Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army											Date: May 2021	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	59.318	140.195	11.702	-	11.702	-	-	-	-	-	-
TR5: *Missile Defense Battlelab*	-	59.318	140.195	11.702	-	11.702	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This Program Element (PE) funds missile defense systems integration efforts for the US Army Space and Missile Defense Command.in its role as the Army Service Component Command (ASCC) to USSTRATCOM and USSPACECOM.

USASMDC: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC as the Army proponent for ground-based midcourse defense (GMD), the Army integrator for global missile defense, and the ASCC of the U.S. Strategic Command (USSTRATCOM). Upon its establishment, USASMDC became the ASCC of the United States Space Command (USSPACECOM). Army Regulation (AR) 10-87 Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007 and AR 5-22 The Army Force Modernization Proponent System dated 19 August 2009 designates USASMDC as the Army specified proponent for Global Missile Defense (GMD) capabilities. As the Army proponent for GMD, USASMDC is responsible for developing warfighting concepts, conducting warfighting experiments to validate those concepts, identifying capabilities needed to implement the validated concepts, and developing Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions to realize GMD capabilities. As the Army integrator for global missile defense, USASMDC is responsible for reviewing programs managed by the Army, other Services, Defense agencies and National agencies to ensure that they are correctly synchronized and will ultimately provide the capabilities required by USSTRATCOM and USSPACECOM to execute their global missile defense responsibilities.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	59.487	11.062	11.651	-	11.651
Current President's Budget	59.318	140.195	11.702	-	11.702
Total Adjustments	-0.169	129.133	0.051	-	0.051
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	129.250			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.169	-0.117			
• Adjustments to Budget Years	-	-	0.051	-	0.051

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: TR5: *Missile Defense Battlelab*		

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army	Date: May 2021
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603305A *I Army Missle Defense Systems Integration*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add: *Conventional Mission Capabilities*	3.000	-
Congressional Add: *Hypersonic Advanced Technology Testbed*	15.000	-
Congressional Add: *Integrated Environmental Control and Power*	8.000	-
Congressional Add: *Pragmatic Artificial Intelligence and new Technology Laboratory*	7.500	-
Congressional Add: *Hypersonic Testing and Related Technology Development*	15.000	-
Congressional Add: *Program increase - pragmatic artificial intelligence and new technology*	-	10.500
Congressional Add: *Program increase - integrated environmental control and power*	-	16.000
Congressional Add: *Program increase - hot air tunnel and MESO technologies for hypersonics*	-	47.000
Congressional Add: *Program increase - conventional mission capabilities*	-	10.250
Congressional Add: *Program increase - air and missile system critical technology development*	-	12.000
Congressional Add: *Program increase - advanced technology end?to?end testbed*	-	10.500
Congressional Add: *Program increase - gun launched interceptors*	-	8.000
Congressional Add: *Program increase*	-	15.000
Congressional Add Subtotals for Project: TR5	48.500	129.250
Congressional Add Totals for all Projects	48.500	129.250

Change Summary Explanation

Funding additions for FERS Civ Pay.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) TR5 / *Missile Defense Battlelab*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
TR5: *Missile Defense Battlelab*	-	59.318	140.195	11.702	-	11.702	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project TR5 funds United States Army Space and Missile Defense Command (USASMDC) efforts to develop the associated operational prototyping, experimentation, operational analysis, and modeling and simulation in support of missile defense capabilities for current and future Forces.

USASMDC: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC as the Army proponent for ground-based midcourse defense (GMD), the Army integrator for global missile defense, and the Army Service Component Command (ASCC) of the U.S. Strategic Command (USSTRATCOM). Upon its establishment, USASMDC became the ASCC of the United States Space Command (USSPACECOM). Army Regulation (AR) 10-87 Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007 and AR 5-22 The Army Force Modernization Proponent System dated 19 August 2009 designates USASMDC as the Army specified proponent for Global Missile Defense. As the Army proponent for GMD, USASMDC is responsible for developing warfighting concepts, conducting warfighting experiments to validate those concepts, identifying capabilities needed to implement the validated concepts, and developing Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions to realize GMD capabilities. As the Army integrator for global missile defense, USASMDC is responsible for reviewing programs managed by the Army, other Services, Defense agencies and National agencies to ensure that they are correctly synchronized and will ultimately provide the capabilities required by USSTRATCOM and USSPACECOM to execute their global missile defense responsibilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Prototypes	6.573	6.623	7.106
Description: Funding is provided to continue to evaluate new technologies in realistic operating environments. This is accomplished by participating in and providing support to Unified Quest wargames and experiments to analyze and integrate technology to identify the feasibility integration into Army missile defense systems. The Space and Missile Defense Command will participate and support biennial rewrites of Army Capstone, Operational and Functional Concepts. Funding also continues operational manager support to STRATCOM, NORTHCOM and SOCOM Joint Technical Capability Demonstrations to ensure Army missile defense equities are represented in advanced technology developments by demonstrating military utility when applied to military equipment and techniques. Examples include: supporting multi service experiments and capability development of the national-directed Phased Adaptive Approach (PAA) for Ballistic Missile Defense (BMD) as it is applied to each of the regional COCOMs; Developing effective Integrated Missile Defense concepts for Army support to the Phased Adaptive Approach (PAA) being implemented within each regional COCOM. A focus area will be informing the Missile Defeat Integrated Capability Development Working Group with experimentation on improving the timeliness and effectiveness of counter ballistic missile time sensitive targeting. Continue to support TRADOC proponents with their responsibilities relative to			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
doctrine, organization, training, material, leader development and education, personnel, and facilities (DOTMLPF-P) plus related matters to continue missile defense proponent input to Joint Capabilities Integration and Development System (JCIDS), Science and Technology, Concept Development, and Capability Development. Provide Government program management and oversite for DOTMLPF-P development and analysis for missile defense-related programs for which USASMDC is the Army's proponent - Ground-based Midcourse Defense System, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) Forward-based Mode Radar (FBM), and Army- specific applications of the Command and Control, Battle Management and Communications program. Provide Government program management and oversite for National Capital Region's Integrated Air Defense System. ***FY 2021 Plans:*** Taking lessons learned from the FY 2020 efforts to continue to evaluate new technologies in realistic operating environments. This is accomplished by participating in and providing support to Unified Quest wargames and experiments to analyze and integrate technology to identify the feasibility integration into Army missile defense systems. The Space and Missile Defense Command is participating in and providing biennial rewrites of Army Capstone, Operational and Functional Concepts. Continuing to provide operational manager support to USSTRATCOM, USNORTHCOM and USSOCOM Joint Technical Capability Demonstrations to ensure Army missile defense equities are represented in advanced technology developments by demonstrating military utility when applied to military equipment and techniques. Examples include: supporting multi service experiments and capability development of the national-directed Phased Adaptive Approach (PAA) for Ballistic Missile Defense (BMD) as it is applied to each of the regional CCMDs; developing effective Integrated Missile Defense concepts for Army support to the Phased Adaptive Approach (PAA) being implemented within each regional CCMD. A focus area will be improving upon the Missile Defeat Integrated Capability Development Working Group formed in FY 2020 with additional experimentation aimed at further improving the timeliness and effectiveness of counter ballistic missile time sensitive targeting. Continuing support to TRADOC proponents with their responsibilities relative to doctrine, organization, training, material, leader development and education, personnel, facilities and policy (DOTMLPF-P) plus related matters to continue missile defense proponent input to Joint Capabilities Integration and Development System (JCIDS), Science and Technology, Concept Development, and Capability Development. Provide Government program management and oversight for DOTMLPF-P development and analysis for missile defense-related programs for which USASMDC is the Army's proponent - Ground-based Midcourse Defense System, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) Forward-based Mode Radar (FBM), and Army- specific applications of the Command and Control, Battle Management and Communications program. Specifically, providing support to Ground-based Midcourse Defense (GMD) Missile Field #4 (MF4) development and construction. Providing support to recapitalized MEP-810C generator fielding and radar site power conversion activities in USINDOPACOM AOR. Providing Hardened Transportable Terminal fielding to USCENTCOM, USINDOPACOM, and USEUCOM AORs and continue to support C2BMC software development, integration, fielding, and operations & sustainment activities. Providing Government program management and oversite for National Capital Region's Integrated Air Defense System.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
These funds are being executed by USASMDC, Center of Excellence in FY 2021. ***FY 2022 Plans:*** Take the lessons learned from the FY 2021 efforts to continue to evaluate new technologies in realistic operating environments. This is accomplished by participating in and providing support to Unified Quest wargames and experiments to analyze and integrate technology to identify the feasibility integration into Army missile defense systems. The Space and Missile Defense Command will participate and support biennial rewrites of Army Capstone, Operational and Functional Concepts. Continue to provide operational manager support to USSTRATCOM, USNORTHCOM and USSOCOM Joint Technical Capability Demonstrations to ensure Army missile defense equities are represented in advanced technology developments by demonstrating military utility when applied to military equipment and techniques. Examples include: supporting multi service experiments and capability development of the national-directed Phased Adaptive Approach (PAA) for Ballistic Missile Defense (BMD) as it is applied to each of the regional CCMDs; developing effective Integrated Missile Defense concepts for Army support to the Phased Adaptive Approach (PAA) being implemented within each regional CCMD. A focus area will be improving upon the Missile Defeat Integrated Capability Development Working Group formed in FY 2020 with additional experimentation aimed at further improving the timeliness and effectiveness of counter ballistic missile time sensitive targeting. Continue support to TRADOC proponents with their responsibilities relative to doctrine, organization, training, material, leader development and education, personnel, facilities and policy (DOTMLPF-P) plus related matters to continue missile defense proponent input to Joint Capabilities Integration and Development System (JCIDS), Science and Technology, Concept Development, and Capability Development. Provide Government program management and oversight for DOTMLPF-P development and analysis for missile defense-related programs for which USASMDC is the Army's proponent - Ground-based Midcourse Defense System, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) Forward-based Mode Radar (FBM), and Army-specific applications of the Command and Control, Battle Management and Communications program. Specifically, provide support to Ground-based Midcourse Defense (GMD) Missile Field #4 (MF4) development and construction. Provide support to recapitalized MEP-810C generator fielding and radar site power conversion activities in USINDOPACOM AOR. Provide Hardened Transportable Terminal fielding to USCENTCOM, USINDOPACOM, and USEUCOM AORs and continue to support C2BMC software development, integration, fielding, and operations & sustainment activities. Provide Government program management and oversite for National Capital Region's Integrated Air Defense System. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Moderate funding increases in FY22 reflect civilian workforce pay increases and increased cost for highly technical support for experimentation, demonstration and capability development in the air and missile defense domain.			
Title: Analysis, and Models and Simulations (M&S)	4.245	4.322	4.596
Description: Funding is provided to evaluate new technologies in realistic operating environments. This will be accomplished by supporting ongoing efforts that provide the most realistic operating environment available to perform technology gap and			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
cost reduction analysis of missile defense systems. Realistic operating environments will be available to determine the ability of the specific technologies to fill capability gaps in terms of utility to the warfighter. Support of technology demonstrations, Analysis and Demonstration Tools/Test Beds for evolving missile defense concepts will address emerging needs and continue to be expanded to ensure that advanced technology development can adequately enhance missile defense capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) will continue to provide program management for maintenance, sustainment, and development for Extended Air Defense Simulation (EADSIM) delivering the required high fidelity synthetic operating environment to provide the capability to perform system and cost benefit analysis, operational planning, and exercise/ experimentation support. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for Reconfigurable Tactical Operations Simulator (RTOS) delivering operator in the loop capability for air and missile defense simulation in distributed exercises and experiments. The SMD COE will continue to provide program management for maintenance, sustainment, and development for the Joint Embedded Messaging System (JEMS) providing data translation application that enables communications between disparate systems, protocols and architectures.			
FY 2021 Plans: Take the lessons learned from the FY 2020 efforts and evaluate new technologies in realistic operating environments. This will be accomplished by supporting ongoing efforts that provide the most realistic operating environment available to perform technology gap and cost reduction analysis of missile defense systems. Realistic operating environments will be available to determine the ability of the specific technologies to fill capability gaps in terms of utility to the warfighter. Support of technology demonstrations, Analysis and Demonstration Tools/Test Beds for evolving missile defense concepts will address emerging needs and continue to be expanded to ensure that advanced technology development can adequately enhance missile defense capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) will continue to provide program management for maintenance, sustainment, and development for Extended Air Defense Simulation (EADSIM) delivering the required high fidelity synthetic operating environment to provide the capability to perform system and cost benefit analysis, operational planning, and exercise/ experimentation support. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for Reconfigurable Tactical Operations Simulator (RTOS) and Future Force Experimentation Air Defense Simulation (FFEADS) delivering operator in the loop capability for air and missile defense simulation in distributed exercises and experiments. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for the Joint Embedded Messaging System (JEMS) providing data translation application that enables communications between disparate systems, protocols and architectures. These funds will be executed by USASMDC SMD CoE.			
FY 2022 Plans: Take the lessons learned from the FY 2021 efforts and continue to evaluate new technologies in realistic operating environments. This will be accomplished by supporting ongoing efforts that provide the most realistic operating environment available to perform technology gap and cost reduction analysis of missile defense systems. Realistic operating environments will be available to			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
determine the ability of the specific technologies to fill capability gaps in terms of utility to the warfighter. Support of technology demonstrations, Analysis and Demonstration Tools/Test Beds for evolving missile defense concepts will address emerging needs and continue to be expanded to ensure that advanced technology development can adequately enhance missile defense capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) will continue to provide program management for maintenance, sustainment, and development for Extended Air Defense Simulation (EADSIM) delivering the required high fidelity synthetic operating environment to provide the capability to perform system and cost benefit analysis, operational planning, and exercise/ experimentation support. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for Reconfigurable Tactical Operations Simulator (RTOS) and Future Force Experimentation Air Defense Simulation (FFEADS) delivering operator in the loop capability for air and missile defense simulation in distributed exercises and experiments. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for for the Joint Embedded Messaging System (JEMS) providing data translation application that enables communications between disparate systems, protocols and architectures. These funds will be executed by USASMDC SMD CoE.			
FY 2021 to FY 2022 Increase/Decrease Statement: Moderate funding increases in FY22 reflect civilian workforce pay increases and increased cost for highly technical support for experimentation, demonstration and capability development in the air and missile defense domain.			
Accomplishments/Planned Programs Subtotals	10.818	10.945	11.702

	FY 2020	FY 2021
Congressional Add: Conventional Mission Capabilities	3.000	-
FY 2020 Accomplishments: Conventional Mission Capabilities: The Space and Missile Defense Technical Center (SMDTC) matured rapid mission planning and range safety capabilities leveraging existing, proven, and low-risk systems. These efforts integrated and developed software tools for trajectory propagation, aerothermal analysis, flight guidance, system vulnerability, and real-time weather. The effort supported test in the Air and Missile Software Integration Laboratory (AMSIL) to meet the near and long-term advances in Integrated Air and Missile Defense (IAMD) system requirements including the Long Range Hypersonic Weapon (LRHW). The SMDTC continued the development of a mission planner supporting detailed flight planning of emerging weapon systems including the LRHW. This planner combined high fidelity vehicle flight dynamics, aerothermal analyses, signature analyses, and environmental analyses (including real-time and predicted weather) with a comprehensive human/machine interface (HMI) and visualization capability. The SMDTC augmented the planner with Range Commanders Council (RCC)-321 compliant tools enabling hazard analysis. Initiated adding		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
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	FY 2020	FY 2021
capabilities for link margin analyses for telemetry, radar, and flight termination systems. Initiated integration of capability within the AMSIL		
Congressional Add: Hypersonic Advanced Technology Testbed ***FY 2020 Accomplishments:*** Hypersonic Advanced Technology Testbed: The Space and Missile Defense Technical Center (SMDTC) initiated the establishment a Hypersonic Advanced Technology Testbed simulation and test capability to replicate realistic flight in 3 and 6 Degrees of Freedom (DOF) dynamic environments for advanced weapon systems. The capability supported the assessment of effect of these environments on critical subsystems, including the state-of-the-art Integrated Air and Missile Defense (IAMD) seekers/sensors, avionics guidance computers, and inertial measurement units (IMU). The testbed leveraged the latest advances in piezoelectric shakers and controllers for true flight-like environments for instrumentation. Initiated technical simulations of advanced IAMD threat sand capabilities to assess system task plans, and engagement plans (e.g. 3DOF, 6DOF) with possible use for ground tests.	15.000	-
Congressional Add: Integrated Environmental Control and Power ***FY 2020 Accomplishments:*** Integrated Environmental Control and Power: The Space and Missile Defense Technical Center (SMDTC) continued development, testing and evaluation, and pre-production reliability testing of integrated power and thermal management technologies, components, and systems. The effort integrated thermal and power management sub-systems to refine and mature advanced platforms of Counter-Unmanned Aircraft System (C-UAS) needs of advanced weapon pods or small stationary container systems to more effectively operate and contribute to Integrated Air and Missile Defense/Short Range Air Defense (IAMD) objectives. The effort built upon the advanced high efficiency Alternating Current (AC) and Direct Current (DC) compatible Environmental Control Unit and electronics cooling technologies allowing for the rapid integration of highly compact and energy efficient DC generators.	8.000	-
Congressional Add: Pragmatic Artificial Intelligence and new Technology Laboratory ***FY 2020 Accomplishments:*** Pragmatic Artificial Intelligence and new Technology Laboratory: The Space and Missile Defense Technical Center (SMDTC) initiated the Pragmatic Artificial Intelligence and New Technology (PAINT) laboratory capability to apply Artificial Intelligence (AI) ?Expert Systems? and other new technologies to Integrated Air and Missile Defense (IAMD) capabilities. The effort began applications of expert computer systems capturing human knowledge and incorporate it into a bounded, autonomous software program. The effort developed methodologies, decision making criteria, lessons learned by IAMD subject matter experts (SMEs), and encode them into the command and control software applications. The PAINT effort focused on	7.500	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
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	FY 2020	FY 2021
applications of basic AI principals to impact the speed and accuracy of software for the benefit of testing IAMD systems in a lab environment such as execise and test safety and operational planning.		
Congressional Add: Hypersonic Testing and Related Technology Development	15.000	-
FY 2020 Accomplishments: Hypersonic Testing and Related Technology Development: The Space and Missile Defense Technical Center (SMDTC) initiated the to design and development of a full duration test laboratory capability for High Speed/Hypersonic (HS/H) systems. The test confirmed design margins for a test capability for testing HS/H systems in a validated realistic environment. This test supported design refinements of capabilities related to the use of nitrous oxide for non-vitiated hot air flow used in HS/H engine testing. The Hypersonic Testing and Related Technology began development of a full duration test laboratory capability for HS/H systems. The effort validated safety and chemistry requirements for HS/H systems in a validated realistic environment.		
Congressional Add: Program increase - pragmatic artificial intelligence and new technology	-	10.500
FY 2021 Plans: FY21 Pragmatic Artificial Intelligence and new Technology Laboratory: The Space and Missile Defense Technical Center (SMDTC) initiated the Pragmatic Artificial Intelligence and New Technology (PAINT) laboratory capability to apply Artificial Intelligence (AI) ?Expert Systems? and other new technologies to Integrated Air and Missile Defense (IAMD) capabilities. The effort began applications of expert computer systems capturing human knowledge and incorporate it into a bounded, autonomous software program. The effort develops methodologies, decision making criteria, lessons learned by IAMD subject matter experts (SMEs), and encode them into the command and control software applications. The PAINT effort focuses on applications of basic AI principals to impact the speed and accuracy of software for the benefit of testing IAMD systems in a lab environment such as exercise and test safety and operational planning.		
Congressional Add: Program increase - integrated environmental control and power	-	16.000
FY 2021 Plans: FY21 Integrated Environmental Control and Power: The Space and Missile Defense Technical Center (SMDTC) continue the development, testing and evaluation, and pre-production reliability testing of integrated power and thermal management technologies, components, and systems. The effort integrated thermal and power management sub-systems to refine and mature advanced platforms of Counter-Unmanned Aircraft System (C-UAS) needs of advanced weapon pods or small stationary container systems to more effectively operate and contribute to Integrated Air and Missile Defense/Short Range Air Defense (IAMD) objectives. The effort built upon the advanced high efficiency Alternating Current (AC) and Direct Current (DC)		

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	FY 2020	FY 2021
compatible Environmental Control Unit and electronics cooling technologies allowing for the rapid integration of highly compact and energy efficient DC generators.		
Congressional Add: Program increase - hot air tunnel and MESO technologies for hypersonics ***FY 2021 Plans:*** FY21 Hypersonic Testing and Related Technology Development: The Space and Missile Defense Technical Center (SMDTC) will initiate the design and development of a test laboratory capability for High Speed/Hypersonic (HS/H) systems. The test will confirm design margins for a test capability for testing HS/H systems in a validated realistic environment. This test supports design refinements of capabilities related to the use of nitrous oxide for non-vitiated hot air flow used in HS/H engine testing. The Hot Air Tunnel validates safety and chemistry requirements for HS/H systems in a validated realistic environment. The effort will began development of a full duration test laboratory capability for HS/H systems.	-	47.000
Congressional Add: Program increase - conventional mission capabilities ***FY 2021 Plans:*** FY21 Conventional Mission Capabilities: The Space and Missile Defense Technical Center (SMDTC) matured rapid mission planning and range safety capabilities leveraging existing, proven, and low-risk systems. These efforts integrates and develops software tools for trajectory propagation, aerothermal analysis, flight guidance, system vulnerability, and real-time weather. The effort supports test in the Air and Missile Software Integration Laboratory (AMSIL) to meet the near and long-term advances in Integrated Air and Missile Defense (IAMD) system requirements including the Long Range Hypersonic Weapon (LRHW). The SMDTC continues the development of a mission planner supporting detailed flight planning of emerging weapon systems including the LRHW. This planner combines high fidelity vehicle flight dynamics, aerothermal analyses, signature analyses, and environmental analyses (including real-time and predicted weather) with a comprehensive human/machine interface (HMI) and visualization capability. The SMDTC augmented the planner compliant tools enabling hazard analysis. Initiated adding capabilities for link margin analyses for telemetry, radar, and flight termination systems. Initiated integration of capability within the AMSIL.	-	10.250
Congressional Add: Program increase - air and missile system critical technology development ***FY 2021 Plans:*** FY21 Air and Missile System Critical Technology Development (AMSCT): The Space and Missile Defense Technical Center (SMDTC) continue the development and demonstration of scalable HPM devices that can be integrated on multiple platforms. The effort assess HPM lethality to optimized effects in threat systems and Identifies HPM protection capabilities to battlefield systems. Provides and develops Air and Missile test environment supporting multiple Space and IAMD technologies and weapon systems.	-	12.000
Congressional Add: Program increase - advanced technology end?to?end testbed	-	10.500

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	FY 2020	FY 2021
FY 2021 Plans: FY21 Advanced Technology end-to-end testbed: The Space and Missile Defense Technical Center (SMDTC) initiates the establishment an Advanced Technology Testbed simulation and test capability to replicate realistic flight in 3 and 6 Degrees of Freedom (DOF) dynamic environments for advanced weapon systems. The capability supported the assessment of effect of these environments on critical subsystems, including the state-of-the-art Integrated Air and Missile Defense (IAMD) seekers/sensors, avionics guidance computers, and inertial measurement units (IMU). The testbed will be designed and developed to include offensive and defensive weapon technologies to engage the emerging threats in a realistic environment, for complete kill chain of air and missile defense technology evaluation capability. Initiate technical simulations of advanced IAMD threat sand capabilities to assess system task plans, and engagement plans (e.g. 3DOF, 6DOF) with possible use for ground tests		
Congressional Add: Program increase - gun launched interceptors ***FY 2021 Plans:*** Research and develop how Counter - Rocket, Artillery, Mortar / Unmanned Aerial Systems (C-RAM / C-UAS) defenses can be overwhelmed by swarm attack . This work will prototype a maneuverable, laser guided GLI by utilizing an Insensitive Munitions compliant solid propulsion divert system and a laser seeker assembly. Design, integrate, and test a prototype GLI to address the C-RAM / C-UAS mission as part of the Integrated Air and Missile Defense role.	-	8.000
Congressional Add: Program increase ***FY 2021 Plans:*** Develop techniques for protection of tactical space resources against cyberattack and dedicated capabilities for continual responsiveness to threat advancement Develop and integrate advanced capability prototype Hardware in The Loop (HWIL) / Software in the Loop (SWIL) for cyber resilient tactical space technologies. Perform non-invasive multi-source attack vector stimulation of space prototypes to support the development and integration of future Army space capabilities that are globally responsive to the joint warfighter and provide the foundation for long-term overmatch against near-peer adversaries. Develop and fabricate thermal management system test and integrations evaluation capability. Develop Electronics cooling for supersonic and hypersonic missiles scalable directly with missile components. Complex compound heat shield materials development and test he joint warfighter and provide the foundation for long-term overmatch against near-peer adversaries. Research and Enhance Laser Lethality Infrastructure for Cruise Missile Lethality Vulnerability Modules developments. Research and Purchase targets for Lethality Vulnerability Module developments.	-	15.000
Congressional Adds Subtotals	48.500	129.250

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
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C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) TR5 / *Missile Defense Battlelab*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Personnel and Operations Support	C/TBD	To Be determined : To be Determined	9.364	7.213		7.307		7.797		-		7.797	Continuing	Continuing	-
		Subtotal	9.364	7.213		7.307		7.797		-		7.797	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contracts	Various	To Be Determined : To Be determined	2.393	3.667		3.638		3.905		-		3.905	Continuing	Continuing	-
Various	Various	To be determined : to be determined	-	48.438		129.250		-		-		-	0.000	177.688	-
		Subtotal	2.393	52.105		132.888		3.905		-		3.905	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Experiments & technology enhancements of prototypes/tools and analysis.	Various	Various Colorado Springs CO and Huntsville AL : Alabama, Colorado Springs	117.427	-		-		-		-		-	Continuing	Continuing	Continuing
Govt Support and Support Contracts	Various	Various Colorado Springs CO and Huntsville AL : Alabama, Colorado Springs	138.783	-		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	256.210	-		-		-		-		-	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) TR5 / *Missile Defense Battlelab*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	267.967	59.318		140.195		11.702		-		11.702	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

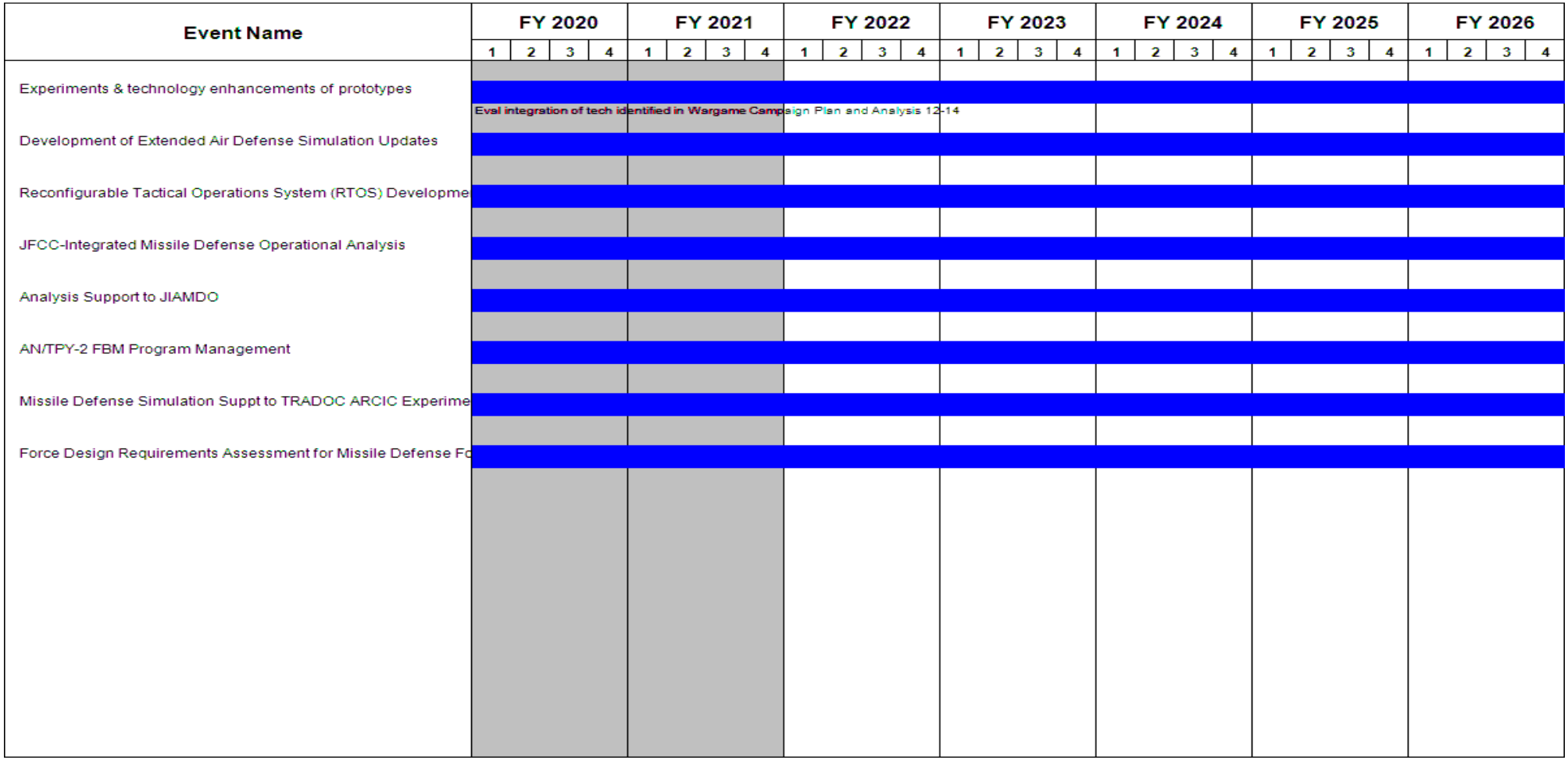

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Experiments & technology enhancements of prototypes	1	2018	4	2027
Development of Extended Air Defense Simulation Updates	1	2018	4	2027
Reconfigurable Tactical Operations System (RTOS) Development	1	2018	4	2027
JFCC-Integrated Missile Defense Operational Analysis	1	2018	4	2027
High Energy Laser for AMD	1	2015	4	2018
Analysis Support to JIAMDO	1	2018	4	2027
AN/TPY-2 FBM Program Management	1	2018	4	2027
Missile Defense Simulation Suppt to TRADOC ARCIC Experimentation	1	2018	4	2027
Force Design Requirements Assessment for Missile Defense Forces	1	2018	4	2027
Allied and Partner Modeling to Inform Integration Efforts to Meet Objectives	3	2016	4	2018
Pacific Focused-Adversary Centric Bundled	3	2016	4	2018
Inert Debris Analysis	3	2017	2	2018
Hypersonics Analysis	2	2017	4	2018