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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Missile Defense Agency **Date:** May 2021

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603884C / <i>Ballistic Missile Defense Sensors</i>
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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	1,964.058	348.356	265.803	224.750	-	224.750	-	-	-	-	-	-
MD11: <i>BMDs Radars</i>	1,838.091	308.276	253.045	197.816	-	197.816	-	-	-	-	-	-
MC11: <i>Cyber Operations</i>	15.048	28.296	1.558	17.203	-	17.203	-	-	-	-	-	-
MD40: <i>Program-Wide Support</i>	110.919	11.784	11.200	9.731	-	9.731	-	-	-	-	-	-

Program MDAP/MAIS Code: 362

Note

Decrease from FY 2021 to FY 2022 reflects a ramp-down from an initial phase of X-Band radar Electronic Protection and Objective Debris Mitigation efforts, reductions for Efficiencies and Process Reforms, delay of L-200 threat mitigation, and manpower efficiencies.

A. Mission Description and Budget Item Justification

The Missile Defense System (MDS) network of layered Sensors provides essential situational awareness and fire control data for the command and control of MDS weapon systems, such as Ground-Based Midcourse Defense (GMD), Aegis Ballistic Missile Defense (BMD), and Terminal High Altitude Area Defense (THAAD). The suite of remote ground-based sensors provides early warning, midcourse, and terminal missile defense threat data. This data enables layered detection and tracking of missile targets, providing fire-control quality position, velocity, and discrimination data through GMD Fire Control (GFC), or Command and Control, Battle Management and Communications (C2BMC).

Overlapping coverage of geographically diverse sensors provides improved threat track data, reduces the impact of the loss of any one sensor, and reduces the potential impact of countermeasures. The extended coverage and accuracy provided by a network of layered sensors increases the defensive footprint and reduces the number of target engagements required, thereby conserving interceptor inventory and maintaining a high probability of successful engagement. Networked forward-based sensors enable C2BMC to pair the best sensor coverage with the best available weapon system to provide the most effective defense against missile threats.

This program element includes MDS threat discrimination improvements, which will enhance MDS effectiveness against the evolving adversary threat. The result will be a MDS architecture more capable of discriminating and destroying reentry vehicles with a higher degree of confidence, improving Warfighter shot doctrine, and more efficiently using interceptor inventory. MDS threat discrimination improvements are funded from the Enabling (0603890C), Midcourse (0603882C), BMD Sensors (0603884C), C2BMC (0603896C), and Aegis BMD (0603892C) PEs.

The BMD Sensors Program contributes to regional and homeland missile defense through the development, delivery, and deployment/redeployment of Army Navy/Transportable Radar Surveillance and Control (AN/TPY-2) radars for operations or tests. AN/TPY-2 radars can be configured to operate as either a THAAD Fire Unit Radar (terminal mode) or Forward-Based Radar. These radars are transportable and add flexibility to respond to geographical changes in threats. Radars provide early warning tracking and discrimination data through all phases of missile flight. Through the MDS C2BMC and coalition data links, the AN/TPY-2 provides fire control data

UNCLASSIFIED

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to enable remote Standard Missile (SM)-3 engagements by Aegis BMD, and to cue deployed THAAD and U.S. and partner PATRIOT (Phased Array Tracking Radar to Intercept on Target) batteries.

The MDS sensor network includes: the Cobra Dane Radar at Eareckson Air Station, AK, the Upgraded Early Warning Radars (UEWRs) at Beale Air Force Base, CA; Fylingdales Royal Air Force, United Kingdom; and Thule Air Base, Greenland, for defense of the homeland. The Clear Ultra High Frequency Early Warning Radar (EWR), at Clear Air Force Station, AK, and the Cape Cod EWR, at Cape Cod Air Force Station, MA, are also being upgraded to include missile defense functionality against long-range threats in addition to their existing Missile Warning and Space Domain Awareness missions. Upgrade activities began in CY 2012 and are now projected to complete in early CY 2022 due to current UEWR operational configuration emergency maintenance required by United States Space Force (USSF) and COVID-19 challenges throughout CY 2020 and early CY 2021 that hampered radar site access for operational testing. The addition of the Clear UEWR and Cape Cod UEWRs to the MDS sensor architecture improves MDS sensor coverage and provides new engagement options against long-range missile threats from Northeast Asia and Southwest Asia respectively.

This program element also supports the planning and deployment of persistent radars.

Cyber Operations sustain the Risk Management Framework (RMF) and Controls Validation Testing (CVT) activities, analysis of validation results, risk assessments, reviews of Plans of Action and Milestones (POA&Ms), and alignment and integration to the Tier 2 Cybersecurity Service Provider (CSSP) for the Sensors mission system.

B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	352.288	281.957	576.699	-	576.699
Current President's Budget	348.356	265.803	224.750	-	224.750
Total Adjustments	-3.932	-16.154	-351.949	-	-351.949
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-16.154			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-6.403	0.000			
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	2.471	0.000	-351.949	-	-351.949

Change Summary Explanation

Decrease in FY 2021 reflects Congressional reduction for MD11 Modeling and Simulation development unjustified growth.

UNCLASSIFIED

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 / BA 4: Advanced Component Development & Prototypes (ACD&P)*

R-1 Program Element (Number/Name)
PE 0603884C / *Ballistic Missile Defense Sensors*

Decrease in FY 2022 predominately reflects the realignment of Layered Homeland Defense funds to proper MDA program elements to implement refined program architecture.

UNCLASSIFIED

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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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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
MD11: <i>BMDS Radars</i>	1,838.091	308.276	253.045	197.816	-	197.816	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note

Decrease from FY 2021 to FY 2022 reflects a decrease of X-Band radar Electronic Protection and Objective Debris Mitigation efforts, reductions for Efficiencies and Process Reforms, delay of L-200 threat mitigation, and manpower efficiencies.

A. Mission Description and Budget Item Justification

The Missile Defense System (MDS) Radars project includes development of future AN/TPY-2, Cobra Dane, Long Range Discrimination Radar (LRDR), Sea Based X-Band (SBX), Sensors Layered Homeland Defense Radars, and Upgraded Early Warning Radars (UEWR) capabilities through system engineering; software development; and testing support.

Modeling and Simulation (M&S) efforts include enhanced sensor models, development of Radio Frequency scene generators, integration of digital simulations into the MDS M&S architecture, and Verification, Validation, and Accreditation of radar models. Joint Emerging Operational Needs Statement (JEONS) provides rapid deployment of software upgrades to optimize performance against increasing threats and improve regional integration. This project also funds participation and support for MDS element ground and flight test campaigns and Warfighter games and exercises.

This project provides development of discrimination advanced algorithms for MDS radars to counter evolving threats. The discrimination improvement effort will develop and field integrated element capabilities to improve MDS ability to identify lethal and non-lethal objects. Sensors will continue development of discrimination improvement mid-term design and test support for MDS radars and far term trade analysis and planning.

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

	FY 2020	FY 2021	FY 2022
Title: Basic Development Program	28.742	26.031	22.314
Articles:	-	-	-
Description: The Basic Development Program includes development and testing of software maintenance updates to address software trouble reports identified on fielded software versions and flight/ground test events. Software improvement efforts also include optimization of increased processing capabilities. The Basic Development Program also provides analysis of software performance during flight and ground testing to support Materiel Release for software deliveries. The Materiel Release Closure Plan for the AN/TPY-2 ensures the Reliability, Availability, and Maintainability (RAM) Program promotes reliability growth in the suite of AN/TPY-2 radars via product improvements.			
Specific and/or unique accomplishments to each FY are as follows:			

UNCLASSIFIED

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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
<p>FY 2021 Plans: - SEE ABOVE.</p> <p>FY 2022 Plans: - SEE ABOVE.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Decrease from FY 2021 to FY 2022 reflects realignment to higher Agency priorities.</p>			
<p>Title: BMDS Radars Modeling & Simulation (M&S)</p> <p align="right">Articles:</p>	37.730 -	41.125 -	48.130 -
<p>Description: Missile Defense System (MDS) Radars M&S efforts include enhanced sensor models, development and maintenance of Radio Frequency (RF) scene generators, integration of digital simulations into the MDS, M&S architecture, and Verification, Validation, and Certification (VV&C) of radar models, including high fidelity models used for performance assessment. This effort includes support for technical and performance assessments using Open Systems Architecture Sensor Models (OSM), Open Systems Architecture Signal Injectors (OSI) and other models/tools, as well as development and sustainment of Digital and Hardware in the Loop (HWIL) representations of various simulations and models to include the tactical versions of AN/TPY-2, LRDR, SBX, UEWR, and CD. This effort funds the development of End-to-end Digital Integrated System-level Simulation (EDISS) and Ground Test Integrated System-level Simulation (GTISS) improvements to the MDA Ground Test Architecture. MDS Radars M&S efforts also fund the development and validation of Multi-band Electronic Attack Digital Injection Capability (MEDIC). This effort includes support for tactical requirements verification, including development and VV&C of models for testing electronic protection and objective debris mitigation algorithms. This project also supports war games, Warfighter exercises and training, and execution of element-level ground test campaigns, as well as the development of M&S frameworks and truth models required to anchor M&S.</p> <p>Specific and/or unique accomplishments to each FY are as follows:</p> <p>FY 2021 Plans: Digital M&S Priorities:</p> <ul style="list-style-type: none"> - Conduct core modeling of real-world radar capabilities to keep pace with the evolving MDS - Continue efforts to meet EDISS v1 requirements, including software development, In-Progress Reviews, EDISS M&S Integration, Test, and Verification, Increment Acceptance Reviews, prioritizing LRDR and AN/TPY-2 modeling - Support preparation for Continuous Digital Assessments - Software Development of EDISS v2 including In-Progress Reviews - Continue systems engineering for EDISS v2, including System Requirements Review and System Functional Review 			

UNCLASSIFIED

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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2020	FY 2021
<ul style="list-style-type: none"> - Initiate systems engineering for EDISS v3 - Initiate validation of high fidelity digital model for LRDR <p>Ground Test M&S priorities:</p> <ul style="list-style-type: none"> - Complete GTISS Phase 1 requirements development - Complete GTISS Phase 1 software development - Complete GTISS Phase 1 M&S Integration, Test, and Verification - Continue Engineering and Development of GTISS Phase 2 - Continue GTISS Phase 2 software development, including in-progress technical reviews - Initiate Integration and Test GTISS Phase 2 M&S - Initiate GTISS Phase 3 requirements analysis and functional analysis, develop system design - Initiate validation of high fidelity models for AN/TPY-2 <p>FY 2022 Plans:</p> <p>Digital M&S Priorities:</p> <ul style="list-style-type: none"> - Continue core modeling of real-world radar capabilities to keep pace with the evolving MDS, continuing LRDR and AN/TPY-2 modeling, along with increasing modeling efforts on MDA standalone radars - Conduct supporting Continuous Digital Assessments - Continue integration, test, and analysis of EDISS v1 capabilities - Continue software development of EDISS v2 - Continue integration and testing for EDISS v2 - Initiate software development for EDISS v3 - Initiate EDISS v4 system requirements analysis - Initiate development of additional capabilities in high fidelity digital models for AN/TPY-2 and SBX - Continue validation of high fidelity digital model for LRDR <p>Ground Test M&S Priorities:</p> <ul style="list-style-type: none"> - Continue Phase 1 of GTISS improvements to the MDA Ground Test Architecture - Complete Engineering and Development of GTISS Phase 2 - Continue Integration and Test GTISS Phase 2 M&S - Complete GTISS Phase 3 Functional Analysis and System Design - Initiate GTISS Phase 3 Integration, Test, and Verification - Initiate development of additional capabilities in high fidelity ground test models 			

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2020	FY 2021	FY 2022
- Continue validation of high fidelity models for AN/TPY-2				
FY 2021 to FY 2022 Increase/Decrease Statement: Increase from FY 2021 to FY 2022 provides for the development of additional Increment 6C/7 capabilities in Digital and Ground Test M&S supporting MDS-wide assessment for LRDR, AN/TPY-2, SBX, UEWR and CD radars and provides for an all-digital data production venue that supports performance assessment.				
Title: Capability Development Program		103.640	135.434	82.531
Articles:		-	-	-
Description: The Capability Development Program provides engineering support to enable compliance with BMD System Specification threat capabilities and addresses advanced threats. This task includes the redesign of select components to address obsolescence and improve reliability of the system. This task continues electronic protection and objective debris mitigation development efforts to reduce or eliminate the effect of corporate clutter and electronic attack on sensors. It develops, designs, and tests sensor mid-term discrimination improvements for X-Band radars, to include SBX threat discrimination improvements. This effort funds participation in far-term discrimination improvement threat model specifications and develops discrimination and countermeasure mitigation capability development. Additional software development activities include support to PATRIOT launch on THAAD capability, X86 performance optimization to enhance processing speed, improvements to cybersecurity posture, additional developmental of sensor electronic protection for AN/TPY-2 and LRDR, and developmental information system enhancements. This effort includes threat updates and verification, core standards system engineering, and required updates to models, simulation, and performance assessment.				
Specific and/or unique accomplishments to each FY are as follows:				
FY 2021 Plans:				
- Initiate development of sensor mid-term discrimination improvements for X-Band radars, to include SBX threat discrimination improvements				
- Initiate development of sensor electronic protection for SBX				
- Initiate additional development of sensor electronic protection for AN/TPY-2 and LRDR and objective debris mitigation development efforts to reduce or eliminate the effect of corporate clutter and electronic attack on sensors				
- Continue expanded active sensor bias and full sensor bias reporting				
- Continue threat updates and verification, core standards system engineering, required updates to models and simulation, and performance assessments				
FY 2022 Plans:				

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2020	FY 2021	FY 2022
<ul style="list-style-type: none"> - Continue development of sensor mid-term threat discrimination improvements for X-Band radars, to include SBX threat discrimination improvements - Continue development of sensor Electronic Protection and Objective Debris Mitigation development efforts to mitigate electronic attack and to reduce the effect of clutter on sensors - Initiate development of a domestic secure server solution to meet the AN/TPY-2 cybersecurity and performance requirements <p>FY 2021 to FY 2022 Increase/Decrease Statement: Decrease from FY 2021 to FY 2022 reflects a decrease in X-Band radar Electronic and Protection and Objective Debris Mitigation efforts, reductions for Efficiencies and Process Reforms, and delay in L-200 threat mitigation.</p> <p>Title: Sensors Directorate Operations</p> <p align="right">Articles:</p> <p>Description: Program Operations provides strategic planning, program integration, contracting, acquisition, engineering, financial management, internal reviews and audits, and program assessments for the Sensors Program Office.</p> <p>Recurring activities include:</p> <ul style="list-style-type: none"> - Provide technical and business management support activities to provide critical program status and decision quality data - Ensure Sensors program compliance with internal and external direction, policies, and regulations to deliver critical capability within a consistent and disciplined process - Conduct internal program reviews to measure program progress against the six Missile Defense Agency approved baselines - Continue a Mission Assurance and Manufacturing Engineering Program to include Quality, Configuration Management, Manufacturing, Engineering, and Safety in all phases of the system life cycle, throughout the supply chain, and at all levels of assembly emphasizing high yield rates which minimize test and rework costs - Provide Quality Safety and Mission Assurance (QSMA) operations to ensure compliance with Agency requirements for design, test, manufacturing, quality, safety and reliability to ensure high quality products are delivered to the Warfighter <p>Specific and/or unique accomplishments to each FY are as follows:</p> <p>FY 2021 Plans: - SEE ABOVE.</p> <p>FY 2022 Plans: - SEE ABOVE.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement:</p>		50.092	49.566	43.140
		-	-	-

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2020	FY 2021	FY 2022
Decrease from FY 2021 to FY 2022 reflect manpower efficiencies.				
<p>Title: Upgrade Clear Early Warning Radar</p> <p align="right">Articles:</p> <p>Description: Upgrade of Clear Early Warning Radar and Cape Cod Early Warning Radar includes adaptation of hardware and software to UEWR infrastructure, support to MDS communications and architecture work and installation at site. This project also includes preparation and removal of legacy equipment at each UEWR site.</p> <p>Specific and/or unique accomplishments to each FY are as follows:</p> <p>FY 2021 Plans: -Complete operations and sustainment activities post operational acceptance to include interim contractor logistics support at Clear Air Force Station (AFS)</p> <p>FY 2022 Plans: -Initiate Automatic Data Processing Equipment (ADPE) Rehost strings for ISTC 1 and ISTC 2 required for CD to continue participation in ground tests</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Increase from FY 2021 to FY 2022 provides for ADPE Rehost strings for ISTC 1 and ISTC 2 required for CD to continue participation in ground tests.</p>		3.172 -	0.889 -	1.701 -
<p>Title: Joint Emerging Operational Need (JEON)</p> <p align="right">Articles:</p> <p>Description: Rapid deployment of software upgrades to optimize performance against increasing threats and improve regional integration. Phase 1 provides enhanced discrimination, increases search plan optimization, and updates Position, Navigation, and Timing and Regional Mission Data. Phase 2 improves debris mitigation to increase raid performance against threats, improves debris tracks on radar resources, and provides search plan upgrades that increase search acquisition and support remote launcher capabilities. Phase 3 provides additional increased search plan capabilities, implementation of the DoD Regional Clock, remote launcher upgrades to integrate AN/TPY-2 with PATRIOT and THAAD systems, and improves proficiencies against advanced threats in complex environments.</p> <p>Specific and/or unique accomplishments to each FY are as follows:</p> <p>FY 2021 Plans:</p>		15.900 -	0.000 -	0.000 -

UNCLASSIFIED

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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDs Radars</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
N/A			
FY 2022 Plans: N/A			
FY 2021 to FY 2022 Increase/Decrease Statement: N/A			
Title: High Altitude Electromagnetic Pulse (HEMP) Hardening	69.000	0.000	0.000
Articles:	-	-	-
Description: This effort develops, designs, and tests HEMP upgrade capabilities for Army Navy/Transportable Radar Surveillance and Control (AN/TPY-2) Forward Based Mode (FBM) radar sites.			
FY 2021 Plans: N/A			
FY 2022 Plans: N/A			
FY 2021 to FY 2022 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	308.276	253.045	197.816

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

<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0208866C MD11: <i>MDS Procurement</i>	10.046	243.270	2.738	-	2.738	-	-	-	-	-	-
• 0208866C MD11: <i>MDS Radars Program, Operation and Maintenance</i>	232.671	255.708	190.553	-	190.553	-	-	-	-	-	-
• 0603882C: <i>Ballistic Missile Defense Midcourse Defense Segment</i>	1,275.414	1,219.261	745.144	-	745.144	-	-	-	-	-	-
• 0603890C: <i>BMD Enabling Programs</i>	630.196	616.455	595.301	-	595.301	-	-	-	-	-	-

UNCLASSIFIED

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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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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
• 0603896C: <i>Ballistic Missile Defense Command and Control, Battle Management & Communication</i>	550.513	645.741	603.448	-	603.448	-	-	-	-	-	-
• 0603898C: <i>Ballistic Missile Defense Joint Warfighter Support</i>	51.095	49.560	50.594	-	50.594	-	-	-	-	-	-
• 0603904C: <i>Missile Defense Integration and Operations Center (MDIOC)</i>	54.783	55.356	52.403	-	52.403	-	-	-	-	-	-
• 0603907C: <i>Sea Based X-Band Radar (SBX)</i>	137.604	118.318	147.241	-	147.241	-	-	-	-	-	-
• 0603914C: <i>Ballistic Missile Defense Test</i>	398.939	365.208	362.906	-	362.906	-	-	-	-	-	-
• 0604181C: <i>Hypersonic Defense</i>	386.528	272.632	247.931	-	247.931	-	-	-	-	-	-
• 0604672C: <i>Homeland Defense Radar-Hawaii</i>	181.569	133.000	0.000	-	0.000	-	-	-	-	-	-
• 0604673C: <i>Pacific Discriminating Radar</i>	2.921	0.000	0.000	-	0.000	-	-	-	-	-	-
• 0604873C: <i>Long Range Discrimination Radar (LRDR)</i>	131.135	138.317	133.335	-	133.335	-	-	-	-	-	-
• 0604879C: <i>Ballistic Missile Defense Sensor Test</i>	96.082	64.245	77.428	-	77.428	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

The Radar Development Contract (RDC) awarded on Nov 1, 2017 supports the Sensors Directorate's X-Band Radars (XBR). Missile Defense System (MDS) capability and performance requirements, which underpin continuing XBR development requirements include, but are not limited to, the Army/Navy Transportable Radar Surveillance and Control (AN/TPY-2) radar and the Sea-Based X-Band (SBX) radar. These requirements stem directly from formal Warfighter requirements as developed in the United States Strategic Command (USSTRATCOM)-led Warfighter Involvement Process (see USSTRATCOM Special Instruction (SI) 538-3, Missile Defense Warfighter Involvement Process, June 25, 2008). Achievable requirements documented in the Prioritized Capabilities List (PCL) and Modification and Fielding Requirements List (MFRL) are documented in MDA's Achievable Capabilities List (ACL) and translated via the MDS architecture and system specifications into flow-down requirements, characteristics, and capability needs for individual MDS program specifications, and ultimately are approved through the systems engineering and

UNCLASSIFIED

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<p>baseline change management process for MDS programs to execute. The RDC supports the XBRs for product improvement, including developmental upgrades of software and development of hardware and software to meet enhanced capabilities and risk reduction measures; warfighter support, including wargames and exercise support; engineering services, including engineering support for delivered and accepted radars to facilitate maintenance efforts which may include, but are not limited to, hardware obsolescence studies, hardware redesign, technology insertion and refurbishment; MDS test subject matter expert (SME) support; modeling and simulation SME support; and cybersecurity. These support activities are for all AN/TPY-2 radars, in the Forward Based Mode (FBM) and Terminal Mode (TM), and the SBX Radar to include the Weather Air Search Radar (WxASR) located on the SBX platform.</p>		

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency												Date: May 2021			
Appropriation/Budget Activity						R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 4						PE 0603884C / Ballistic Missile Defense Sensors				MD11 / BMDS Radars					
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Basic Development Program - Material Release Get Well Plan - AMCOM	MIPR	AMCOM : AL	0.283	0.285	Nov 2019	0.290	Nov 2020	0.133	Nov 2021	-		0.133	Continuing	Continuing	Continuing
Basic Development Program - Basic Development - SBX	SS/CPAF	Raytheon : MA	0.000	2.000	Nov 2019	2.000	Nov 2020	1.500	Nov 2021	-		1.500	Continuing	Continuing	Continuing
Basic Development Program - Information Assurance AN/TPY-2	SS/CPAF	Raytheon : MA	26.537	4.230	Nov 2019	3.131	Nov 2020	0.000		-		0.000	0.000	33.898	0.000
Basic Development Program - Information Assurance SBX	SS/CPAF	Raytheon : MA	1.303	0.000		0.000		0.000		-		0.000	0.000	1.303	0.000
Basic Development Program - Material Release Get Well Plan - ATEC	MIPR	ATEC : AL	0.715	0.820	Nov 2019	0.697	Nov 2020	0.000		-		0.000	0.000	2.232	0.000
Basic Development Program - Material Release Get Well Plan - CCDC	SS/CPAF	CCDC AVMC : AL	17.649	1.250	Dec 2019	1.125	Nov 2020	0.000		-		0.000	0.000	20.024	0.000
Basic Development Program - Sys Integration & Tech Assessments	MIPR	CCDC AVMC : AL	26.283	3.132	Nov 2019	2.100	Nov 2020	0.000		-		0.000	0.000	31.515	0.000
Basic Development Program - X-Band Software Enhancements/ Development	SS/CPAF	Raytheon : AL	127.914	17.025	Feb 2020	16.688	Nov 2020	20.681	Nov 2021	-		20.681	Continuing	Continuing	Continuing
BMDS Radars Modeling & Simulation (M&S) - M&S Development	SS/CPFF	Raytheon : AL,MA, CO	158.157	20.540	Jan 2020	25.717	Jan 2021	33.741	Jan 2022	-		33.741	Continuing	Continuing	Continuing
BMDS Radars Modeling & Simulation (M&S) - M&S Development - Boeing	C/CPAF	Boeing : AL	0.000	0.248	Nov 2019	0.000		0.000		-		0.000	0.000	0.248	0.000

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency												Date: May 2021			
Appropriation/Budget Activity						R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 4						PE 0603884C / Ballistic Missile Defense Sensors				MD11 / BMDS Radars					
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
BMDS Radars Modeling & Simulation (M&S) - M&S Development - Decibel	C/CPAF	Decibel : AL	0.000	2.000	Jan 2020	0.000		0.000		-		0.000	0.000	2.000	0.000
BMDS Radars Modeling & Simulation (M&S) - M&S Development - Northrop Grumman	C/CPAF	Northrop Grumman : AL	0.000	1.219	Mar 2020	0.000		0.000		-		0.000	0.000	1.219	0.000
BMDS Radars Modeling & Simulation (M&S) - M&S Development-FFRDC/ UARC	Various	JHU, MITRE : MD, AL	0.000	1.171	Oct 2019	0.000		0.000		-		0.000	0.000	1.171	0.000
BMDS Radars Modeling & Simulation (M&S) - M&S Development-LM	SS/CPIF	Lockheed Martin : NJ	0.000	6.043	Nov 2019	2.600	Nov 2020	3.144	Nov 2021	-		3.144	Continuing	Continuing	Continuing
BMDS Radars Modeling & Simulation (M&S) - VV&A of Models	MIPR	CCDC AVMC : AL	59.223	3.969	Dec 2019	9.520	Dec 2020	7.898	Dec 2021	-		7.898	Continuing	Continuing	Continuing
BMDS Radars Modeling & Simulation (M&S) - VV&A of Models - GTRI	FFRDC	GTRI : GA	0.000	0.126	Oct 2019	0.780	Oct 2020	0.796	Oct 2021	-		0.796	Continuing	Continuing	Continuing
BMDS Radars Modeling & Simulation (M&S) - Warfighter Exercises	SS/CPFF	Raytheon : MA	14.372	2.414	Mar 2020	2.508	Feb 2021	2.551	Feb 2022	-		2.551	Continuing	Continuing	Continuing
Capability Development Program - Electronic Protection - GTRI	SS/CPFF	GTRI : GA	0.521	0.000		0.000		0.000		-		0.000	0.000	0.521	0.000
Capability Development Program - Electronic Protection - PRIME	C/CPAF	Raytheon : MA	18.315	0.000		29.354	Nov 2020	17.270	Nov 2021	-		17.270	Continuing	Continuing	Continuing
Capability Development Program - Enhanced Discrimination - CCDC	MIPR	CCDC AVMC : AL	8.214	4.586	Nov 2019	6.200	Nov 2020	0.500	Nov 2021	-		0.500	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency												Date: May 2021			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)						Project (Number/Name)					
0400 / 4				PE 0603884C / Ballistic Missile Defense Sensors						MD11 / BMDS Radars					
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Capability Development Program - Enhanced Discrimination - MITRE	FFRDC	MITRE : AL	3.187	0.743	Nov 2019	0.000		0.000		-		0.000	0.000	3.930	0.000
Capability Development Program - AN/TPY-2 Capability Development - CCDC	MIPR	CCDC AVMC : AL	10.390	10.408	Nov 2019	8.850	Nov 2020	4.977	Nov 2021	-		4.977	Continuing	Continuing	Continuing
Capability Development Program - AN/TPY-2 Capability Development - GTRI	SS/CPFF	GTRI : GA	0.000	1.084	Nov 2019	0.000		0.000		-		0.000	0.000	1.084	0.000
Capability Development Program - AN/TPY-2 Capability Development - JHU	FFRDC	John Hopkins University : MD	4.408	0.933	Oct 2019	0.000		0.000		-		0.000	0.000	5.341	0.000
Capability Development Program - AN/TPY-2 Capability Development - NSWC	MIPR	Naval Surface Warfare Center : VA	0.000	0.094	Nov 2019	0.000		0.000		-		0.000	0.000	0.094	0.000
Capability Development Program - AN/TPY-2 Capability Development - PRIME	SS/CPAF	Raytheon : MA	205.642	27.306	Nov 2019	21.279	Nov 2020	25.536	Nov 2021	-		25.536	Continuing	Continuing	Continuing
Capability Development Program - Communication Development	MIPR	Secretary of the Air Force (SAF) : Various	0.000	8.886	Jul 2020	0.000		0.000		-		0.000	0.000	8.886	0.000
Capability Development Program - Electronic Protection - CCDC	MIPR	CCDC AVMC : AL	25.504	0.000		4.500	Nov 2020	0.000		-		0.000	0.000	30.004	0.000
Capability Development Program - Enhanced Discrimination	C/CPAF	Raytheon : MA	266.242	25.581	Jan 2020	42.515	Jan 2021	21.755	Jan 2022	-		21.755	Continuing	Continuing	Continuing

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Capability Development Program - Enhanced Discrimination - LM	SS/CPIF	Lockheed Martin : NJ	5.922	0.000		6.670	Dec 2020	1.900	Dec 2021	-		1.900	Continuing	Continuing	Continuing
Capability Development Program - Network and Infrastructure Services	C/CPAF	Jacobs Engineering : AL, CO, MA, VA	0.000	6.086	Nov 2019	6.290	Nov 2020	6.176	Nov 2021	-		6.176	Continuing	Continuing	Continuing
Capability Development Program - Post Intercept Assessment (PIA)	C/CPAF	Raytheon : MA	10.400	0.000		0.000		0.000		-		0.000	0.000	10.400	0.000
Capability Development Program - SBX Capability Development	MIPR	CCDC AVMC : AL	0.000	0.907	Nov 2019	0.000		4.417	Nov 2021	-		4.417	Continuing	Continuing	Continuing
Capability Development Program - SBX Capability Development - includes Post Intercept Assessment (PIA)	SS/CPAF	Raytheon : MA	8.700	10.881	Mar 2020	4.776	Jan 2021	0.000		-		0.000	0.000	24.357	0.000
Capability Development Program - UEWR Capability Development - CCDC	MIPR	CCDC AVMC : AL	0.000	6.145	Dec 2019	5.000	Jun 2021	0.000		-		0.000	0.000	11.145	0.000
Sensors Directorate Operations - AN/TPY-2 WSMR Support	MIPR	WSMR : NM	0.000	0.617	Feb 2020	0.000		0.619	Oct 2021	-		0.619	Continuing	Continuing	Continuing
Sensors Directorate Operations - Army Hybrid Program Office	MIPR	SMDC : AL	8.919	1.197	Dec 2019	2.035	Dec 2020	1.436	Dec 2021	-		1.436	Continuing	Continuing	Continuing
Sensors Directorate Operations - Civilians/ Travel	Various	MDA : AL, VA, MA	203.606	17.693	Oct 2019	19.201	Oct 2020	19.484	Oct 2021	-		19.484	Continuing	Continuing	Continuing
Sensors Directorate Operations - Contractor Service Support	Various	Various : Various	242.510	21.505	Oct 2019	18.850	Oct 2020	14.431	Oct 2021	-		14.431	Continuing	Continuing	Continuing

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Sensors Directorate Operations - FFRDC/ UARC	SS/CPAF	GTRI, JHU/APL, MITRE, MIT/LL : AL, GA, MA, MD, VA	104.211	7.815	Nov 2019	7.815	Nov 2020	6.390	Nov 2021	-		6.390	Continuing	Continuing	Continuing
Sensors Directorate Operations - Network and Infrastructure Services	C/CPAF	Jacobs Engineering : AL, AK, CA, CO, HI, NM, VA	47.610	0.752	Jan 2020	0.292	Jan 2021	0.298	Jan 2022	-		0.298	Continuing	Continuing	Continuing
Sensors Directorate Operations - Network and Infrastructure Services - Network Management	C/FFP	Network Management Resources, Inc : VA	0.000	0.513	Aug 2020	0.000		0.000		-		0.000	0.000	0.513	0.000
Sensors Directorate Operations - Other Govt Agencies	MIPR	Various : Various	38.063	0.000		1.373	Feb 2021	0.482	Feb 2022	-		0.482	Continuing	Continuing	Continuing
Upgrade Clear Early Warning Radar - Facilities Site Activation/Admin Comms	MIPR	Various : AL, MA, AK	7.839	0.000		0.000		0.000		-		0.000	0.000	7.839	0.000
Upgrade Clear Early Warning Radar - Radar Upgrade -- Prime Contractor	C/CPAF	Raytheon : MA	130.452	3.172	Jan 2020	0.889	Jan 2021	1.701	Jan 2022	-		1.701	Continuing	Continuing	Continuing
Joint Emerging Operational Need (JEON) - Software Enhancements/ Development	C/CPAF	Raytheon : MA	55.000	15.900	Jan 2020	0.000		0.000		-		0.000	0.000	70.900	0.000
High Altitude Electromagnetic Pulse (HEMP) Hardening - FBM Site Modifications	MIPR	Various : Various	0.000	5.800	Mar 2020	0.000		0.000		-		0.000	0.000	5.800	0.000
High Altitude Electromagnetic Pulse (HEMP) Hardening - Hardened Transportable Terminal (HTT) Communications	MIPR	DISA : VA	0.000	1.227	Sep 2020	0.000		0.000		-		0.000	0.000	1.227	0.000

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
High Altitude Electromagnetic Pulse (HEMP) Hardening - Hardened Transportable Terminal (HTT) Engineering, Development and Sustainment	MIPR	Tobyhanna Army Depot (TYAD) : PA	0.000	5.773	May 2020	0.000		0.000		-		0.000	0.000	5.773	0.000
High Altitude Electromagnetic Pulse (HEMP) Hardening - Power Distribution Centers (PDC) and Commercial Power	C/TBD	Various : Various	0.000	39.600	Mar 2020	0.000		0.000		-		0.000	0.000	39.600	0.000
High Altitude Electromagnetic Pulse (HEMP) Hardening - Power Distribution System (PDS) Development and Integration	SS/CPAF	Raytheon : MA	0.000	16.600	Mar 2020	0.000		0.000		-		0.000	0.000	16.600	0.000
Subtotal			1,838.091	308.276		253.045		197.816		-		197.816	Continuing	Continuing	N/A

Remarks
Note: Clear Early Warning Upgrade Program includes upgrade of the Cape Cod EWR.

Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		-		-		-		-	-	-	N/A

Remarks
Operations and sustainment of Upgraded Early Warning Radar (UEWR), COBRA DANE (CD), and Army Navy/Transportable Radar Surveillance and Control (AN/TPY-2) Radars Contract Logistics Support (CLS) are Operations and Maintenance (O&M) Defense-Wide appropriations and are described in the Missile Defense Agency (MDA) O- Documents.

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		-		-		-		-	-	-	N/A

Remarks
N/A

Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		-		-		-		-	-	-	N/A

Remarks
N/A

Project Cost Totals	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
1,838.091	308.276	253.045	197.816	-	197.816	Continuing	Continuing	N/A	

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

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency **Date: May 2021**

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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	Significant Event Complete ▲		Milestone Decision Complete ★		Element Test Complete ◆		System Level Test Complete ●		Complete Activity ◆					
	Significant Event Planned △		Milestone Decision Planned ☆		Element Test Planned ◇		System Level Test Planned ○		Planned Activity ◇					
	FY 2020		FY 2021		FY 2022		FY 2023		FY 2024		FY 2025		FY 2026	
GTI-20 Sprint 1(E/C) (MDS Ground Test)	◆													
(EX) EAGLE RESOLVE 20	▲													
GTI-20 Sprint 2 (JEON) (MDS Ground Test)			◆											
Site 4c SICO (MDS Ground Test)				◆										
GTI-08a (N/I) (MDS Ground Test)				◇	◇	◇	◇	◇						
(EX) AIR AND MISSILE DEFENSE EXERCISE 21				◆	◆	◆								
FS-21 E4 (AEGIS 5.1, DT Intercept Flight Test)						△								
FTX-43 (OTHER, DT Tracking Exercise Flight Test)						△								
TH CTV-01 (LTPO, DT Interceptor Only Flight Test)										△				
FTT-21 (TH, DT Intercept Flight Test)										△				
SNG-S-H-4										◇				
SNG-A-H-4										◇				
GTI-ISR (21) (MDS Ground Test)												◇		
GTI-09 Sprint 1 (E/C) (MDS Ground Test)												◇		
SNG-A-D-3												◇		
SNG-S-D-5												◇		
SNG-U-D-4												◇		
SNG-C-D-2												◇		
(EX) AIR AND MISSILE DEFENSE EXERCISE 22												◇	◇	◇
(EX) EAGLE RESOLVE 22													△	
GTD-08a (N/I) (MDS Ground Test)													◇	
SNG-U-H-3													◇	
FTM-46 (AEGIS 5.0, DT/OT Intercept Flight Test)													△	
GTI-09 Sprint 2 (E/C) (MDS Ground Test)													◇	◇

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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	FY 2020			FY 2021			FY 2022			FY 2023			FY 2024			FY 2025			FY 2026		
GTI-08b Sprint 1 (N/I) (MDS Ground Test)									◇												
FTX-45									△												
FTX-26 (OT) (SN, OT Target Only Flight Test)										△											
GTD-09 (E/C) (MDS Ground Test)										◇											
SNG-S-D-4										◇											
SICO-08b (MDS Ground Test)										◇											

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
GTI-20 Sprint 1(E/C) (MDS Ground Test)	2	2020	2	2020
(EX) EAGLE RESOLVE 20	2	2020	2	2020
GTI-20 Sprint 2 (JEON) (MDS Ground Test)	3	2020	3	2020
Site 4c SICO (MDS Ground Test)	4	2020	4	2020
GTI-08a (N/I) (MDS Ground Test)	4	2020	4	2021
(EX) AIR AND MISSILE DEFENSE EXERCISE 21	1	2021	3	2021
FS-21 E4 (AEGIS 5.1, DT Intercept Flight Test)	3	2021	3	2021
FTX-43 (OTHER, DT Tracking Exercise Flight Test)	3	2021	3	2021
TH CTV-01 (LTPO, DT Interceptor Only Flight Test)	4	2021	4	2021
FTT-21 (TH, DT Intercept Flight Test)	4	2021	4	2021
SNG-S-H-4	4	2021	4	2021
SNG-A-H-4	4	2021	4	2021
GTI-ISR (21) (MDS Ground Test)	1	2022	1	2022
GTI-09 Sprint 1 (E/C) (MDS Ground Test)	1	2022	1	2022
SNG-A-D-3	1	2022	1	2022
SNG-S-D-5	1	2022	1	2022
SNG-U-D-4	1	2022	1	2022
SNG-C-D-2	1	2022	1	2022
(EX) AIR AND MISSILE DEFENSE EXERCISE 22	1	2022	3	2022
(EX) EAGLE RESOLVE 22	2	2022	2	2022
GTD-08a (N/I) (MDS Ground Test)	2	2022	2	2022
SNG-U-H-3	2	2022	2	2022

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD11 / <i>BMDS Radars</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
FTM-46 (AEGIS 5.0, DT/OT Intercept Flight Test)	2	2022	2	2022
GTI-09 Sprint 2 (E/C) (MDS Ground Test)	2	2022	3	2022
GTI-08b Sprint 1 (N/I) (MDS Ground Test)	3	2022	3	2022
FTX-45	3	2022	3	2022
FTX-26 (OT) (SN, OT Target Only Flight Test)	4	2022	4	2022
GTD-09 (E/C) (MDS Ground Test)	4	2022	4	2022
SNG-S-D-4	4	2022	4	2022
SICO-08b (MDS Ground Test)	4	2022	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.

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MC11 / <i>Cyber Operations</i>
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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
MC11: <i>Cyber Operations</i>	15.048	28.296	1.558	17.203	-	17.203	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note

Increase from FY 2021 to FY 2022 provides for critical cybersecurity requirements to support 12 AN/TPY-2 radars, SBX, five UEWRs, Cobra Dane, and LRDR.

A. Mission Description and Budget Item Justification

Sustain the Department of Defense Instruction (DoDI) 8510.01 Risk Management Framework (RMF) for DoD Information Technology (IT) requirement for the MDA Sensors Directorate and conduct Security Control Assessments (SCA) activities, analysis of validation results, risk assessments, and reviews of proposed Program Manager/Information System Security Manager (PM/ISSM) Plans of Action and Milestones (POA&M) for MDA Sensors mission systems. It also includes support for external cybersecurity assessments and penetration testing of the Sensors mission systems, both in laboratory Element Cybersecurity Experiments and in ground test activities, in accordance with the Director, Operational Test and Evaluation (DOT&E) directive and the Integrated Master Test Plan (IMTP). It maintains the Assessment and Authorization (A&A) data repository, capturing the RMF documentation (artifacts, validation results, Cybersecurity Risk Assessment results, cybersecurity scorecard, and Authorizing Official (AO) authorization decisions) and POA&M for all MDA information systems. This project supports the alignment, development, and implementation of an integrated Tier 2 Cyber Security Service Provider (CSSP) capability on the Sensors mission systems in accordance with the DoD Cybersecurity Discipline Implementation Plan and DoDI 8530.01 Cybersecurity Activities Support to DoD Information Network Operations.

Provides the monitoring, prioritization, and tracking of Cybersecurity mitigation detailed in Information Technology security POA&Ms. The activities include preparation of A&A documentation and accreditation recommendations to the MDA Senior Information Security Officer (SISO)/Security Control Assessor (SCA) and Authorizing Official (AO). Independent Verification and Validation (IV&V) team actions ensure the availability, integrity, authentication, confidentiality, and non-repudiation of the MDA mission; test; and administrative systems. These activities are necessary to comply with the Federal Information Security Management 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)	28.296	1.558	17.203
Articles:	-	-	-
Description: Cyber Operations funds Sensors Directorate Information System Security Manager (ISSM) civilian salaries and cybersecurity engineering and architecture planning for program information technology systems. This project plans and tests the cybersecurity controls for the Missile Defense System (MDS) and maintains Sensors Risk Management Framework (RMF) authorizations for Sensors-managed information systems, conducts Controls Validation Testing (CVT)/ Security Controls Assessment (SCA) of sensors mission and support systems, and provides and maintains Plans of Action and Milestones (POA&M) to mitigate cybersecurity deficiencies. Cyber Operations conducts annual cybersecurity program reviews on the Sensors enclaves to assess compliance in implementing and maintaining controls. This effort supports the alignment,			

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MC11 / <i>Cyber Operations</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
<p>development, and implementation of an integrated Tier 2 Cyber Security Service Provider (CSSP) capability on the Sensors mission systems in accordance with the DoD Cybersecurity Discipline Implementation Plan and DoDI 8530.01 Cybersecurity Activities Support to DoD Information Network Operations.</p> <p>Specific and/or unique accomplishments to each FY are as follows:</p> <p>FY 2021 Plans: -Funds FY 2021 cybersecurity manpower only</p> <p>FY 2022 Plans: -Increase scope and complexity of portfolio of systems/networks managed, including implementation of RMF requirements for Hardware in the Loop (HWIL) and lab architectures and flight and ground test support architectures. Additional RMF compliance efforts for critical modeling and simulation/stimulation capabilities for both software-based modeling and HWIL testing.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Increase from FY 2021 to FY 2022 provides for critical cybersecurity requirements to support 12 AN/TPY-2 radars, SBX, five UEWRs, CD, and LRDR as well as mission support and ground and flight test assets.</p>			
Accomplishments/Planned Programs Subtotals	28.296	1.558	17.203

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
• 0603896C: <i>Ballistic Missile Defense Command and Control, Battle Management & Communication</i>	550.513	645.741	603.448	-	603.448	-	-	-	-	-	-
• 0603898C: <i>Ballistic Missile Defense Joint Warfighter Support</i>	51.095	49.560	50.594	-	50.594	-	-	-	-	-	-
• 0603904C: <i>Missile Defense Integration and Operations Center (MDIOC)</i>	54.783	55.356	52.403	-	52.403	-	-	-	-	-	-
• 0603907C: <i>Sea Based X-Band Radar (SBX)</i>	137.604	118.318	147.241	-	147.241	-	-	-	-	-	-
• 0604672C: <i>Homeland Defense Radar-Hawaii</i>	181.569	133.000	0.000	-	0.000	-	-	-	-	-	-

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MC11 / <i>Cyber Operations</i>
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0604673C: <i>Pacific Discriminating Radar</i>	2.921	0.000	0.000	-	0.000	-	-	-	-	-	-
• 0604873C: <i>Long Range Discrimination Radar (LRDR)</i>	131.135	138.317	133.335	-	133.335	-	-	-	-	-	-
• 0604879C: <i>Ballistic Missile Defense Sensor Test</i>	96.082	64.245	77.428	-	77.428	-	-	-	-	-	-
• 0901598C: <i>Management HQ - MDA</i>	27.065	26.902	24.102	-	24.102	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Missile Defense Agency												Date: May 2021			
Appropriation/Budget Activity						R-1 Program Element (Number/Name)						Project (Number/Name)			
0400 / 4						PE 0603884C / Ballistic Missile Defense Sensors						MC11 / Cyber Operations			
Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Network / System Certification and Accreditation (C&A) - AN/TPY 2 CSSP Development and Implementation	SS/CPAF	Raytheon : MA	0.000	8.680	Feb 2020	0.000		0.470	Oct 2021	-		0.470	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - AN/TPY 2 Cybersecurity Compliance	SS/CPAF	Raytheon : MA	0.000	6.345	Jan 2020	0.000		3.075	Oct 2021	-		3.075	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - CND/IA Advisory and Assistance Services (Booz Allen) - Consolidated in Contract Support Services	C/CPFF	Booz Allen Hamilton : AL, CO, VA	5.134	0.000		0.000		0.000		-		0.000	0.000	5.134	0.000
Network / System Certification and Accreditation (C&A) - CND/IA Advisory and Assistance Services (Torch Technologies) - Consolidated in Contract Support Services	C/CPFF	Torch Technologies : AL, CO, VA	2.641	0.000		0.000		0.000		-		0.000	0.000	2.641	0.000
Network / System Certification and Accreditation (C&A) - Civilian Salaries/Travel	Various	MDA : AL, CO, VA	1.255	0.371	Oct 2019	0.333	Oct 2020	0.466	Oct 2021	-		0.466	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Contract Support Services	Various	MDA : Various	0.000	4.522	Nov 2019	1.225	Oct 2020	4.535	Nov 2021	-		4.535	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) -	SS/CPAF	Raytheon : MA	6.018	3.831	Mar 2020	0.000		0.000		-		0.000	0.000	9.849	0.000

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MC11 / <i>Cyber Operations</i>
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Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Cybersecurity Supply Chain Compliance															
Network / System Certification and Accreditation (C&A) - LRDR Cybersecurity Compliance	SS/FPIF	Lockheed Martin : NJ	0.000	3.221	Mar 2020	0.000		1.186	Oct 2021	-		1.186	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - SBX Cybersecurity Compliance	MIPR	Military Sealift Command : VA	0.000	1.326	Feb 2020	0.000		3.430	Oct 2021	-		3.430	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Sensors Test Cybersecurity Compliance	Various	Various : AK, AL, CO, VA	0.000	0.000		0.000		0.986	Oct 2021	-		0.986	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Systems Engineering Cybersecurity	MIPR	Various : AL, CO, VA	0.000	0.000		0.000		3.055	Oct 2021	-		3.055	Continuing	Continuing	Continuing
Subtotal			15.048	28.296		1.558		17.203		-		17.203	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	15.048	28.296	1.558	17.203	-	17.203	Continuing	Continuing	N/A

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

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Missile Defense Agency **Date:** May 2021

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MC11 / <i>Cyber Operations</i>
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	Significant Event Complete ▲				Milestone Decision Complete ★				Element Test Complete ◆				System Level Test Complete ●				Complete Activity ◆															
	Significant Event Planned △				Milestone Decision Planned ☆				Element Test Planned ◇				System Level Test Planned ○				Planned Activity ◇															
	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026							
Risk Management Framework (RMF) Assessment and Authorization (A&A) package preparation and submission	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇																				
Cyber Security Program Policy / Risk Management	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇																				
Cyber Security Mitigation Monitoring and Tracking	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇																				
BMDS Cyber Security Policy Development	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇																				
Integrated Cyber Security Service Provider	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇																				

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MC11 / <i>Cyber Operations</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Risk Management Framework (RMF) Assessment and Authorization (A&A) package preparation and submission	1	2020	4	2022
Cyber Security Program Policy / Risk Management	1	2020	4	2022
Cyber Security Mitigation Monitoring and Tracking	1	2020	4	2022
BMDS Cyber Security Policy Development	1	2020	4	2022
Integrated Cyber Security Service Provider	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.

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>				Project (Number/Name) MD40 / <i>Program-Wide Support</i>			
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: <i>Program-Wide Support</i>	110.919	11.784	11.200	9.731	-	9.731	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note

Program Wide Support (PWS) is allocated on a pro-rata basis across multiple Agency program elements (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	11.784	11.200	9.731
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 unified communications support; materiel and readiness and central property management of equipment; Facilities Sustainment,			

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD40 / <i>Program-Wide Support</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
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.			
<i>FY 2021 Plans:</i> - SEE ABOVE.			
<i>FY 2022 Plans:</i> - SEE ABOVE.			
<i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> 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	11.784	11.200	9.731

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

N/A

Remarks

D. Acquisition Strategy

N/A

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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 0603884C / Ballistic Missile Defense Sensors	Project (Number/Name) MD40 / Program-Wide Support
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Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Wide Support - Agency Facilities and Maintenance	MIPR	Various Multi: : AL, CO, CA, VA	0.000	0.000		11.200	Nov 2020	0.000		-		0.000	0.000	11.200	0.000
Program Wide Support - Agency Operations Management	C/CPAF	Various : Multi: AL, CA, CO, VA	8.423	0.177	Jul 2020	0.000		0.000		-		0.000	0.000	8.600	0.000
Program Wide Support - Agency Operations and Support Civilian Salaries, Travel, Training	Various	Various MDA Multi: : AL, CO, CA, VA	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Other Agency Services	MIPR	Various : AK, AL, CO, CA, HI, MD, VA	11.247	2.234	Jul 2020	0.000		0.000		-		0.000	0.000	13.481	0.000
Program Wide Support - Agency Operations and Support Services	C/CPFF	Various : Multi: AK, AL, CO, CA, HI, MD, VA	76.118	9.373	Aug 2020	0.000		9.731	Nov 2021	-		9.731	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations, Sustainment and GPC	C/FFP	Various : Multi: AK, AL, CA, HI, NY, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	0.000
Program Wide Support - Prior year no longer funded in the FYDP	Various	Various : Various	15.131	0.000		0.000		0.000		-		0.000	0.000	15.131	0.000
Subtotal			110.919	11.784		11.200		9.731		-		9.731	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	110.919	11.784	11.200	9.731	-	9.731	Continuing	Continuing	N/A

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

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD40 / <i>Program-Wide Support</i>
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Significant Event Complete ▲	Milestone Decision Complete ★	Element Test Complete ◆	System Level Test Complete ●	Complete Activity ◆							
Significant Event Planned △	Milestone Decision Planned ☆	Element Test Planned ◇	System Level Test Planned ○	Planned Activity ◇							
					FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
MD40 Program-Wide Support					◇	◇	◇	◇	◇	◇	◇

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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 0603884C / <i>Ballistic Missile Defense Sensors</i>	Project (Number/Name) MD40 / <i>Program-Wide Support</i>

Schedule Details

Events	Start		End	
	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.