Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Missile Defense Agency											Date: February 2020	
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 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	58.079	12.720	46.201	14.910	-	14.910	15.178	16.205	16.879	17.300	Continuing	Continuing
MD71: *Advanced Concepts and Performance Assessments*	55.660	11.350	11.552	11.637	-	11.637	11.872	12.086	12.444	12.709	Continuing	Continuing
MD40: *Program-Wide Support*	2.419	0.605	0.605	0.592	-	0.592	0.602	0.652	0.864	0.944	Continuing	Continuing
MC71: *Cyber Operations*	-	0.765	34.044	2.681	-	2.681	2.704	3.467	3.571	3.647	0.000	50.879
Program MDAP/MAIS Code: 362												

Note

The increase from FY 2019 to FY 2020 and decrease from FY 2020 to FY 2021 reflects the FY 2020 Congressional add for advanced cyber capabilities and cybersecurity of left through right of launch.

A. Mission Description and Budget Item Justification

The Advanced Concepts and Performance Assessment (ACPA) Program Element delivers an integrated government concept definition, simulation, and analysis 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.

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 through:

- Independent model-based simulations of industry technology concepts to inform the systems engineering process
- Digital simulation and hardware-in-the-loop performance assessments of algorithms and hardware concepts prior to expensive live fire test events
- End-to-end testing of technology concepts integrated with weapon systems and Command, Control, Battle Management and Communications (C2BMC)

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Missile Defense Agency	Date: February 2020
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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	13.017	14.208	14.904	-	14.904
Current President's Budget	12.720	46.201	14.910	-	14.910
Total Adjustments	-0.297	31.993	0.006	-	0.006
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	31.993			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.297	0.000			
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	0.000	0.000	0.006	-	0.006

Change Summary Explanation

Increase in FY 2020 reflects the Congressional add for advanced cyber capabilities and cybersecurity of left through right of launch.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Missile Defense Agency			Date: February 2020
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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
MD71: *Advanced Concepts and Performance Assessments*	55.660	11.350	11.552	11.637	-	11.637	11.872	12.086	12.444	12.709	Continuing	Continuing

Note

N/A

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. Coupled with these 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)	FY 2019	FY 2020	FY 2021
Title: Advanced Concepts and Performance Assessment	11.350	11.552	11.637
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 (SMEs) delivers independent government performance evaluations which exercise kinetic and non-kinetic missile defense concept representations against the broad spectrum of evolving threats. - Assess forward-and ground-based airborne electro-optical infrared and advanced sensors - Provide independent government assessments of industry sensor, directed energy and weapon system technology concepts - Evaluate lethality impacts from emerging concepts			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Missile Defense Agency		Date: February 2020
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)	FY 2019	FY 2020	FY 2021
- Examine directed energy pathfinder solutions - Study low earth orbit satellite capabilities - Assess and identify promising boost phase intercept capabilities - Perform concept performance against emerging advanced threats including hypersonic threat testing scenarios - Mature advanced technology concepts through lab, ground, and flight test data - 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 for the future MDS - Develop and extend modeling techniques - 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 2020 Plans:*** Due to the evolving nature of the threat, ACPA's diverse staff of SMEs develops advanced concepts across a broad spectrum of missile defense technology initiatives. Concept assessment initiatives identified above will be matured and coupled with increased emphasis on the following: - Quantify the contribution of emerging concepts by integrating representative performance with Command and Control, Battle Management, Communications (C2BMC) networks (eg. MDA C2BMC, Integrated Air and Missile Defense, Cooperative Engagement Capability, Artificial Intelligence (AI) enabling end-to-end capability demonstrations with weapon systems) - Develop the computing infrastructure for AI Test bed and the development of deep neural networks to exercise advanced algorithms and assess potential applications to machine learning - Extend the Government's capability to evaluate engagement decision timelines and evaluate concept of operations that could possibly expand engagement opportunities - Develop an initial integrated modeling and analysis capability to assess new technology concepts associated with the complex interactions between left through right of launch integration - Address the capability gap in testing/simulation of advanced sensors in a credible environment by developing an advance photonics test bed capable of providing foundational truth for advanced sensor performance assessment of industry concepts - Develop Cyber test bed environment to enable the ability to model cyber-attacks and their impact on affected systems, understand the characteristics of cyber-attacks and how they come about, gain insight into network vulnerability and develop improved security strategies.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Missile Defense Agency		Date: February 2020
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)	FY 2019	FY 2020	FY 2021
- Identify cooperative initiatives to leverage Allied and Service Partners contributions and focus on expanding opportunities for collaboration on missile defense Science and Technology initiatives. ***FY 2021 Plans:*** See Above. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	11.350	11.552	11.637

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 0603178C: *Weapons Technology*	13.400	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• 0603180C: *Advanced Research*	42.100	27.674	18.687	-	18.687	18.883	18.975	19.720	20.222	Continuing	Continuing
• 0603294C: *Common Kill Vehicle Technology*	55.549	13.600	11.058	-	11.058	10.996	11.052	11.290	11.563	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 2021 Missile Defense Agency			Date: February 2020
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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
MD40: *Program-Wide Support*	2.419	0.605	0.605	0.592	-	0.592	0.602	0.652	0.864	0.944	Continuing	Continuing

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 2021 Missile Defense Agency			Date: February 2020
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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
MC71: *Cyber Operations*	-	0.765	34.044	2.681	-	2.681	2.704	3.467	3.571	3.647	0.000	50.879

Note

The increase from FY 2019 to FY 2020 and decrease from FY 2020 to FY 2021 reflects the Congressional add for advanced cyber capabilities and cybersecurity of left through right of launch.

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 which establishes Risk Management Framework (RMF) requirements for DoD Information Technology (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)	FY 2019	FY 2020	FY 2021
Title: Information Assurance / Cyber Network Defense	0.765	34.044	2.681
Description: Funds network defense and ISSAM activities including: - Conduct cybersecurity/IA engineering and architecture planning - Plan and test IA controls - Develop DoD RMF certification and accreditation packages - Conduct controls validation testing of systems and provide plan of action and milestones 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 2020 Plans:*** In addition to baseline efforts identified above emphasis in FY 2020 will be expanded to: - Explore cyber effects on emerging technology concepts			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Missile Defense Agency		Date: February 2020
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)	FY 2019	FY 2020	FY 2021
- Sustain and improve IT toolsets, maintain hardware currency, and sustain the IT and IA workforce ***FY 2021 Plans:*** See Above. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease from FY 2020 to FY 2021 reflects the FY 2020 Congressional add for advanced cyber capabilities and cybersecurity of left through right of launch.			
Accomplishments/Planned Programs Subtotals	0.765	34.044	2.681

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A