Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Missile Defense Agency											Date: February 2018	
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 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	149.976	54.395	252.879	189.753	-	189.753	205.645	254.130	122.494	52.373	Continuing	Continuing
MD85: *Common Kill Vehicle Technology*	149.976	51.133	249.915	181.248	-	181.248	195.924	242.675	116.791	50.000	Continuing	Continuing
MD40: *Program Wide Support*	-	3.262	2.964	8.505	-	8.505	9.721	11.455	5.703	2.373	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 Technology Risk Reduction efforts are requested in the 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 an 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 Ballistic Missile Defense System (BMDS) architecture that balances performance across the sensor, Command, Control, Battle Management and Communications (C2BMC), 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Missile Defense Agency	Date: February 2018
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603294C *I Common Kill Vehicle Technology*

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	0.000	252.879	321.175	-	321.175
Current President's Budget	54.395	252.879	189.753	-	189.753
Total Adjustments	54.395	0.000	-131.422	-	-131.422
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	56.513	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-0.829	0.000			
• SBIR/STTR Transfer	-1.289	0.000			
• FY 2017 Request for Additional Appropriations	0.000	0.000	0.000	-	0.000
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	0.000	0.000	-131.422	-	-131.422

Change Summary Explanation

The increase in FY 2017 from PB 2018 to PB 2019 reflects funds for MOKV requested in the Multi Object Kill Vehicle Program Element (0604894C) and appropriated in the Common Kill Vehicle Technology Program Element (0603294C).

The decrease in FY 2019 from PB 2018 to PB 2019 reflects delaying planned acceleration of kill vehicle and carrier vehicle component risk reduction as well as interoperability hardware-in-the-loop laboratory demonstrations.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency			Date: February 2018
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MD85: *Common Kill Vehicle Technology*	149.976	51.133	249.915	181.248	-	181.248	195.924	242.675	116.791	50.000	Continuing	Continuing

Note

N/A

A. Mission Description and Budget Item Justification

In FY 2019, MDA will focus on Multi Object Kill Vehicle (MOKV) competitive Technology Risk Reduction with industry.

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.

As part of MOKV concept development, industry identified technology component risk reduction efforts that support their concepts. In FY 2019, MDA will continue risk reduction for selected kill vehicle and carrier vehicle component and subsystem technologies that lower development risk, leading to follow-on interoperability hardware-in-the loop laboratory 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 together to conduct interoperability hardware-in-the-loop laboratory demonstrations of performance, functionality and interfaces.

A number of components will be integrated into the kill vehicle demonstrations 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.

An interoperability demonstration 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.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency		Date: February 2018
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 2017	FY 2018	FY 2019
Title: Common Kill Vehicle	51.133	249.915	181.248
Description: Competitive Technology Risk Reduction of MOKV concepts with industry. In FY 2019, funding for MOKV Technology 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 Specific and/or unique accomplishments to each FY are as follows: ***FY 2018 Plans:*** - SEE ABOVE. ***FY 2019 Plans:*** - SEE ABOVE. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The decrease from FY 2018 to FY 2019 reflects delaying planned acceleration of kill vehicle and carrier vehicle component risk reduction as well as kill vehicle and carrier vehicle interoperability hardware-in-the-loop laboratory demonstrations.			
Accomplishments/Planned Programs Subtotals	51.133	249.915	181.248

Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency		Date: February 2018
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*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• 0603176C: *Advanced Concepts and Performance Assessment*	14.534	12.996	13.017	-	13.017	14.267	14.899	15.235	16.224	Continuing	Continuing
• 0603178C: *Weapons Technology*	47.403	5.495	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• 0603180C: *Advanced Research*	27.185	20.184	20.365	-	20.365	20.778	21.194	21.652	22.036	Continuing	Continuing
• 0604894C: *Multi Object Kill Vehicle*	0.000	6.500	8.256	-	8.256	33.935	8.277	184.118	355.060	0.000	596.146

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: PB 2019 Missile Defense Agency			Date: February 2018
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MD40: *Program Wide Support*	-	3.262	2.964	8.505	-	8.505	9.721	11.455	5.703	2.373	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 2017	FY 2018	FY 2019
Title: Program Wide Support	3.262	2.964	8.505
Description: N/A			
FY 2018 Plans: N/A			
FY 2019 Plans: N/A			
FY 2018 to FY 2019 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	3.262	2.964	8.505

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency		Date: February 2018
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

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Missile Defense Agency		Date: February 2018
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603294C / *Common Kill Vehicle Technology*	**Project (Number/Name)** MD40 / *Program Wide Support*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Wide Support - Agency Operations and Support Services (Reqn)	Reqn	Various : Multi: AK, AL,CA, CO, VA	0.000	0.942	Nov 2016	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Services.	C/CPFF	Various : Multi: AL, VA	0.000	2.320	Nov 2016	2.964	Nov 2017	8.505	Nov 2018	-		8.505	Continuing	Continuing	Continuing
		Subtotal	0.000	3.262		2.964		8.505		-		8.505	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	3.262		2.964		8.505		-		8.505	Continuing	Continuing	N/A

Remarks

N/A