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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development</i>					R-1 Program Element (Number/Name) PE 0304115F <i>I Multi Domain Command and Control (MDC2)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	150.880	0.000	150.880	106.400	14.880	14.880	14.880	Continuing	Continuing
673380: <i>Multi Domain Command and Control (MDC2)</i>	-	0.000	0.000	150.880	0.000	150.880	106.400	14.880	14.880	14.880	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020, PE 0304115F, Multi Domain Command and Control (MDC2), Project Number 673380, Multi Domain Command and Control (MDC2), transferred from PE 0207410F, Air & Space Operations Center (AOC), Project Number 674596, AOC WS Modifications, in order to improve transparency of development programs.

A. Mission Description and Budget Item Justification

In FY 2019, Multi-Domain Command and Control (MDC2) Development was a new start in PE 0207410F, AOC, Project Number 674596, AOC WS Mods.

Multi-Domain Command and Control (MDC2) is a multi-node concept which connects existing DevOps environments in order to achieve MDC2 objectives. It serves as a warfighter-centric focal point for USAF-organic rapid software development, experimentation, testing, and operationalization of MDC2 capabilities. It will explore advanced technology and leverage agile acquisition to rapidly operationalize MDC2 tools and capabilities. Experimentation to shape the future MDC2 network capability through data virtualization. The ShadowNet is a multi-node concept unifying software development with operators in order to achieve MDC2 objectives. It serves as a warfighter-centric focal point for USAF, Joint and coalition by rapidly developing capability and testing future multi-domain concepts.

In FY 2020, the Air Force will develop a MDC2 capability to provide warfighters and support elements across all services and domains a common C2 platform from which disparate data sources may be leveraged and cross-domain effects may be synchronized. This common platform expands on the Kessel Run Air Operations Center platform and is undergirded by the creation of an enterprise data lake and an experimentation campaign focused on testing and developing enterprise solutions for the common enablers of data, network, and link capability.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver MDC2 capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

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Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development		R-1 Program Element (Number/Name) PE 0304115F I Multi Domain Command and Control (MDC2)						
B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total		
Previous President's Budget		0.000	0.000	0.000	0.000	0.000		
Current President's Budget		0.000	0.000	150.880	0.000	150.880		
Total Adjustments		0.000	0.000	150.880	0.000	150.880		
• 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		0.000	0.000					
• Other Adjustments		0.000	0.000	150.880	0.000	150.880		
Change Summary Explanation								
FY 2020: Increase includes \$14.880M transferred from PE 0207410F, Air & Space Operations Center (AOC), Project Number 674596, AOC WS Modifications and \$136M of additional development funding for ShadowNet experimentation, C2 Common Platform and Enterprise Data Lake efforts								
C. Accomplishments/Planned Programs (\$ in Millions)				FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Multi Domain Command and Control (MDC2) Development				0.000	0.000	150.380	0.000	150.380
Description: Development of enduring capability for a scalable operational infrastructure and data architecture to acquire and develop MDC2 capability; procure/lease a virtualized (cloud-based) data structure for all relevant information (mission data, business data, applications, enterprise services, etc.). Experiment, explore, and develop innovative C2 tools designed for multi-domain; multi-level security tools and capabilities to enhance C2 interoperability and data sharing for the 2030 and beyond fight. Utilize for program support and other activities that may include, but are not limited to experiments, infrastructure/architecture needs, coding, technical analysis, etc.								
FY 2019 Plans: See PE 0207410F, Air & Space Operations Center (AOC), Project Number 674596, AOC WS Modifications.								
FY 2020 Base Plans: - Continue to evolve the MDC2 capability through Agile DevOps development, integration, and test of progressively improving capabilities in support of mission requirements								

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Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development		R-1 Program Element (Number/Name) PE 0304115F I Multi Domain Command and Control (MDC2)				
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<div>- Conduct ShadowNet experimentation activities supporting MDC2; ShadowNet activities include Enterprise and Data management, operational assessments, and Air, Space, and Cyber hybrid nodes</div> <div>- Develop a common C2 backbone to enable MDC2; expand the capabilities of the Kessel Run platform into a MDC2 common platform in order to facilitate C2 capabilities development for any operational community (e.g., air, space, cyber, Intelligence, Surveillance and Reconnaissance (ISR), logistics, etc.)</div> <div>- Develop an MDC2 Enterprise Data Lake to support a common, relational database for Air Force C2 nodes in air, space, and cyberspace. Builds and updates the relational database to enable C2 nodes to virtualize data sets and support multi domain situation awareness for commanders</div> <div>FY 2020 OCO Plans: N/A</div> <div>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to transfer from PE 0207410F, Project Number 674596, and additional development efforts for ShadowNet experimentation, C2 Common Platform and Enterprise Data Lake.</div>						
<div>Title: MDC2 Test and Evaluation</div> <div>Description: MDC2 testing and test support activities.</div> <div>FY 2019 Plans: See PE 0207410F, Air & Space Operations Center (AOC), Project Number 674596, AOC WS Modifications.</div> <div>FY 2020 Base Plans: Continue to test operationalization of MDC2 capabilities.</div> <div>FY 2020 OCO Plans: N/A</div> <div>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to transfer from PE 0207410F, Project Number 674596.</div>		0.000	0.000	0.500	0.000	0.500
Accomplishments/Planned Programs Subtotals		0.000	0.000	150.880	0.000	150.880

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D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPAF 03 833140: <i>Strategic Command And Control</i>	0.000	0.000	2.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	2.000
Remarks											
E. Acquisition Strategy Employ advanced technology to rapidly experiment with future MDC2 concepts and capabilities. Inform on data enterprise, network, technical & acquisition policy, industry collaboration and Joint/coalition interoperability decisions. Leverage agile acquisition principles to field C2 systems on an operationally-relevant timeline in support of Multi Domain Operations (MDO).											
F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force												Date: February 2019			
Appropriation/Budget Activity 3600 / 7						R-1 Program Element (Number/Name) PE 0304115F / Multi Domain Command and Control (MDC2)				Project (Number/Name) 673380 / Multi Domain Command and Control (MDC2)					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MDC2 Development	Various	Various : Various	-	0.000		0.000		6.880	Apr 2020	-		6.880	Continuing	Continuing	-
MDC2 ShadowNet Experimentation	Various	Various : Various	-	0.000		0.000		36.000	Mar 2020	-		36.000	Continuing	Continuing	-
MDC2 C2 Common Platform	Various	Kessel Run : Hanscom AFB, MA	-	0.000		0.000		60.000	Jan 2020	-		60.000	Continuing	Continuing	-
MDC2 Enterprise Data Lake	Various	Various : Various	-	0.000		0.000		40.000	Apr 2020	-		40.000	Continuing	Continuing	-
Subtotal			-	0.000		0.000		142.880		-		142.880	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MDC2 Systems Engineering	Various	Various : Various	-	0.000		0.000		5.500	Dec 2019	-		5.500	Continuing	Continuing	-
Subtotal			-	0.000		0.000		5.500		-		5.500	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MDC2 Test and Evaluation	Various	Various : Hanscom AFB, MA	-	0.000		0.000		0.500	Dec 2019	-		0.500	Continuing	Continuing	-
Subtotal			-	0.000		0.000		0.500		-		0.500	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MDC2 Program Support Costs (PSC)	Various	Various : Various	-	0.000		0.000		2.000	May 2020	-		2.000	Continuing	Continuing	-

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Appropriation/Budget Activity 3600 / 7					R-1 Program Element (Number/Name) PE 0304115F / <i>Multi Domain Command and Control (MDC2)</i>					Project (Number/Name) 673380 / <i>Multi Domain Command and Control (MDC2)</i>				

Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			-	0.000		0.000		2.000		-		2.000	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	0.000	0.000	150.880	-	150.880	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force											Date: February 2019			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)					Project (Number/Name)				
3600 / 7					PE 0304115F / Multi Domain Command and Control (MDC2)					673380 / Multi Domain Command and Control (MDC2)				

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Multi Domain Command and Control (MDC2)																												
MDC2 Development																												
MDC2 ShadowNet Experimentation																												
MDC2 C2 Common Platform																												
MDC2 Enterprise Data Lake																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0304115F / Multi Domain Command and Control (MDC2)	Project (Number/Name) 673380 / Multi Domain Command and Control (MDC2)

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Multi Domain Command and Control (MDC2)				
MDC2 Development	1	2020	4	2024
MDC2 ShadowNet Experimentation	2	2020	4	2021
MDC2 C2 Common Platform	2	2020	4	2021
MDC2 Enterprise Data Lake	3	2020	4	2021