Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Missile Defense Agency	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603176C *I Advanced Concepts and Performance Assessment*

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	115.886	49.069	40.000	16.737	-	16.737	17.265	17.693	18.109	18.477	Continuing	Continuing
MD71: *Advanced Concepts and Performance Assessments*	78.266	20.866	22.250	12.446	-	12.446	12.852	13.178	13.442	13.711	Continuing	Continuing
MD40: *Program-Wide Support*	3.629	0.592	0.607	0.608	-	0.608	0.608	0.605	0.680	0.699	Continuing	Continuing
MC71: *Cyber Operations*	33.991	27.611	17.143	3.683	-	3.683	3.805	3.910	3.987	4.067	Continuing	Continuing

Program MDAP/MAIS Code: 362

Note

Decrease from FY 2022 to FY 2023 reflects the FY 2022 Congressional add for improvements to Missile Defense System (MDS) cybersecurity, cyber operations, and hypersonic kill vehicles hardware in the loop upgrades.

A. Mission Description and Budget Item Justification

The Advanced Concepts and Performance Assessment (ACPA) Program Element delivers an integrated government concept definition, simulation, analysis, and testbed capability. ACPA's focus is on the exploration of novel and/or emerging capabilities that may have the potential to enhance the Missile Defense System (MDS). ACPA centralizes assessment of advanced missile defense technology and delivers insight into the performance of proposed concepts extending the Missile Defense Agency's (MDA) ability to address evolving threats for the Warfighter. Working with National Laboratories and Industry, MDA will invest in the analysis and assessment of directed energy system components to determine their effectiveness and capability for missile defense.

Subject Matter Experts (SMEs) provide independent assessments of government, university, and industry technology concepts, used in concert with systems engineering requirements, to support acquisition strategy decisions and define technology focus areas. The innovative structured concept definition and assessment methodology enables MDA to quickly validate focus areas, verify contractor technology solutions, and evaluate promising concepts in future MDS architectures. This methodology significantly enhances MDA's ability to assess technology concepts while decreasing the cost of development by:

- Delivering Independent model-based simulations of industry technology concepts to inform the systems engineering process
- Quantifying expectations through algorithms, digital simulation, hardware-in-the-loop, and/or demonstration events prior to expensive live fire test events
- Executing end-to-end testing of technology concepts integrated with weapon systems through Command and Control (C2) network architectures

Performance assessment of advanced concepts is the key enabler for Government evaluation of concepts in the earliest stages of technology development and maximizes the efficiency of technology investments. Performance assessment is used to quantify capability expectations of innovative concepts to counter the expanding regional and homeland missile threats, including ballistic and cruise missiles, and hypersonic vehicles.

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Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603176C *I Advanced Concepts and Performance Assessment*

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	49.410	15.800	0.000	-	0.000
Current President's Budget	49.069	40.000	16.737	-	16.737
Total Adjustments	-0.341	24.200	16.737	-	16.737
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	24.200			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.341	0.000			
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	0.000	0.000	16.737	-	16.737

Change Summary Explanation

Increase of $24.2 million in FY 2022 provides the Congressional Plus-up for improvements to Missile Defense System (MDS) cybersecurity, cyber operations, and hypersonic kill vehicle hardware-in-the-loop test and assessment capability.

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Missile Defense Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603176C / *Advanced Concepts and Performance Assessment*	Project (Number/Name) MD71 / *Advanced Concepts and Performance Assessments*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MD71: *Advanced Concepts and Performance Assessments*	78.266	20.866	22.250	12.446	-	12.446	12.852	13.178	13.442	13.711	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Decrease from FY 2022 to FY 2023 reflects the FY 2022 Congressional add for hypersonic kill vehicles hardware in the loop upgrades.

A. Mission Description and Budget Item Justification

Advanced Concepts and Performance Assessments (ACPA) centralizes advanced technology concept modeling, simulation, software, and analysis. Integrating models of promising disruptive technical solutions into Missile Defense System (MDS) system-level simulations enables leadership to make data driven acquisition and technology investment decisions. Concepts that improve or adapt existing systems, that incorporate mobile sensors and interceptors that can be surged into zones of crisis or conflict are also deemed disruptive. Examples of efforts required to quantify the contribution of disruptive technologies may include, but not be limited to environmental experimentation and phenomenological characterization required for new sensor concepts, advanced weapon technologies, and emerging directed energy concepts. Using a technology development testbed approach, ACPA enables assessment and characterization of incremental technology improvements to inform requirements and evaluate missile defense elements, components, and/or sub-component technologies.

Coupled with characterization efforts, ACPA develops innovative left-through-right-of-launch modeling capabilities including physics-based representations in the areas of cyber, sensor technologies, lethality and survivability, communications, and sensor support. ACPA is focusing on Science and Technology initiatives which increase interoperability and leverages expertise with Allied and Service partners.

ACPA capitalizes on the innovation of small businesses, universities, Federally Funded Research and Development Centers (FFRDCs), and University Affiliated Research Centers (UARCs) to pursue a broad range of hardware, software, models, algorithms, trade studies, and analysis. These innovations bring together government developed models representing existing and future missile defense architectures, technology concepts, and advanced algorithms to provide detailed assessments of concept performance and inform investment decisions. These innovations, combined with a robust high performance computing infrastructure, provide a unique in-house government capability to demonstrate and assess technology concepts for emerging technology risk reduction, to mature concepts with laboratory, ground, and flight test data, and where possible, apply concepts in simulated exercises with weapon systems across representative communication architectures.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023
Title: Advanced Concepts and Performance Assessment	11.366	12.250	12.446
Articles:	-	-	-
Description: Provide quantitative assessments that define the benefits of technology investments and inform requirements using an integrated concept definition, simulation, and performance analysis capability. A staff of diverse Subject Matter Experts			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Missile Defense Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603176C / *Advanced Concepts and Performance Assessment*	**Project (Number/Name)** MD71 / *Advanced Concepts and Performance Assessments*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023
(SMEs) delivers independent government performance evaluations which exercise kinetic and non-kinetic missile defense concept representations against the broad spectrum of evolving threats. - Assess electro-optical infrared and advanced sensor technologies and quantify impacts on MDS - Provide independent government assessments of industry sensor, directed energy and weapon system technology concepts - Evaluate lethality impacts and weapons effectiveness of emerging concepts - Examine pathfinder solutions and demonstrate the utility of directed energy for missile defense - Study on-orbit satellite capabilities and contribution to defense against advanced threats - Assess and identify promising intercept capabilities across all phases of flight - Perform concept performance against emerging advanced threats including hypersonic threat testing scenarios - Mature advanced technology concepts in a testbed environment and through lab, ground, and flight demonstrations - Apply concepts in simulated exercises with weapon systems - Work with the MDS Architect and Missile Defense Agency (MDA) Systems Engineer to design concepts, build models and assess technology concepts' contributions to future MDS architectures - Develop and extend modeling techniques, including incorporation of artificial intelligence - Focus research and engineering activities from university and small business partners to identify suitable technology and concepts that improve MDS performance through a rapid innovation model based on an engineering test bed - Assess multi-domain data fusion concept for current or future weapon systems. Specific and/or unique accomplishments to each FY are as follows: ***FY 2022 Plans:*** - SEE ABOVE ***FY 2023 Plans:*** - SEE ABOVE ***FY 2022 to FY 2023 Increase/Decrease Statement:*** N/A			
Title: Hypersonic Hardware-in-the-Loop	9.500	10.000	0.000
Articles:	-	-	-
Description: Develop an independent government hypersonic testbed supporting assessment and maturation of industry and/or government technology approaches. Leverage existing facilities and extend ballistic/hypersonic kill vehicle hardware-in-the-loop (HWIL) by integrating with evolving hypersonic sensor HWIL capabilities. Provide a prototype platform consisting of technologies			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Missile Defense Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603176C / *Advanced Concepts and Performance Assessment*	**Project (Number/Name)** MD71 / *Advanced Concepts and Performance Assessments*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023
necessary to evaluate the potential of new kill vehicle concepts to identify, track, and engage emerging threats; including vehicles with dynamically changing aerothermal signatures. Assess, mature, and integrate high-fidelity environmental truth models and/or representations for aerothermal, aero-optics and/or jet interaction for hypersonic flight environments to provide accurate simulations for digital scene injections into kill vehicle concept representations in HWIL facilities. Bolster prototype development and maturation by upgrading hypersonic HWIL capabilities through pathfinder process integrating agile continuous integration/continuous delivery capabilities. ***FY 2022 Plans:*** - SEE ABOVE ***FY 2023 Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Decrease from FY 2022 to FY 2023 reflects the FY 2022 Congressional add.			
Accomplishments/Planned Programs Subtotals	20.866	22.250	12.446

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• 0603180C: *Advanced Research*	29.621	47.966	22.023	-	22.023	22.758	23.296	23.851	24.335	Continuing	Continuing

Remarks

D. Acquisition Strategy

Employ various contracting strategies in a flexible manner to maximize the contribution to MDA. Execute through utilization of small businesses, leverage the Nation's engineering centers of excellence (FFRDCs and UARCs); generate cooperatives with other Government Agencies to provide concept modeling and assessment capability. This strategy uses agency and partner SMEs and government model-based assessments to inform Better Buying Power acquisition decisions.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Missile Defense Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603176C / *Advanced Concepts and Performance Assessment*	Project (Number/Name) MD40 / *Program-Wide Support*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MD40: *Program-Wide Support*	3.629	0.592	0.607	0.608	-	0.608	0.608	0.605	0.680	0.699	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Missile Defense Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603176C / *Advanced Concepts and Performance Assessment*	Project (Number/Name) MC71 / *Cyber Operations*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MC71: *Cyber Operations*	33.991	27.611	17.143	3.683	-	3.683	3.805	3.910	3.987	4.067	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Decrease from FY 2022 to FY 2023 reflects the FY 2022 Congressional add for improvements to Missile Defense System (MDS) cybersecurity, and cyber operations.

A. Mission Description and Budget Item Justification

This project supports the monitoring and tracking of Cybersecurity mitigations as required in the Department of Defense (DoD) Instruction Number 8510.01, as amended which establishes Risk Management Framework (RMF) requirements for DoD IT. Funds in this project implement and sustain DoD-required RMF and associated Controls Validation Testing (CVT) activities, analysis of validation results, risk assessments and reviews of proposed Program Manager/Information Assurance System Security Manager (ISSAM) Plans of Action and Milestones for enabling modeling and simulation mission systems. This project captures the RMF documentation (artifacts, validation results, Information Assurance (IA) risk assessment results, and MDA authorizing official and chief information officer accreditation decisions) into the Defense Information Systems Agency's Enterprise Mission Assurance Support Service system. Hardware and software upgrades required to meet DoD standards are supported by funding in this project. Independent verification and validation 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 Security Management Act.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023
Title: Information Assurance / Cyber Network Defense	27.611	17.143	3.683
Articles:	-	-	-
Description: Funds Risk Management Framework (RMF), network defense, and information technology requirements including: - Conduct cybersecurity/IA engineering and architecture planning - Maintain hardware/software currency to meet DoD-mandated cybersecurity requirements - Support monitoring and tracking of Cybersecurity mitigations detailed in IT security plan of action and milestones (POAM) - Develop DoD RMF certification and accreditation packages - Conduct controls validation testing of systems and to provide POAM to mitigate IA deficiencies - Conduct annual IA reviews to assess compliance in implementing and maintaining IA controls Specific and/or unique accomplishments to each FY are as follows:			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Missile Defense Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603176C / *Advanced Concepts and Performance Assessment*	**Project (Number/Name)** MC71 / *Cyber Operations*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023
-Develop advanced cyber operations capabilities of the cyber secure information system architecture effort to support battle management and kill-chain optimization efforts. This work includes development and deployment activities maturing automation, security features, and integration of software. -Complete DOD cybersecurity discipline implementation plan to protect IT systems in a highly contested cybersecurity threat environment. ***FY 2023 Plans:*** - SEE ABOVE ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Decrease from FY 2022 to FY 2023 reflects the FY 2022 Congressional add for improvements to Missile Defense System (MDS) cybersecurity, and cyber operations.			
Accomplishments/Planned Programs Subtotals	27.611	17.143	3.683

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A