISE 09		✦	✦																									
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 20		✦	✦	✦																								
(EX) AIR AND MISSILE DEFENSE EXERCISE 20		✦	✦	✦																								
GTI-20 Sprint 2 (JEON) (MDS Ground Test)			✦																									
(EX) STEADFAST ALLIANCE 20			✦	✦																								
(WG) Demonstration, Table-top Exercises & Experiments 20			✦	✦	✦																							
FTP-27 E1 (LTPO, DT/OT Flight Test)				▲																								
(EX) EUROPEAN TEST BED 20				✦																								
(EX) GLOBAL RESPONSE EXERCISE 10				▲																								
(EX) KEEN SWORD 21				✦	✦																							
(EX) AUSTERE CHALLENGE 21				✦	✦	✦																						
FTM-44 (AEGIS 5.1, DT Intercept Flight Test)					▲																							
(EX) Joint Project Optic Windmill 2021					✦	✦																						

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

Significant Event Complete ▲ Significant Event Planned △ | Milestone Decision Complete ★ Milestone Decision Planned ☆ | Element Test Complete ◆ Element Test Planned ◇ | System Level Test Complete ● System Level Test Planned ○ | Complete Activity ✦ Planned Activity ✧

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 21					✦	✦																						
(EX) AIR AND MISSILE DEFENSE EXERCISE 21					✦	✦	✦																					
(WG) NIMBLE TITAN 22					✧	✧	✧	✧	✧	✧	✧	✧																
Enterprise Sensor Lab Infrastructure Support Planned					✧	✧	✧	✧	✧	✧	✧	✧																
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 20						▲																						
(EX) RESILIENT SHIELD 21						▲																						
(EX) GLOBAL LIGHTNING 21						✦	✦																					
(EX) EUROPEAN TEST BED 21						✧	✧	✧																				
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 21						✧	✧	✧																				
(EX) Joint Live, Virtual, and Constructive 2021/2022						✧	✧	✧	✧	✧	✧	✧																
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)							△																					
(EX) PACIFIC SENTRY 21							✧																					
FTM-31 E1 (AEGIS SBT, DT/OT Intercept Flight Test)							△																					
(WG) Huntsville Wargames 21							✧	✧																				
(WG) Demonstration, Table-top Exercises & Experiments 21							✧	✧	✧																			
FTT-21 (TH, DT Intercept Flight Test)								△																				
FTP-21 E1 (P8.1.1)(LTPO, DT Intercept Flight Test)								△																				
(WG) Space & Missile Defense Symposium 21								△																				
GM BVT-03 (GM, DT Interceptor Only Flight Test)								△																				
(EX) VIGILANT SHIELD 22								✧	✧																			
(EX) GLOBAL THUNDER 21								✧	✧																			

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

Significant Event Complete ▲ Significant Event Planned △ | Milestone Decision Complete ★ Milestone Decision Planned ☆ | Element Test Complete ◆ Element Test Planned ◇ | System Level Test Complete ● System Level Test Planned ○ | Complete Activity ✦ Planned Activity ✧

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
(EX) KEEN EDGE 22								✧	✧	✧																		
GTI-ISR (21) (MDS Ground Test)									✧																			
GTI-09 Sprint 1 (E/C) (MDS Ground Test)									✧																			
(EX) JUNIPER COBRA 22									✧	✧																		
(EX) AIR AND MISSILE DEFENSE EXERCISE 22									✧	✧	✧																	
(EX) EAGLE RESOLVE 22										△																		
(EX) RESILIENT SHIELD 22										△																		
GTI-09 Sprint 2 (E/C) (MDS Ground Test)										✧	✧																	
(EX) GLOBAL LIGHTNING 22										✧	✧																	
(EX) STEADFAST ALLIANCE 22										✧	✧																	
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 22										✧	✧	✧																
(EX) EUROPEAN TEST BED 22										✧	✧	✧																
FTX-45											△																	
FTX-42 (OTHER, DT Target Only Flight Test)											△																	
(WG) Demonstration, Table-top Exercises & Experiments 22											✧	✧																
GTD-09 (E/C) (MDS Ground Test)												✧																
(EX) VIGILANT SHIELD 23												✧																
(EX) KEEN SWORD 23												✧																
(EX) GLOBAL RESPONSE EXERCISE 11												✧																
(EX) GLOBAL THUNDER 22												✧																
(EX) GLOBAL RESPONSE EXERCISE 12												✧																

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
GTI-07c (N/I) (MDS 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
Enterprise Sensor Lab Infrastructure Support	1	2020	4	2020
(EX) Joint Live, Virtual, and Constructive 2019/2020	1	2020	1	2021
GTI-20 Sprint 1(E/C) (MDS Ground Test)	2	2020	2	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) RESILIENT SHIELD 20	2	2020	2	2020
(EX) GLOBAL LIGHTNING 20	2	2020	3	2020
(EX) GLOBAL RESPONSE EXERCISE 09	2	2020	3	2020
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 20	2	2020	4	2020
(EX) AIR AND MISSILE DEFENSE EXERCISE 20	2	2020	4	2020
GTI-20 Sprint 2 (JEON) (MDS Ground Test)	3	2020	3	2020
(EX) STEADFAST ALLIANCE 20	3	2020	4	2020
(WG) Demonstration, Table-top Exercises & Experiments 20	3	2020	1	2021
FTP-27 E1 (LTPO, DT/OT Flight Test)	4	2020	4	2020
(EX) EUROPEAN TEST BED 20	4	2020	4	2020
(EX) GLOBAL RESPONSE EXERCISE 10	4	2020	4	2020
(EX) KEEN SWORD 21	4	2020	1	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
(EX) AUSTERE CHALLENGE 21	4	2020	2	2021
FTM-44 (AEGIS 5.1, DT Intercept Flight Test)	1	2021	1	2021
(EX) Joint Project Optic Windmill 2021	1	2021	2	2021
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 21	1	2021	2	2021
(EX) AIR AND MISSILE DEFENSE EXERCISE 21	1	2021	3	2021
(WG) NIMBLE TITAN 22	1	2021	4	2022
Enterprise Sensor Lab Infrastructure Support Planned	1	2021	4	2022
(EX) EUROPEAN AIR & MISSILE DEFENSE EXERCISE 20	2	2021	2	2021
(EX) RESILIENT SHIELD 21	2	2021	2	2021
(EX) GLOBAL LIGHTNING 21	2	2021	3	2021
(EX) EUROPEAN TEST BED 21	2	2021	4	2021
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 21	2	2021	4	2021
(EX) Joint Live, Virtual, and Constructive 2021/2022	2	2021	4	2022
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
(EX) PACIFIC SENTRY 21	3	2021	3	2021
FTM-31 E1 (AEGIS SBT, DT/OT 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
FTT-21 (TH, DT Intercept Flight Test)	4	2021	4	2021
FTP-21 E1 (P8.1.1)(LTPO, DT Intercept Flight Test)	4	2021	4	2021
(WG) Space & Missile Defense Symposium 21	4	2021	4	2021
GM BVT-03 (GM, DT Interceptor Only Flight Test)	4	2021	4	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
(EX) VIGILANT SHIELD 22	4	2021	1	2022
(EX) GLOBAL THUNDER 21	4	2021	1	2022
(EX) KEEN EDGE 22	4	2021	2	2022
GTI-ISR (21) (MDS Ground Test)	1	2022	1	2022
GTI-09 Sprint 1 (E/C) (MDS Ground Test)	1	2022	1	2022
(EX) JUNIPER COBRA 22	1	2022	2	2022
(EX) AIR AND MISSILE DEFENSE EXERCISE 22	1	2022	3	2022
(EX) EAGLE RESOLVE 22	2	2022	2	2022
(EX) RESILIENT SHIELD 22	2	2022	2	2022
GTI-09 Sprint 2 (E/C) (MDS Ground Test)	2	2022	3	2022
(EX) GLOBAL LIGHTNING 22	2	2022	3	2022
(EX) STEADFAST ALLIANCE 22	2	2022	3	2022
(EX) JOINT AIR AND MISSILE DEFENSE EXERCISE SERIES 22	2	2022	4	2022
(EX) EUROPEAN TEST BED 22	2	2022	4	2022
FTX-45	3	2022	3	2022
FTX-42 (OTHER, DT Target Only Flight Test)	3	2022	3	2022
(WG) Demonstration, Table-top Exercises & Experiments 22	3	2022	4	2022
GTD-09 (E/C) (MDS Ground Test)	4	2022	4	2022
(EX) VIGILANT SHIELD 23	4	2022	4	2022
(EX) KEEN SWORD 23	4	2022	4	2022
(EX) GLOBAL RESPONSE EXERCISE 11	4	2022	4	2022
(EX) GLOBAL THUNDER 22	4	2022	4	2022
(EX) GLOBAL RESPONSE EXERCISE 12	4	2022	4	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MT01 / *C2BMC Test*

Note

Based on the OUSD(C) FY 2022 President's Budget Submission Guidance, fiscal years covered in the justification material will include FY 2020 through FY 2022. Planned entries in the R4 may continue past FY 2022, out-years will be addressed in future budget submissions.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	Project (Number/Name) MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
MX01: *Command & Control, Battle Management, Communications (C2BMC) Development Support*	727.785	114.017	128.482	125.086	-	125.086	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

N/A

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, USCENTCOM, and U.S. Space Command (USSPACECOM) 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)	FY 2020	FY 2021	FY 2022
Title: Operations Engineering	91.290	102.606	107.728
Articles:	-	-	-
Description: This activity funds C2BMC support of current operational, test, and training systems. Recurring efforts include: - On-site maintenance, help-desk support, and developer reach-back support to ensure operational availability - 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 - Integrated logistics support by providing a secure supply chain; reliability, availability, and maintainability (RAM) engineering; obsolescence engineering; and sparing to ensure operational availability - 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 - Information System Security Officers (ISSOs) ensuring C2BMC compliance with latest cybersecurity requirements and policies - 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 Midcourse Defense (GMD) Fire Control (GFC), Aegis, Terminal High Altitude Area Defense (THAAD), Navy Link Monitoring			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
and Management Tool (LMMT), AN/TPY-2, standard Army communications, Defense Information Systems Agency (DISA) fiber networks, and Allied/Coalition interfaces - 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 - Facility modifications required to house current or future C2BMC equipment and transportation for moving C2BMC equipment - Integrated product support for tactical satellite communications (SATCOM) used in flight tests, hardened SATCOM, and associated shelters - Provide transportation for flight test equipment and SME support and analysis for numerous test, exercise, and real world events - Provide recurring proficiency training to CCMDs and keep training material and systems consistent with operational capabilities Specific and/or unique accomplishments for each FY are as follow: ***FY 2021 Plans:*** - Provide sustainment of fielded EPAA Phase 3/EOR (Spiral 8.2-3) deployed to USEUCOM, USCENTCOM, USNORTHCOM, and USINDOPACOM - Provide operational planning for LRDR for Homeland Defense (Spiral 8.2-5) - Initiate hardware updates and software licenses to support protection of the system from vulnerability and operational sustainment - Field NORTHCOM user node and second geographically separated management node ***FY 2022 Plans:*** - Transition from providing sustainment of fielded EPAA Phase 3/EOR (Spiral 8.2-3) deployed to USEUCOM, USCENTCOM, USNORTHCOM, and USINDOPACOM to Spiral 8.2-5. - Execute final deployment and integration and testing for LRDR for Homeland Defense (Spiral 8.2-5) - Continue hardware updates and software licenses to support protection of the system from vulnerability and operational sustainment ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase from FY 2021 to FY 2022 provides additional material licenses and spares necessary to sustain Spiral 8.2-5 and infrastructure facility modifications to maintain Missile Defense Integration and Operation Center (MDIOC) Facility.			
Title: Concurrent Test, Training, and Operations (CTTO)	22.727	25.876	17.358
Articles:	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
Description: 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, USCENTCOM, and USSPACECOM. C2BMC connects all MDS 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 MDS, and decreases recall-to-mission operations times from weeks and days to hours and minutes. The recently acquired C2BMC MSVP is a gaming-based stand-alone trainer developed from a Small Business Innovation Research (SBIR) project. It delivers mission training simulation using core Standard Space Trainer (SST) and provides the same level of training fidelity as the legacy TSS but with greater flexibility in architecture and reduced long term cost. Recurring accomplishments include sustaining current training systems for MDS 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. Specific and/or unique accomplishments for each FY are as follows: ***FY 2021 Plans:*** - Continue modifications and verification testing of MDS LRDR for Homeland Defense (Spiral 8.2-5) MSVP and DTS - Continue deployment activities of MDS LRDR for Homeland Defense (Spiral 8.2-5) MSVP and DTS - Continue development/modifications on MDS Radar MSVP and Spiral Training Systems ***FY 2022 Plans:*** - Modifications of MSVP and DTS for inclusion of the capabilities that are planned for delivery in Spiral 8.2-7 - Continue support and deployment activities of MDS LRDR for Homeland Defense (Spiral 8.2-5) for MSVP and DTS - Complete C2BMC Increment 5 (Spiral 8.2-3) training efforts ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease from FY 2021 to FY 2022 reflects savings from deploying MSVP and the end of development work for C2BMC Increment 5 (Spiral 8.2-3) TSS in FY 2022.			
Accomplishments/Planned Programs Subtotals	114.017	128.482	125.086

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*	

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0603881C: *Ballistic Missile Defense Terminal Defense Segment*	295.312	312.317	277.949	-	277.949	-	-	-	-	-	-
• 0603882C: *Ballistic Missile Defense Midcourse Defense Segment*	1,275.414	1,219.261	745.144	-	745.144	-	-	-	-	-	-
• 0603884C: *Ballistic Missile Defense Sensors*	348.356	265.803	224.750	-	224.750	-	-	-	-	-	-
• 0603890C: *BMD Enabling Programs*	630.196	616.455	595.301	-	595.301	-	-	-	-	-	-
• 0603892C: *AEGIS BMD*	722.582	877.336	732.512	-	732.512	-	-	-	-	-	-
• 0603904C: *Missile Defense Integration and Operations Center (MDIOC)*	54.783	55.356	52.403	-	52.403	-	-	-	-	-	-
• 0603907C: *Sea Based X-Band Radar (SBX)*	137.604	118.318	147.241	-	147.241	-	-	-	-	-	-
• 0603914C: *Ballistic Missile Defense Test*	398.939	365.208	362.906	-	362.906	-	-	-	-	-	-
• 0603915C: *Ballistic Missile Defense Targets*	545.764	536.133	553.334	-	553.334	-	-	-	-	-	-
• 0604181C: *Hypersonic Defense*	386.528	272.632	247.931	-	247.931	-	-	-	-	-	-
• 0604672C: *Homeland Defense Radar-Hawaii*	181.569	133.000	0.000	-	0.000	-	-	-	-	-	-
• 0604673C: *Pacific Discriminating Radar*	2.921	0.000	0.000	-	0.000	-	-	-	-	-	-
• 0604873C: *Long Range Discrimination Radar (LRDR)*	131.135	138.317	133.335	-	133.335	-	-	-	-	-	-

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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*

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). A Small Business Innovation Research (SBIR) Phase III contract with Sonalysts provides a standalone training system which delivers mission training.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operations Engineering - Operations Engineering - Contract Support Services (CSS)	MIPR	MDA Various : Huntsville, AL; Colorado Springs, CO; NCR	3.357	0.746	Oct 2019	0.590	Oct 2020	0.609	Oct 2021	-		0.609	Continuing	Continuing	Continuing
Operations Engineering - Operations Engineering - Indirect Support	MIPR	DISA DECC/DISA TECC : Various	48.028	0.000		0.000		0.000		-		0.000	0.000	48.028	0.000
Operations Engineering - Operations Engineering - Specialized Warfighter Development Contract	SS/CPAF	Northrop Grumman Corporation : Huntsville, AL	0.000	0.693	Mar 2020	0.000		0.000		-		0.000	0.000	0.693	0.000
Operations Engineering - Operations Engineering - Sustaining Support	C/CPAF	Jacobs Technology : Huntsville, AL; Colorado Springs, CO	3.103	1.794	Mar 2020	0.000		1.810	Mar 2022	-		1.810	Continuing	Continuing	Continuing
Operations Engineering - Operations Engineering - Training Support	C/FPIF	Boeing : Huntsville, AL	1.336	0.946	Oct 2019	1.171	Oct 2020	1.666	Oct 2021	-		1.666	Continuing	Continuing	Continuing
Operations Engineering - Operations Engineering - Unit Personnel, Control System Improvement Sustaining Support	MIPR	Army, Navy, Air Force : Various	13.505	6.763	Oct 2019	6.601	Oct 2020	12.565	Oct 2021	-		12.565	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	510.098	80.348	Dec 2019	94.244	Dec 2020	91.078	Dec 2021	-		91.078	Continuing	Continuing	Continuing
Concurrent Test, Training, and Operations (CTTO) -	SS/CPFF	Sonalysts : Waterford, CT	0.000	7.049	Nov 2019	2.382	Dec 2020	2.765	Dec 2021	-		2.765	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
(Training Enhancements) MSVP															
Concurrent Test, Training, and Operations (CTTO) - CTTO/Training Enhancements	MIPR	Aviation and Missile Research Development and Engineering Center : Huntsville, AL	15.236	6.416	Dec 2019	6.429	Dec 2020	8.388	Dec 2021	-		8.388	Continuing	Continuing	Continuing
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/CPIF	Lockheed Martin Team : Huntsville, AL; Colorado Springs, CO	114.834	9.262	Dec 2019	17.065	Dec 2020	6.205	Dec 2021	-		6.205	Continuing	Continuing	Continuing
		Subtotal	727.785	114.017		128.482		125.086		-		125.086	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	727.785	114.017		128.482		125.086		-		125.086	Continuing	Continuing	N/A

Remarks

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

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*

Significant Event Complete ▲ Significant Event Planned △ | Milestone Decision Complete ★ Milestone Decision Planned ☆ | Element Test Complete ◆ Element Test Planned ◇ | System Level Test Complete ● System Level Test Planned ○ | Complete Activity ✦ Planned Activity ✧

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
MX01 Command & Control, Battle Management, Communications (C2BMC) Development Support	✦	✦	✦	✦																								
MX01 Command & Control, Battle Management, Communications (C2BMC) Development Support Planned					✧	✧	✧	✧	✧	✧	✧	✧																

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MX01 / *Command & Control, Battle Management, Communications (C2BMC) Development Support*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
MX01 Command & Control, Battle Management, Communications (C2BMC) Development Support	1	2020	4	2020
MX01 Command & Control, Battle Management, Communications (C2BMC) Development Support Planned	1	2021	4	2022

Note

Based on the OUSD(C) FY 2022 President's Budget Submission Guidance, fiscal years covered in the justification material will include FY 2020 through FY 2022. Planned entries in the R4 may continue past FY 2022, out-years will be addressed in future budget submissions.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	Project (Number/Name) MD40 / *Program-Wide Support*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
MD40: *Program-Wide Support*	145.535	23.682	25.754	22.266	-	22.266	-	-	-	-	-	-
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)	FY 2020	FY 2021	FY 2022
Title: Program Wide Support	23.682	25.754	22.266
Articles:	-	-	-
Description: 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD40 / *Program-Wide Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** - SEE ABOVE. ***FY 2022 Plans:*** - SEE ABOVE. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease from FY 2021 to FY 2022 reflects the PWS allocation on a pro-rata basis across multiple Agency PE's each fiscal year based on the total Agency budget, and therefore fluctuates per PE by fiscal year.			
Accomplishments/Planned Programs Subtotals	23.682	25.754	22.266

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD40 / *Program-Wide Support*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Wide Support - Agency Operations Management	Various	Various : Multi: AL, CA, CO, VA	5.919	0.358	Jul 2020	0.000		0.000		-		0.000	6.277	12.554	0.000
Program Wide Support - Agency Operations and Support Services	C/CPFF	Various : Multi: AK, AL, CA, CO, HI, VA	7.924	7.264	Oct 2019	7.899	Jul 2021	4.146	Jul 2022	-		4.146	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Services (FFP)	C/FFP	Various : Multi: AK, AL, CA, CO, HI, VA	22.388	0.661	Nov 2019	0.510	Nov 2020	0.586	Nov 2021	-		0.586	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Services Civilian Salaries, Travel, Training	Various	Various : Multi: AL, CA, CO, VA	57.268	15.061	Nov 2019	16.765	Oct 2020	16.884	Oct 2021	-		16.884	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations, Sustainment and GPC	Various	Various : Multi: AL, CO, VA etc.	0.000	0.037	Oct 2019	0.050	Nov 2020	0.050	Oct 2021	-		0.050	Continuing	Continuing	Continuing
Program Wide Support - FFRDC/UARC	C/CPAF	JHU/APL : AL, VA	0.000	0.301	Sep 2020	0.530	Dec 2020	0.600	Jan 2022	-		0.600	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
		Subtotal	145.535	23.682		25.754		22.266		-		22.266	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	145.535	23.682		25.754		22.266		-		22.266	Continuing	Continuing	N/A

Remarks

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

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD40 / *Program-Wide Support*

Significant Event Complete ▲ Significant Event Planned △ | Milestone Decision Complete ★ Milestone Decision Planned ☆ | Element Test Complete ◆ Element Test Planned ◇ | System Level Test Complete ● System Level Test Planned ○ | Complete Activity ✦ Planned Activity ✧

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
MD40 Program-Wide Support	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧																

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Missile Defense Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603896C / *Ballistic Missile Defense Command and Control, Battle Management & Communication*	**Project (Number/Name)** MD40 / *Program-Wide Support*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
MD40 Program-Wide Support	1	2020	4	2022

Note

Based on the OUSD(C) FY 2022 President's Budget Submission Guidance, fiscal years covered in the justification material will include FY 2020 through FY 2022. Planned entries in the R4 may continue past FY 2022, out-years will be addressed in future budget submissions.