Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Missile Defense Agency											Date: May 2017	
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603294C / *Common Kill Vehicle Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	92.632	60.851	0.000	252.879	-	252.879	321.175	110.934	0.000	0.000	Continuing	Continuing
MD85: *Common Kill Vehicle Technology*	91.320	58.656	0.000	249.915	-	249.915	315.619	107.734	0.000	0.000	Continuing	Continuing
MD40: *Program Wide Support*	1.312	2.195	0.000	2.964	-	2.964	5.556	3.200	0.000	0.000	Continuing	Continuing
Program MDAP/MAIS Code: 362												

Note

All FY 2017 Multi Object Kill Vehicle (MOKV) efforts were requested in the BA-4 0604894C Program Element. Beginning in FY 2018, MOKV BA-3 risk reduction and technology development efforts are requested in this BA-3 Common Kill Vehicle Technology program element 0603294C; MOKV product development is requested in the BA-4 Multi Object Kill Vehicle program element 0604894C.

A. Mission Description and Budget Item Justification

The Multi Object Kill Vehicle program will enhance interceptor performance to enable the Warfighter to counter more numerous and complex threats to the homeland by establishing the technological foundation for engaging multiple objects from a single interceptor. The Missile Defense Agency (MDA) is developing the concepts for a MOKV based on a modular, open systems architecture designed to common interfaces and standards, making upgrades easier and broadening MDA's vendor and supplier base. The MOKV will rely on a BMDS architecture that balances performance across the sensor, Command, Control, Battle Management and Communications, and kill vehicle elements. Analysis shows that having multiple kill vehicles on each interceptor can dramatically improve the performance of the system, significantly reduce the burden on interceptor inventory, and reduce cost to defend the Homeland.

This funding provides technology risk reduction

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B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	61.753	0.000	0.000	-	0.000
Current President's Budget	60.851	0.000	252.879	-	252.879
Total Adjustments	-0.902	0.000	252.879	-	252.879
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.902	0.000			
• Other Adjustment	0.000	0.000	252.879	-	252.879

Change Summary Explanation

The increase from PB17 to PB18 in FY2018 is for additional Multi-Object Kill Vehicle technology risk reduction.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Missile Defense Agency			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603294C / *Common Kill Vehicle Technology*	Project (Number/Name) MD85 / *Common Kill Vehicle Technology*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
MD85: *Common Kill Vehicle Technology*	91.320	58.656	0.000	249.915	-	249.915	315.619	107.734	0.000	0.000	Continuing	Continuing

Note

N/A

A. Mission Description and Budget Item Justification

MDA will focus on competitive development and risk reduction of Multi Object Kill Vehicle (MOKV) components and subsystems with industry in FY 2018.

MDA has implemented a structured, disciplined systems engineering process to assure the MOKV is a Ballistic Missile Defense System (BMDS) solution. The systems engineering effort will define; the requirements for a deployable MOKV, the exit requirements for the technology component and subsystem risk reduction phase; and the entrance criteria for a future development phase. The Government will develop MOKV system engineering guidelines from industry concepts, government analysis, modeling, and simulation. The MOKV concepts and identified technology component risk reduction will formulate the trade space across cost, risk, and kill vehicle performance to establish requirements that are feasible and affordable for the engineering, manufacturing and development of a future MOKV. MDA anticipates deploying this capability across the interceptor fleet in the next decade to address the evolving threat.

This capability relies on a BMDS architecture that balances performance across the sensor; Command, Control, Battle Management and Communications; and kill vehicle elements. Analysis shows that having multiple kill vehicles on each interceptor can dramatically improve the performance of the system, significantly reduce the burden on interceptor inventory, and reduce cost to defend the Homeland.

As part of MOKV concept development, industry identified technology component risk reduction efforts that support their concepts. In FY 2018, MDA will continue risk reduction for selected kill vehicle and carrier vehicle component and subsystem technologies that lower development risk, leading to follow-on integrated prototype demonstrations. MOKV technology risk reduction efforts include engagement management, communications, seekers and advanced sensors, divert attitude and control systems, integrated avionics, and inertial measurement units.

As part of further enhancing MOKV component risk reduction, kill vehicle and carrier vehicle subsystems will be matured to fully operable prototypes and integrated together to conduct high-fidelity hardware-in-the-loop laboratory demonstrations of performance, functionality and interfaces.

A number of components will be integrated into the kill vehicle prototype demonstrators to show operating functions and performance against simulated threats. Avionics will demonstrate relevant through put and navigation accuracy. Seeker telescope and sensor packaging will confirm frame rate speed, and achieve pixel density and sensitivity to acquire and track threat objects. Communication and antenna packaging will indicate transmission power and receiver sensitivity sufficiency, in conjunction with the viewing angles that will be encountered in an operational environment. Divert and attitude control system will demonstrate the thrust and divert capabilities that are necessary, in conjunction with seeker packaging and performance, to perform lethal engagements against a designated threat object.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Missile Defense Agency		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603294C / *Common Kill Vehicle Technology*	**Project (Number/Name)** MD85 / *Common Kill Vehicle Technology*

A prototype demonstrator for the carrier vehicle, on which the kill vehicles will reside, will integrate an adjunct seeker telescope and sensor components to show larger format focal plane array sensitivity for object detection. Communication and real time engagement management operations will be tested to establish capabilities to optimally manage threat object identification and hand off target assignments to the kill vehicles.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Common Kill Vehicle	58.656	0.000	249.915

Description: Competitive risk reduction and development of Multi Object Kill Vehicle (MOKV) concepts with industry. In FY 2018, funding for MOKV risk reduction is requested in this BA-3 Common Kill Vehicle Technology program element 0603294C and the MOKV development is requested in the BA-4 Multi Object Kill Vehicle program element 0604894C.

- Conduct technology risk reduction for selected component and subsystem technologies that lower development risk. Potential candidate MOKV technology risk reduction efforts include engagement management, kill vehicle-to-kill vehicle communications, advanced sensor, propulsion systems, and inertial measurement units
- Refine and update government MOKV concepts for independent performance predictions via government simulations to establish baseline for contractor concept assessments
- Continue development of MOKV engagement management algorithms to analyze and characterize government concepts for managing the many-on-many engagement challenges due to complex threats
- Conduct independent engagement management test framework to test and analyze industry concept performance, identify algorithm risk issues, confirm risk reduction progress, and enable continued Agency's MOKV requirements development
- Continue to build, assemble, and test initial inertial measurement unit prototype to support final design, prototype fabrication, and model validation
- Conduct planning for integrated demonstration test events focused on critical functions to validate reduction of technical risk
- Define the requirements for a deployable MOKV using a structured, disciplined systems engineering process

FY 2016 Accomplishments:
- MOKV Industry Contractors delivered initial concepts and modeling parameters for preliminary government assessment
- Initiated development of the MOKV engagement management algorithms to address managing the many-on-many engagement challenges due to complex threats
- Updated and refined government MOKV concept for independent performance predictions via government simulations to initiate contractor concept assessments
- Built, assembled, and tested initial inertial measurement unit prototype to support model validation
- Initiated design and analysis of a high band width software defined radio to support kill vehicle-to-kill vehicle and kill vehicle-to-ground communications

FY 2017 Plans:

Exhibit R-2A, RDT&E Project Justification: FY 2018 Missile Defense Agency		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603294C / *Common Kill Vehicle Technology*	**Project (Number/Name)** MD85 / *Common Kill Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
see above			
FY 2018 Plans: see above			
Accomplishments/Planned Programs Subtotals	58.656	0.000	249.915

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• 0603176C: *Advanced Concepts and Performance Assessment*	11.853	17.880	12.996	-	12.996	13.741	15.048	15.319	16.361	Continuing	Continuing
• 0603178C: *Weapons Technology*	50.263	71.843	5.495	-	5.495	0.000	0.000	0.000	0.000	Continuing	Continuing
• 0603180C: *Advanced Research*	16.987	27.733	20.184	-	20.184	20.695	21.555	21.936	22.361	Continuing	Continuing
• 0604894C: *Multi Object Kill Vehicle*	0.000	71.513	6.500	-	6.500	3.500	229.524	209.830	265.898	0	786.765

Remarks

D. Acquisition Strategy

The acquisition strategy consists of three focus areas. First, through competition with missile integration contractors, develop kill vehicle architectures and interfaces with competitive design of multi-object kill concepts incorporating engagement management concept of operations, kill vehicles and enhanced discrimination capability. Second, conduct risk reduction activities to identify and mature the technology necessary to increase the reliability and performance of our kill vehicles using the Advanced Technology Innovation Broad Agency Announcement and competitive procurements. Make investments that mitigate the component development gaps for future Multi-Object Kill Vehicles, and enhance the competitive environment. Make the necessary investments to maturing component technology; enhanced inertial navigation and kill vehicle-to-kill vehicle communications. Third, leverage the technical expertise of Federally Funded Research and Development Centers, University Applied Research Centers, and Universities and government laboratories to independently develop reference concept using proven modeling/analysis techniques.

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: FY 2018 Missile Defense Agency			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603294C / *Common Kill Vehicle Technology*	Project (Number/Name) MD40 / *Program Wide Support*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
MD40: *Program Wide Support*	1.312	2.195	0.000	2.964	-	2.964	5.556	3.200	0.000	0.000	Continuing	Continuing

Note

N/A

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 Global Deployment personnel and support performing deployment site preparation and activation and, provides facility capabilities for MDA Executing Agent locations. Other MDA wide costs includes: 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; and similar operating expenses. PWS is allocated on a pro-rata basis and therefore, fluctuates by year based on the adjusted RDT&E profile (which excludes: 0305103C Cyber Security Initiative, 0603274C Special Programs, 0603913C Israeli Cooperative Program and 0901598C Management Headquarters).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Program Wide Support	2.195	0.000	2.964
Description: N/A			
FY 2016 Accomplishments: N/A			
FY 2017 Plans: - In FY 2017, Program Wide Support was proportionately reallocated as a result of the Common Kill Vehicle Technology transfer to the Multi Object Kill Vehicle, Program Element 0604894C.			
FY 2018 Plans: N/A			
Accomplishments/Planned Programs Subtotals	2.195	0.000	2.964

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: FY 2018 Missile Defense Agency		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603294C / *Common Kill Vehicle Technology*	**Project (Number/Name)** MD40 / *Program Wide Support*

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A