Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Missile Defense Agency											Date: March 2019	
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 0603882C *I Ballistic Missile Defense Midcourse Defense Segment*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	4,225.003	1,153.263	803.359	1,156.506	-	1,156.506	829.451	766.237	834.533	776.671	Continuing	Continuing
MD08: *Ground Based Midcourse*	4,092.237	1,103.288	739.895	1,065.322	-	1,065.322	741.269	686.536	748.655	686.405	Continuing	Continuing
MC08: *Cyber Operations*	33.863	18.399	33.754	37.870	-	37.870	40.161	34.857	36.450	37.265	Continuing	Continuing
MD40: *Program-Wide Support*	98.903	31.576	29.710	53.314	-	53.314	48.021	44.844	49.428	53.001	Continuing	Continuing
Program MDAP/MAIS Code: 362												

Note

Increase from FY 2019 to FY 2020 provides an increase for ground systems software development and hardware upgrades, initiation of the development of the Hawaii In-Flight Interceptor Communications System (IFICS) Data Terminal (IDT), upgrade and reactivation of the IDT on the Sea Based X-Band Radar (SBX), Ground Based Midcourse Defense (GMD) Lab upgrades and cybersecurity efforts.

A. Mission Description and Budget Item Justification

The GMD element of the Ballistic Missile Defense System (BMDS) provides combatant commanders with a continuously available (24 hours a day, 7 days a week, 365 days a year) capability to defend the Homeland against limited Intercontinental Ballistic Missile (ICBM) attacks. The GMD capability consists of Ground Based Interceptor (GBI), GMD Fire Control system (GFC), GMD Communications Network (GCN), Hawaii IFICS IDT and ground Launch Support Systems (LSS). The Missile Defense Agency (MDA) will deliver 64 operationally deployed GBIs located at Fort Greely, Alaska (60 GBIs) and Vandenberg Air Force Base, California (4 GBIs). Each GBI delivers a single kill vehicle to defeat threat warheads in space during the midcourse phase of the ballistic trajectory. The GFC consists of fire control nodes in Fort Greely, Alaska and Missile Defense Integration and Operations Center (MDIOC) Colorado Springs, Colorado. IDTs are currently located in Fort Greely, Alaska: Vandenberg Air Force Base, California; Eareckson Air Station, Alaska; and Fort Drum, New York. The GMD capability leverages integration of BMDS sensors across the globe. Development objectives for GMD include: improve homeland defensive capability against an evolving threat that is increasing both in number of missiles and complexity of threat payloads, execute flight testing, modernize the GMD ground system, provide fire control and communications, develop GBI software enhancements that improve reliability, capability, and discrimination, improve GMD models and simulations (M&S), and participate with other BMDS assets in system ground tests.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Missile Defense Agency					Date: March 2019
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 0603882C *I Ballistic Missile Defense Midcourse Defense Segment*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	957.097	926.359	1,046.235	-	1,046.235
Current President's Budget	1,153.263	803.359	1,156.506	-	1,156.506
Total Adjustments	196.166	-123.000	110.271	-	110.271
• Congressional General Reductions	-4.000	0.000			
• Congressional Directed Reductions	0.000	-136.400			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	229.996	35.000			
• Congressional Directed Transfers	0.000	-21.600			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-24.298	0.000			
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	-5.532	0.000	110.271	-	110.271

Change Summary Explanation

Increase in FY 2018 from PB19 to PB20 reflects the enacted congressional adjustment of $229.996 million in accordance with the FY 2018 Appropriations Act.

Decrease in FY 2019 from PB19 to PB20 reflects the enacted congressional adjustment for forward financing in the FY 2018 Appropriations Act.

Increase in FY 2020 from PB19 to PB20 provides the development of the Hawaii In-Flight Interceptor Communications System (IFICS) Data Terminal (IDT), upgrade and reactivation of the IDT on the Sea Based X-Band Radar (SBX), Ground Based Midcourse Defense (GMD) Lab upgrades and cybersecurity efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency			Date: March 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	Project (Number/Name) MD08 / *Ground Based Midcourse*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
MD08: *Ground Based Midcourse*	4,092.237	1,103.288	739.895	1,065.322	-	1,065.322	741.269	686.536	748.655	686.405	Continuing	Continuing
Quantity of RDT&E Articles	11	-	-	-	-	-	-	-	-	-		

Note

Increase from FY 2019 to FY 2020 provides increased ground systems software development and hardware upgrades, initiation of the development of the Hawaii IFICS IDT, upgrade and reactivation of the IDT on the SBX, GMD Lab upgrades and cybersecurity efforts.

A. Mission Description and Budget Item Justification

GMD includes development and delivery of GMD Ground Systems, GBIs, Systems Engineering and Program Management. Development objectives for GMD include: improve homeland defensive capability against an evolving threat that is increasing both in number of missiles and complexity of threat payloads, execute Flight Tests, modernize the GMD ground system provides improved fire control and communications, develop GBI software enhancements that improve reliability and discrimination, improve GMD M&S, and participate with other BMDS assets in system ground tests. GMD will continue the effort to develop and field improved standalone and integrated BMDS discrimination capabilities, both of which will improve the BMD System's ability to identify lethal reentry vehicles and non-lethal threat objects for enhanced interceptor performance.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
Title: Ground Based Interceptor	390.118	104.276	167.186
Articles:	-	-	-
Description: Due to the move of GBI manufacturing to procurement, the FY19 Ground Based Interceptor Development, Manufacturing and Reliability accomplishments were consolidated in this accomplishment beginning in FY 2020. The GBI accomplishment will continue to develop improvements to enhance reliability, counter emerging threats, eliminate obsolescence and incorporate available technologies. The GBI Program will continue acquisition of boosters. The GBI reliability program conducts the analysis and testing necessary to characterize the reliability and service life of the GBI Fleet. The data generated from the reliability program allows the Program Office to manage the GBI fleet, develop design improvements, develop fleet maintenance strategies, and extend interceptor service life. The data is also used by MDA engineering to develop battle simulations for the ground test program; and by the Warfighter in developing tactics, techniques, and procedures. Recurring work: Conduct of key Kill Vehicle (KV) engineering assessments including integrated sneak circuit analyses, Worst Case Circuit Analysis, and electrical/thermal derating analyses to document current performance/capability and identify potential risk areas to assess and improve overall KV reliability for the Warfighter; collection of Reliability, Availability, Maintainability and Testability (RAM-T) data and analysis of performance metrics on the Operational System in order to continuously improve the system for the Warfighter; continue the Probabilistic Risk Assessment (reliability model) development to assess the GBI			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD08 / *Ground Based Midcourse*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
design enabling improvements to overall GBI reliability for Warfighter defense of the homeland; continue Stockpile Reliability Program (SRP) functional testing of naturally aged GBI subsystems and components removed from previously fielded GBIs during upgrade/modification to understand performance and aging characteristics in order to establish life limits, achieve GBI maintenance cost savings, and build Warfighter confidence in aging GBIs; and continue rocket motor propellant studies to extend the service life of limited life items in order to achieve cost savings on GBI lifecycle maintenance and further build Warfighter confidence in aging GBIs. Specific and/or unique accomplishments to each FY are as follows: ***FY 2019 Plans:*** -Deliver two flight test configured interceptors to support the first GBI salvo test (FTG-11) -Continue to develop, test and field interceptor software upgrade with improved mid-term discrimination capability and capabilities to improve Exoatmospheric Kill Vehicle (EKV) performance reliability for known issues in order to enhance system capability against robust threat systems -Initiate activities to support the Flight Test Ground-based Midcourse Defense Booster Verification Test (BVT-03) -Initiate All Up Round (AUR) systems engineering for RKV integration, testing and fielding with Configuration 1 Integrated Boost Vehicles Continue booster development to address inertial measurement unit obsolescence and increase the capacity of GBIs available for the warfighter from 44 to 64 to defeat developing threats -Complete development of 2- or 3-Stage selectable boost vehicle software that provides additional engagement battlespace to the warfighter -Continue acquisition of CE-II Block I EKV/C2 integrated boost vehicles with the Consolidated Booster and Avionics Upgrades (CBAU) GBI to improve warfighter capability and capacity -Continue acquisition of five boosters to support flight testing -Conduct of key KV engineering assessments including integrated sneak circuit analyses, Worst Case Circuit Analysis, and electrical/thermal derating analyses to document current performance/capability and identify potential risk areas to assess and improve overall KV reliability for the Warfighter - Continue the Probabilistic Risk Assessment (reliability model) development to assess the GBI design enabling improvements to overall GBI reliability for Warfighter defense of the homeland; continue SRP functional testing of naturally aged GBI subsystems and components removed from previously fielded GBIs during upgrade/modification to understand performance and aging characteristics in order to establish life limits, achieve GBI maintenance cost savings, and build Warfighter confidence in aging GBIs			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD08 / *Ground Based Midcourse*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
- Continue rocket motor propellant studies to extend the service life of limited life items in order to achieve cost savings on GBI lifecycle maintenance and further build Warfighter confidence in aging GBIs ***FY 2020 Plans:*** -Initiate GBI developmental laboratory Special Test Equipment (STE) refresh engineering, hardware procurement, and installation planning -Initiate systems engineering effort with Ground Based Strategic Deterrent (GBSD) Program to support future GBI boost vehicle development -Continue to develop, test and field interceptor software upgrades with improved mid-term discrimination capability and capabilities to improve EKV performance reliability for known issues in order to enhance system capability against robust threat systems -Continue to use the EKV Hardware-in-the-Loop 10V Chamber for operational analysis of emerging threats, discrimination improvements performance, pre-mission testing and post flight analysis and reconstruction in accordance with the Integrated Master Test Plan (IMTP) to reduce execution risks and gain confidence that capabilities performed as expected -Continue booster development to address inertial measurement unit obsolescence and increase the capacity of GBIs available for the warfighter from 44 to 64 to defeat developing/emerging threats -Continue All Up Round (AUR) systems engineering for RKV integration, testing and fielding with Integrated Boost Vehicles -Continue flight test rotation program of fielded GBIs by upgrading kill vehicles and boosters, adding the necessary Non-Tactical Equipment to support the IMTP requirements -Continue acquisition of five boosters to support flight testing and to ensure the number of fielded GBIs does not decrease through the FYDP -Deliver a flight test boost vehicle and complete GBI integration to support Flight Test Ground-based Midcourse Defense BVT-03 -Deliver CE-II Block 1 payload level spares as GBI Line Replaceable Units to support maintaining the fielded GBI fleet -Complete acquisition of CE-II Block I EKV/ C2 integrated boost vehicles with the CBAU GBI to improve warfighter capability and capacity -Complete acquisition of CE-II Block I EKV/ C2 integrated boost vehicles with the CBAU GBI to improve warfighter capability and capacity ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 provides for GBI lab upgrades, software maintenance and upgrades, initiation of the engineering effort with GBSD Program to support future GBI boost vehicle development, and GBI AUR engineering/product support for all GBI development and production activities.			
Title: Ground Systems & Fire Control	354.420	264.034	570.445

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD08 / *Ground Based Midcourse*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
Articles:	-	-	-

Description: The GMD Ground Systems enable control and operation of the GMD Element as part of the BMDS. Ground Systems consists of the GMD Fire Control system, GMD Communications Network, In-Flight Interceptor Communications System (IFICS) Data Terminal (IDT), Launch Site Components (LSC) (silos, silo interface vaults [SIVs]), and the LSS (Command and Launch Equipment (CLE), which includes Launch Support Equipment (LSE).

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

FY 2019 Plans:
-Complete deployment of CLE/GFC re-architecture hardware suites to mitigate obsolescence and increase reliability, sustainability, and availability of GMD fire control systems
-Continue development and production of the IDT technology upgrades to support the RKV On-Demand Communications capability for systems discrimination data, directed engagement and hit assessments
-Continue IFICS End-to-End Test to demonstrate communication between the RKV and the GMD Ground System
-Complete design and development of 7B upgrades for Mid-Term discrimination improvements; upgrade interfaces to IDT to support On-Demand Communications and Warfighter enhancements
-Continue GS 7B GCN Modernization efforts to support GMD system expansion and emerging requirement, enhance/maintain Cybersecurity posture, and mitigate hardware and software obsolescence
-Continue design and development of the version 8 software build that allows implementation of Mid-Term Discrimination upgrades
-Continue system upgrades to the Readiness and Control (R&C) building in Fort Greely, Alaska. The upgrades will maximize shielded protection to vital systems and provide more operational space for the Warfighters
-Continue design and development of software upgrades for Shoot-Assess-Shoot version 9 software supported by GMD Post-Intercept Assessment utilizing GMD sensors
-Continue ground systems development to increase the capacity of GBIs for the warfighter to defeat developing threats in terms of number of threat missiles and complexity of threat payloads.
-Continue work for 20 new silos and associated support equipment for a new missile field (Missile Field #4) to accommodate the GBIs at Fort Greely, AK.
-Continue obsolescence upgrades for in-silo hardware and software to support 20 new silos and enhance cybersecurity.
-Continue work to add two additional silos in Missile Field 1 at Fort Greely, AK

FY 2020 Plans:
- Continue development and production of the IDT technology upgrades to support the RKV On-Demand Communications capability for systems discrimination data, directed engagement and hit assessments

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD08 / *Ground Based Midcourse*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
- Continue IFICS End-to-End Test to demonstrate communication between the RKV and the GMD Ground System - Continue GCN Modernization efforts to support GMD system expansion and emerging requirement, enhance/maintain Cybersecurity posture, and mitigate hardware and software obsolescence - Continue design and development of the version 9 software build that allows implementation of BMDS system track within GMD Ground Systems as well as Mid-Term Discrimination upgrades - Initiate development of the Hawaii IFICS IDT and upgrade and reactivation of the IDT on the SBX to increase the defense of Hawaii as well as the number of communication events with the kill vehicle for increased threat raid sizes & flight testing - Continue system upgrades to the R&C building in Fort Greely, Alaska. The upgrades will maximize shielded protection to vital systems and provide more operational space for the Warfighters - Continue design and development of software upgrades for Shoot-Assess-Shoot version 9 software supported by GMD Post-Intercept Assessment utilizing GMD sensors - Continue ground systems development to increase the capacity of GBIs for the warfighter to defeat developing threats in terms of number of threat missiles and complexity of threat payloads ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 provides for ground systems software development and hardware upgrades, initiation of the development of the Hawaii IFICS IDT, upgrade and reactivation of the IDT on the SBX.			
Title: Systems Engineering and Program Management	303.171	311.146	267.423
Articles:	-	-	-
Description: GMD Systems Engineering and Program Management provide essential services for the development and fielding of the GMD hardware and software and Industry Program Management operations. Systems Engineering includes concept definition, requirements and interface development, system design, integration, software IV&V, M&S development, test planning and verification efforts. Key products are development, integration and maintenance of the technical baseline and critical engineering processes for implementation and delivery of an integrated GMD element capability. Recurring System Engineering work includes: Continue requirements development, engineering analysis, capability integration, and performance verification for increment 6 of the GMD system and BMDS integration; continue to assess current capabilities against the evolving threat; continue sustainment of core information technology data and unified communications services to accomplish research and development activities; develop and deliver updated interfaces incorporating RKV capabilities in the GMD system; continue Technical Direction Agent activities to provide the technical and program execution expertise required to offer independent assessment/analysis, unbiased and objective system level-oriented advice; continue modeling and simulation development and integration to assess component and system performance in support of annual technical assessments; continue			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
modeling and simulation verification, validation, and accreditation (VV&A) to establish high confidence in Warfighter assessments; continue design, planning, provide configuration management and control of network diagrams, technical specifications, and interfaces for the Vandenberg Launch Control Center, Vandenberg Air Force Base, California; introduce the use of the RKV Development Laboratory (RDL) space chamber for RKV specific end game performance testing similar to testing conducted for EKV in the 10V chamber; continue government led software assurance and , independent software IV&V of all GMD delivered software and firmware to improve software reliability; continue requirements audit to include: functional decomposition / traceability, bottoms-up verification, sufficiency audit, and establishment of detailed performance requirement error budgets and allocations to ensure complete understanding of system capability and potential gaps; and continue rigorous independent verification and validation and system engineering analysis of GMD software to increase system performance and reliability. Program Management provides for prime contractor management of the GMD program. This effort includes program and business management, program administration, subcontract management, technical and testing oversight, verification of hardware and software development, quality/safety/mission assurance, integrated logistics support, and infrastructure to develop, test and sustain the GMD system and components while ensuring the program meets all cost, schedule, and performance requirements. Specific and/or unique accomplishments to each FY are as follows: ***FY 2019 Plans:*** -Initiate integration phase of ground testing and test analysis for mid-term discrimination capabilities via Ground Test -Complete the Enhanced Homeland Defense Systems Engineering activities executing Increment 6 Systems Engineering under the current Prime Contract -Continue the development of modeling and simulation M&S wrapped tactical code to reduce the life cycle cost and increase the fidelity of the results and integrate GMD Sim into the new OSF -Complete design and development of Mid-term discrimination improvements techniques -Continue test planning for discrimination improvements capabilities -Continue development of discrimination improvements through Far Term -Continue to develop fire control/weapon handover improvements and create preliminary design that includes: - 2/3 Stage Selectable GBI Weapon - Fire Control Cyber security improvements - Initial Integration of RKV ***FY 2020 Plans:*** -Execute Increment 6B Preliminary Design Review -Execute Increment 6B Critical Design Review			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
-Deliver Increment 6B architectural models -Deliver updated interfaces that support Increment 6B new capabilities to include LRDR, 2/3 stage selectable booster and RKV -Deliver performance assessments to support element and component technical reviews associated with Increment 6B development -Develop and deliver accredited GMD M&S products to support performance assessments, ground tests and flight tests -Update GMD Performance Specifications as required to maintain alignment to BMDS Specifications -Deliver Increment 8 GMD Performance Specification -Continue development of discrimination improvements to enhance GMD performance against existing and emerging threats -Continue to conduct government-led, software IV&V on all industry software and firmware deliveries -Develop or modify GMD models and supporting M&S components to meet system-level and enterprise M&S infrastructure requirements for both the Ground Test re-architecture and all-Digital BMDS M&S architecture ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY 2019 to FY 2020 reflects the realignment of GMD test related funding from this PE to the Ballistic Missile Defense Midcourse Defense Segment Test (0604887C) PE.			
Title: Program Operations	55.579	60.439	60.268
Articles:	-	-	-
Description: Program Operations provides for government management of the GMD program. This effort provides: Technical, business, acquisition, configuration management and integration activities to ensure the GMD program meets cost, schedule, and performance goals and ensure program compliance with internal and external direction, policies, and regulations to deliver critical capability within a consistent and disciplined process; internal Agency program reviews to measure program progress against the six MDA approved baselines; Mission Assurance and Manufacturing Engineering Program to include Quality, Configuration Management, Manufacturing, Engineering, and Safety (QSMA) 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; and sustainment of core infrastructure and unified communications services to accomplish the GMD mission. Specific and/or unique accomplishments to each FY are as follows: ***FY 2019 Plans:*** - SEE ABOVE. ***FY 2020 Plans:*** - SEE ABOVE. ***FY 2019 to FY 2020 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
N/A			
Accomplishments/Planned Programs Subtotals	1,103.288	739.895	1,065.322

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0203882C: MD08: *GMD O&M*	138.751	139.204	153.218	-	153.218	146.614	159.376	165.746	165.790	Continuing	Continuing
• 0603882C: MD08:: *GMD Procurement*	268.000	532.600	9.471	-	9.471	323.466	532.975	467.001	244.663	Continuing	Continuing
• 0603914C: *Ballistic Missile Defense Test*	406.806	515.897	395.924	-	395.924	417.946	335.481	451.723	405.136	Continuing	Continuing
• 0603915C: *Ballistic Missile Defense Targets*	512.838	561.352	554.171	-	554.171	513.964	439.826	358.018	276.108	Continuing	Continuing
• 0604874C: *Improved Homeland Defense (HLD) Interceptors*	742.842	421.820	412.363	-	412.363	326.922	197.386	137.553	86.423	Continuing	Continuing
• 0604887C: *Ballistic Missile Defense Midcourse Defense Segment Test*	85.030	72.634	98.139	-	98.139	91.955	116.709	110.937	101.103	Continuing	Continuing
• 0604894C: *Multi Object Kill Vehicle*	6.347	6.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	12.847

Remarks

D. Acquisition Strategy

The GMD program will continue to follow testing, development, and evolutionary acquisition through incremental development. The Agency acquisition strategy ensures GMD components are upgraded to improve both All-Up System (AUS) performance and AUR performance in order to retain the proven GMD contribution to the Integrated BMDS. This acquisition approach reduces obsolescence risk, provides opportunities for incremental capability improvements, and allows decision makers to make informed trades between cost, schedule, and performance while exploring improved operational and technological capabilities.

GMD awarded a competitive Development and Sustainment Contract (DSC) on December 30, 2011. This contract included development, fielding, test, systems engineering, integration, and configuration management; equipment manufacturing and upgrade; training, operations and sustainment of the GMD system and associated support facilities.

In January of 2018 the MDA Director approved the extension of the DSC to execute the Missile Defeat and Defense Enhancement scope (20 silos and 20 GBIs). On January 31, 2018, the DSC Extension was awarded to the Boeing Company with a period of performance through Q1 FY2024. In addition to the MDDE requirements,

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the DSC Extension also includes supporting test, engineering, software, and performance based logistics scope. The DSC structure breaks out major efforts into separate Contract Line Item Numbers with individual incentives for management insight, accounting and property accountability.

GM is also implementing a more robust Program Board structure allowing more Government insight and decisions into the technical baseline and has changed business processes for greater Government involvement in Program decisions. In addition, GM utilizes Government laboratory modeling & simulation, and analysis capabilities to augment Boeing's efforts.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency		Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ground Based Interceptor - All Up Round Development	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/TX/VA	0.000	0.000		16.965	Nov 2018	18.672	Nov 2019	-		18.672	Continuing	Continuing	Continuing
Ground Based Interceptor - Booster Development	C/CPIF	Boeing : AL/AK/AZ CA/CO/TX/VA	72.000	53.000	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Based Interceptor - Configuration 2 CBAU Booster Development	C/CPIF	Boeing : AL/AK/AZ CA/CO/TX/VA	53.546	1.004	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Based Interceptor - EKV Spares	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/TX/VA	0.000	6.811	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Based Interceptor - Five Boosters	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	40.084	82.602	Nov 2017	39.357	Nov 2018	22.826	Nov 2019	-		22.826	Continuing	Continuing	Continuing
Ground Based Interceptor - Flight Rotations for BMDS Testing	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/TX/VA	61.568	12.382	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Based Interceptor - GBI Prime Product Support	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	235.938	126.302	Nov 2017	19.492	Nov 2018	46.458	Nov 2019	-		46.458	Continuing	Continuing	Continuing
Ground Based Interceptor - Government Reliability Program	MIPR	AMRDEC / Redstone Arsenal, AL : NSWC Crane, IN	17.969	4.763	Nov 2017	6.628	Nov 2018	4.999	Nov 2019	-		4.999	Continuing	Continuing	Continuing
Ground Based Interceptor - Ground Based Interceptors #48-58 (CE-II)	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/TX/VA	705.204	11.376	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Based Interceptor - Ground Based Strategic Deterrent (GBSD) Cooperative Development	TBD	TBD : TBD	0.000	0.000		0.000		15.406	Nov 2019	-		15.406	Continuing	Continuing	Continuing
Ground Based Interceptor - Interceptor Manufacturing Support	MIPR	NASA MSFC& AMRDEC, HSV, AL Draper Laboratory, MA; : Vanguard, HSV, AL	16.124	1.885	Nov 2017	1.812		8.148	Nov 2019	-		8.148	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD08 / *Ground Based Midcourse*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ground Based Interceptor - Operational Spares	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	22.430	6.086	Nov 2017	0.446	Nov 2018	2.966	Nov 2019	-		2.966	Continuing	Continuing	Continuing
Ground Based Interceptor - Prime Interceptor Manufacturing & Lab Support	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/TX/VA	34.044	34.044	Nov 2017	1.139	Nov 2018	23.245	Nov 2019	-		23.245	Continuing	Continuing	Continuing
Ground Based Interceptor - Prime Reliability Program	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	31.548	8.984	Nov 2017	8.674	Nov 2018	8.145	Nov 2019	-		8.145	Continuing	Continuing	Continuing
Ground Based Interceptor - Software Maintenance & Updates	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	47.232	40.879	Nov 2017	9.763	Nov 2018	16.321	Nov 2019	-		16.321	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Government Fort Drum IDT	MIPR	MDA/AL : /VA/NY	0.576	0.000		0.000		0.000		-		0.000	0.000	0.576	0.000
Ground Systems & Fire Control - Government Missile Field 4 (20 Silos)	MIPR	MDA : AL/VA	1.200	4.375	Nov 2017	6.207	Nov 2018	8.629	Nov 2019	-		8.629	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Government Software Development	MIPR	AMRDEC : Redstone Arsenal, AL	9.980	0.982	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Hawaii IDT	TBD	TBD : TBD	0.000	0.000		0.000		30.430	Nov 2019	-		30.430	Continuing	Continuing	Continuing
Ground Systems & Fire Control - MF-1: two silos to ensure the number of fielded GBIs does not decrease through the FYDP	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/VA	0.000	0.000		14.958	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Prime CLE Re-Architecture	C/CPIF	Boeing AL/AK/AZ : CA/CO/VA	46.609	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Prime	C/CPIF	Boeing AL/AK/AZ : CA/CO/VA	5.908	2.016	Nov 2017	2.044	Nov 2018	1.264	Nov 2019	-		1.264	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Communications Infrastructure															
Ground Systems & Fire Control - Prime Fort Drum IDT	C/CPIF	Boeing AL : CO/NY/ VA	10.063	0.000		0.000		0.000		-		0.000	0.000	10.063	0.000
Ground Systems & Fire Control - Prime Ground Systems Software Development	C/CPIF	Boeing AL/AK/AZ : CA/CO/VA	310.534	115.483	Nov 2017	142.023	Nov 2018	162.584	Nov 2019	-		162.584	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Prime MF-1 Repair and Refurbishment	C/CPIF	Boeing AL/AK/AZ : CA/CO/VA	38.925	0.000		0.000		0.000		-		0.000	0.000	38.925	0.000
Ground Systems & Fire Control - Prime Missile Field 4 (20 Silos)	C/CPIF	Boeing : AL/AK/AZ/ CA/CO/VA	8.048	63.540	Nov 2017	28.507	Nov 2018	102.777	Nov 2019	-		102.777	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Prime On Demand Communications	C/CPFF	Boeing : AL/AK/AZ/ CA/CO/TX/VA	0.000	0.000		5.820	Nov 2018	66.037	Nov 2019	-		66.037	Continuing	Continuing	Continuing
Ground Systems & Fire Control - Prime Technology Refresh	C/CPIF	Boeing AL/AK/AZ : CA/CO/VA	189.031	168.024	Nov 2017	64.475	Nov 2018	178.745	Nov 2019	-		178.745	Continuing	Continuing	Continuing
Ground Systems & Fire Control - SBX IDT Reactivation	TBD	TBD : TBD	0.000	0.000		0.000		19.979	Nov 2019	-		19.979	Continuing	Continuing	Continuing
		Subtotal	1,958.561	744.538		368.310		737.631		-		737.631	Continuing	Continuing	N/A

Remarks

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering and Program Management - Cyber Security	MIPR	MDA : AL/VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	0.000
Systems Engineering and Program Management - Government Discrimination Improvements	MIPR	FFRDC/UARC : AL	8.551	8.374	Nov 2017	2.483	Nov 2018	1.891	Nov 2019	-		1.891	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Government EKV HWIL Tests in Space Chamber	MIPR	AEDC : Tullahoma, TN	27.401	6.292	Nov 2017	6.303	Nov 2018	5.707	Nov 2019	-		5.707	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Government Modeling and Simulation	MIPR	SED and Morrow Labs : Redstone Arsenal/AL	86.647	18.628	Nov 2017	26.581	Nov 2018	26.048	Nov 2019	-		26.048	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Government Systems Engineering & Integration	MIPR	AMRDEC : HSV/AL	61.442	55.894	Nov 2017	60.092	Nov 2018	50.042	Nov 2019	-		50.042	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Information Management & Technology Ops	C/CPAF	Northrop Grumman/ Jacobs Engineering : AL, AK, CA, CO, HI, NM, VA	25.670	12.705	Nov 2017	12.415	Nov 2018	12.477	Nov 2019	-		12.477	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Model & Simulations Industry Support	C/CPAF	Northrop Grumman : AI, VA	2.539	0.000		0.000		0.000		-		0.000	0.000	2.539	0.000
Systems Engineering and Program Management - Modeling & Simulation Element Improvements	C/CPIF	Boeing : AL/CA/CO/ VA	0.000	0.000		0.000		2.798	Nov 2019	-		2.798	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Prime Design, Readiness, Analysis and Reporting	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	14.521	0.000		9.151	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering and Program Management - Prime Discrimination Improvements	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	57.350	26.384	Nov 2017	40.338	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Prime EKV HWIL Tests in Space Chamber	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	68.978	1.678	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Prime Modeling and Simulation	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	185.083	16.276	Nov 2017	14.298	Nov 2018	15.932	Nov 2019	-		15.932	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Prime Program Management	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	257.365	64.875	Nov 2017	53.812	Nov 2018	53.546	Nov 2019	-		53.546	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Prime System Engineering and Integration	C/CPIF	Boeing AL/AK/AZ : CA/CO/TX/VA	367.316	28.040	Nov 2017	32.287	Nov 2018	39.979	Nov 2019	-		39.979	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Systems Engineering & Analysis	MIPR	Various : AL/VA	25.867	2.472	Nov 2017	1.921	Nov 2018	1.851	Nov 2019	-		1.851	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Systems Engineering & Analysis - CSS Support	C/CPFF	TEAMS : AL	11.715	8.501	Nov 2017	6.607	Nov 2018	6.739	Nov 2019	-		6.739	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Systems Engineering & Analysis – FFRDC / UARC	MIPR	Various : AL/VA	6.400	4.444	Nov 2017	3.454	Nov 2018	4.742	Nov 2019	-		4.742	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Systems Engineering	C/CPIF	Boeing : AL	17.269	7.734	Nov 2017	6.011	Nov 2018	6.410	Nov 2019	-		6.410	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
& Analysis – Industry Support															
Systems Engineering and Program Management - Systems Engineering and Program Management - Discrimination Engineering & Analysis	C/CPIF	Boeing : AL/CA/CO/VA	9.043	16.388	Nov 2017	12.737	Nov 2018	15.497	Nov 2019	-		15.497	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Systems Engineering and Program Management Model & Simulations Support	Allot	MDA : AL/VA	40.096	8.086	Nov 2017	6.285	Oct 2018	7.760	Nov 2019	-		7.760	Continuing	Continuing	Continuing
Systems Engineering and Program Management - Technical Direction Agent	MIPR	AL/CA/GA/MA : MD/NM/UT/VA	39.506	16.400	Nov 2017	16.371	Nov 2018	16.004	Nov 2019	-		16.004	Continuing	Continuing	Continuing
Program Operations - Contract Support Services	C/CPFF	Various : AL/AK/CA/CO/VA	444.448	14.676	Oct 2017	19.589	Oct 2018	19.430	Oct 2019	-		19.430	Continuing	Continuing	Continuing
Program Operations - FFRDC Support	MIPR	MIT/LL : AL/VA/CO	49.156	2.215	Oct 2017	1.977	Oct 2018	1.933	Oct 2019	-		1.933	Continuing	Continuing	Continuing
Program Operations - Government Civilian Salaries	MIPR	MDA : AL/VA	266.014	28.844	Oct 2017	30.741	Oct 2018	29.675	Oct 2019	-		29.675	Continuing	Continuing	Continuing
Program Operations - Information Technology Services	MIPR	MDA : AL/CA/VA/CO/AK	3.584	2.619	Nov 2017	2.403	Nov 2018	2.184	Nov 2019	-		2.184	Continuing	Continuing	Continuing
Program Operations - Other Govt Agencies	MIPR	Various : AL/VA/FL/CO	47.865	5.561	Oct 2017	4.168	Oct 2018	5.515	Oct 2019	-		5.515	Continuing	Continuing	Continuing
Program Operations - Safety and Quality	MIPR	MDA : AL/AK/CA/VA	0.583	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Operations - Travel	MIPR	MDA : AL/VA	9.267	1.664	Oct 2017	1.561	Oct 2018	1.531	Oct 2019	-		1.531	Continuing	Continuing	Continuing
		Subtotal	2,133.676	358.750		371.585		327.691		-		327.691	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	-	-		-		-		-		-	-	-	N/A

Remarks

N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	-	-		-		-		-		-	-	-	N/A

Remarks

N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	4,092.237	1,103.288		739.895		1,065.322		-		1,065.322	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 2020 Missile Defense Agency		Date: March 2019
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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 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
CLE Re-architecture	✧	✧	✧	✧	✧	✧	✧	✧																				
Communications Infrastructure	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧												
Ground Based Interceptors Rotation and Upgrades	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧
Technology Refresh	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧								
On Demand Communications	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧																
Deliver GBIs (54-58)	✧	✧	✧	✧																								
Post-Intercept Assessment	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧								
Hawaii IFICS Data Terminal (IDT)									✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧				
Ground Systems Software 8 Development (FQT)												✧																
Ground Systems Software 9 Development (FQT)																	✧											

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Missile Defense Agency		Date: March 2019
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Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
CLE Re-architecture	1	2018	4	2019
Communications Infrastructure	1	2018	4	2021
Ground Based Interceptors Rotation and Upgrades	1	2018	4	2024
Technology Refresh	1	2018	4	2022
On Demand Communications	1	2018	4	2020
Deliver GBIs (54-58)	1	2018	4	2018
Post-Intercept Assessment	1	2018	4	2022
Hawaii IFICS Data Terminal (IDT)	1	2020	4	2023
Ground Systems Software 8 Development (FQT)	4	2020	4	2020
Ground Systems Software 9 Development (FQT)	2	2022	2	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency			Date: March 2019
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COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
MC08: *Cyber Operations*	33.863	18.399	33.754	37.870	-	37.870	40.161	34.857	36.450	37.265	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Increase from FY 2019 to FY 2020 reflects increased efforts to mitigate cybersecurity threats with the implementation of cyber resiliency on the GMD systems through the development of system level requirements which will enhance the operation capability.

A. Mission Description and Budget Item Justification

Sustains MDA Risk Management Framework and Controls Validation Testing (CVT) activities, analysis of validation results, risk assessments and reviews of proposed Program Manager/Information Systems Security Manager (PM/ISSM) Plans of Action and Milestones (POA&Ms) for MDA GMD mission systems. It maintains the Assessment and Authorization (A&A) data repository, capturing the RMF documentation (artifacts, validation results, and Cybersecurity Risk Assessment results, and Authorization decisions) and POA&Ms on all MDA information systems.

Monitor and track Cybersecurity mitigations detailed in Information Technology security POA&Ms. Activities include preparation of A&A documentation and authorization recommendations to the MDA Senior Information Systems Security Officer (SISSO)/ 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. Activities in the Project are necessary to comply with the Federal Information Systems Modernization Act (FISMA) 2014.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
Title: Network / System Certification and Accreditation (C&A)	4.116	6.168	6.393
Articles:	-	-	-
Description: Sustains the MDA RMF and CVT activities, analysis of validation results, risk assessments and reviews of proposed PM POA&Ms for MDA GMD mission system. It maintains the AA data repository, capturing the RMF documentation (artifacts, validation results, and Information Assurance Risk Assessment results, and Authorization Official (AO) accreditation decisions) and POA&M on all MDA information systems. Provides GMD Cybersecurity civilian salaries. Conducts cybersecurity/ Information Assurance (IA) engineering and architecture planning for GMD information technology systems. Plans and tests cybersecurity controls for BMDS GMD systems. Conducts CVT of GMD mission systems and provide PO&Ms to mitigate cybersecurity deficiencies. Conducts annual cybersecurity reviews on the GMD enclaves to assess compliance in implementing and maintaining cybersecurity controls. Develops GMD DoD RMF Assessment and Authorization packages.			
Specific and/or unique accomplishments to each FY are as follows:			
FY 2019 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
- SEE ABOVE. ***FY 2020 Plans:*** -Implement the GMD Cybersecurity Risk Process across all systems to allow Program Management to execute risk-based decisions on cybersecurity controls -Continue assessing, implementing, documenting, and validating up to 512 cybersecurity control families (1935 security protections and control enhancements) for 25 representative systems which are comprised of 250,000 computing and logic bearing components supporting the GMD Development, Test, Training, and Operational systems -Continue ensuring compliance with security mandates to maintain continued authorization to operate -Continue protecting the GMD systems through the incorporation of a qualified cybersecurity workforce ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 provides the implementation of the GMD Cybersecurity Risk Process across all systems to allow Program Management to execute risk-based decisions on cybersecurity controls			
Title: Cybersecurity	14.283	27.586	31.477
Articles:	-	-	-
Description: Implements the GMD Cybersecurity Program and Defense in Depth Cybersecurity Strategy for GMD Systems throughout their lifecycle. This includes Research, Development, Test, and Operational Mission Environment Systems, Networks, and Enclaves to ensure system availability to the Warfighter. Specific and/or unique accomplishments to each FY are as follows: ***FY 2019 Plans:*** -Continue implementing necessary upgrades to enhance the cybersecurity posture of the GMD systems while remaining responsive to active or emerging cyber threats against GMD -Execute internal penetration test planning and execution on component level systems to identify candidates for resiliency requirements -Develop mitigation plans for vulnerabilities discovered during cyber testing -Conduct GM Program Cybersecurity Risk Assessments on all vulnerabilities and deficiencies -Develop Tactics, Techniques, and Procedures (TTPs) to address cybersecurity incidents and responses -Develop a cybersecurity training laboratory to test cyber resiliency capabilities and develop training scenarios -Develop training curriculum for Fire Control Operators and Cyber Incident Responders to test TTPs and new cyber defense capabilities			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
-Increase the number of network defenders to ensure redundancy of network defense capabilities ***FY 2020 Plans:*** -Continue implementing necessary upgrades to enhance the cybersecurity posture of the GMD operational environments and it's supporting information systems and networks while remaining responsive to active or emerging cyber threats against GMD -Implement robust cyber resiliency in GMD systems by developing system level requirements that flow to Ground Systems and Interceptor components to modify designs so GMD systems can operate under cyber-attacks. This level of cybersecurity design will require recurring testing and training for Warfighter and computer network defense operators to address the resilient capability against changing cyber threats -Develop cybersecurity processes and procedures that will provide operators, maintainers, and Warfighter specific steps to recognize and react to cyber-attacks -Develop and execute quarterly cybersecurity training scenarios which will allow fire control operators and network defenders to train through a cyber-contested environment while in an engagement scenario -Execute GM specific penetration testing on multiple components in an effort to identify capability flaws -Develop training curriculum for Fire Control Operators and Cyber Incident Responders to test TTPs and new cyber defense capabilities -Conduct GM Program Cybersecurity Risk Assessments on all vulnerabilities and deficiencies -Continue development Tactics, Techniques, and Procedures (TTPs) to address cybersecurity incidents and responses -Support modification of Installation Support Agreements (ISA's) for assigned real property to ensure Facility-Related Control Systems that support MDA facilities are cyber secure per DoDI 8510.01 -Conduct Cybersecurity training of personnel to include incorporating basic cybersecurity guidance into facility acquisition projects and advanced cybersecurity training for facility cybersecurity personnel ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 provides increased efforts to mitigate cybersecurity threats with the implementation of cyber resiliency on the GMD systems through the development of system level requirements which will enhance the operation capability.			
Accomplishments/Planned Programs Subtotals	18.399	33.754	37.870

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0203882C: MD08: *GMD O&M*	137.896	143.027	139.319	-	139.319	142.269	145.188	0.000	0.000	Continuing	Continuing
• 0604874C: *Improved Homeland Defense (HLD) Interceptors*	742.842	421.820	412.363	-	412.363	326.922	197.386	137.553	86.423	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MC08 / *Cyber Operations*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0604887C: *Ballistic Missile Defense Midcourse Defense Segment Test*	85.030	72.634	98.139	-	98.139	91.955	116.709	110.937	101.103	Continuing	Continuing

Remarks

D. Acquisition Strategy

GMD uses the cybersecurity funding to apply security engineering principles to acquire, design, test, implement and field technical solutions throughout the systems architecture to ensure sufficient protections exist from a threat and risk based approach. To achieve this, cybersecurity protection requirements must be validated and properly flowed into system requirements and design specifications early enough to provide the most cost benefit. Many BMDS systems are now or within the very near future undergoing tech-refresh and so the opportunity to receive the most benefit of implementing the more stringent protections is at hand and aligns with the proposed budget as submitted.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MC08 / *Cyber Operations*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Network / System Certification and Accreditation (C&A) - Civilian Salaries	MIPR	MDA : AL/CA/CO	2.788	0.732	Oct 2017	1.218	Oct 2018	1.176	Oct 2019	-		1.176	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C&A) - Contract Support Services	C/CPFF	Booz Allen Hamilton, AL : Torch Technologies, AL Parsons, AL	14.078	3.384	Nov 2017	4.950	Oct 2018	5.217	Nov 2019	-		5.217	Continuing	Continuing	Continuing
Cybersecurity - Cybersecurity	C/CPAF	Jacobs, CO : BAE, AL	10.603	4.298	Nov 2017	4.076	Nov 2018	3.846	Nov 2019	-		3.846	Continuing	Continuing	Continuing
Cybersecurity - Facility-Related Control Systems Contract Method	MIPR	TBD : TBD	0.000	0.000		0.000		0.914	Nov 2019	-		0.914	Continuing	Continuing	Continuing
Cybersecurity - GMD Cybersecurity Program	C/CPIF	Boeing : AL/AK/CA/CO	0.951	5.861	Nov 2017	18.305	Nov 2018	19.679	Nov 2019	-		19.679	Continuing	Continuing	Continuing
Cybersecurity - Ground Systems Software Cybersecurity	C/CPIF	Boeing AL/AK/AZ : CA/CO/VA	5.443	4.124	Nov 2017	5.205	Nov 2018	7.038	Nov 2019	-		7.038	Continuing	Continuing	Continuing
		Subtotal	33.863	18.399		33.754		37.870		-		37.870	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	33.863	18.399		33.754		37.870		-		37.870	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 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MC08 / *Cyber Operations*

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 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
GMD Cybersecurity Mitigation Monitoring and Tracking	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧
GMD Cybersecurity Program Policy / Risk Management	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧
GMD Information Assurance Certification and Accreditation (C&A) Package Preparation/Submission	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧
GMD Transition to Cybersecurity Risk Management Framework (CRMF)	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧								
BMDS Cybersecurity Policy Development	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MC08 / *Cyber Operations*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
GMD Cybersecurity Mitigation Monitoring and Tracking	1	2018	4	2024
GMD Cybersecurity Program Policy / Risk Management	1	2018	4	2024
GMD Information Assurance Certification and Accreditation (C&A) Package Preparation/ Submission	1	2018	4	2024
GMD Transition to Cybersecurity Risk Management Framework (CRMF)	1	2018	4	2022
BMDS Cybersecurity Policy Development	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency			Date: March 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	Project (Number/Name) MD40 / *Program-Wide Support*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
MD40: *Program-Wide Support*	98.903	31.576	29.710	53.314	-	53.314	48.021	44.844	49.428	53.001	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Program Wide Support (PWS) is allocated 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.

A. Mission Description and Budget Item Justification

PWS contains non-headquarters management costs in support of MDA functions and activities across the entire BMDS. It Includes Government Civilians and Contract Support Services. This provides integrity and oversight of the BMDS 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. 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; data and unified communications support; supplies and maintenance; materiel and readiness and central property management of equipment; Facilities Sustainment, Restoration and Modernization (SRM) 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 2018	FY 2019	FY 2020
Title: Program Wide Support	31.576	29.710	53.314
Articles:	-	-	-
Description: PWS contains non-headquarters management costs in support of MDA functions and activities across the entire BMDS. It Includes Government Civilians and Contract Support Services. This provides integrity and oversight of the BMDS 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. 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; data and unified communications support; supplies and maintenance; materiel and readiness and central property management of equipment; Facilities Sustainment, Restoration and Modernization (SRM) 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD40 / *Program-Wide Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020
FY 2019 Plans: - SEE ABOVE. ***FY 2020 Plans:*** - SEE ABOVE. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 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	31.576	29.710	53.314

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD40 / *Program-Wide Support*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Wide Support - Agency Operations Management	C/CPAF	Various : Multi: AL, CA, CO, VA	14.937	1.860	Jul 2018	0.427	Jul 2019	0.698	Jul 2020	-		0.698	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Civilian Salaries, Travel, Training	Allot	MDA : Multi: AK, AL, CA, CO, VA	25.886	25.886	Oct 2017	26.223	Oct 2018	28.885	Oct 2019	-		28.885	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Other Agency Services (FFP)	C/FFP	PHACIL, INC : Multi: AK, AL, CA, CO, VA	22.720	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Other Agency Services (MIPR)	MIPR	Various : Multi: AK, AL, CO, CA, HI, VA	26.298	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Services	C/CPFF	Various : Multi: AK, AL,CA, CO, HI, VA	3.830	3.830		0.000		23.731	Nov 2019	-		23.731	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Sustainment Transportation	Reqn	Various : AK, AL, CA	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Wide Support - FFRDC/UARC	C/CPFF	Utah St Univ; JHU/ APL LLC : Multi: MD, UT	1.372	0.000		0.000		0.000		-		0.000	3.500	4.872	0.000
Program Wide Support - Facilities and Maintenance	MIPR	Various : Multi: AK, AL, CA, VA	3.860	0.000		3.060	May 2019	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	98.903	31.576		29.710		53.314		-		53.314	Continuing	Continuing	N/A

Remarks

Support is allocated on a pro-rata basis and therefore, fluctuates by year based on the adjusted RDT&E profile

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Missile Defense Agency			Date: March 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	Project (Number/Name) MD40 / *Program-Wide Support*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	98.903	31.576		29.710		53.314		-		53.314	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 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**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 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
MD40 Program-Wide Support	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧	✧

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Missile Defense Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603882C / *Ballistic Missile Defense Midcourse Defense Segment*	**Project (Number/Name)** MD40 / *Program-Wide Support*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
MD40 Program-Wide Support	1	2018	4	2024