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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army **Date:** February 2018

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i>
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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	-	0.000	20.000	95.085	23.000	118.085	102.806	122.558	267.217	255.788	Continuing	Continuing
FI4: <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	-	0.000	20.000	95.085	23.000	118.085	102.806	122.558	267.217	255.788	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Army has a need to improve capabilities to defend maneuver formations and other tactical echelons from low altitude air attack and surveillance. Adaptive threats have developed a suite of airborne threat capabilities, supported by an integrated mix of surface-to-air and surface-to-surface shooters that threaten the ability of maneuver forces to conduct operations. Specifically, maneuver formations require improved air defense identification and defeat capabilities to counter Fixed Wing (FW), Rotary Wing (RW), Unmanned Aerial Systems (UAS) and Rocket Artillery and Mortar (RAM) threats.

This additional capability will be provided through a multi-phase approach that enables rapid fielding of an initial capability, culminating in a program of record that will field a full capability. Initially, the Army will field an interim M-SHORAD solution using an Army Senior Leader Directed Requirement, informed by an FY 2017 M-SHORAD Demonstration. The system or system-of-systems solution will provide the capability to identify, track, and neutralize or destroy low-altitude air threats to include Fixed Wing (FW), Rotary Wing (RW), and Group 1 - 3 Unmanned Aircraft Systems (UAS) while keeping pace and surviving with the maneuver Brigades. This interim solution will be fielded in up to three M-SHORAD battalions. The objective solution is needed to counter FW, RW, UAS, and indirect fires (RAM) threats. Both mounted and dismounted capabilities are required. As part of the objective solution, the 50 kilowatt laser will be assessed for possible transition from Science Technology to an objective M-SHORAD program in FY2022.

FY 2019 base and OCO dollars in the amount of \$118.085 million will continue the interim M-SHORAD capability development and integration of the identified solution into existing maneuver formation equipment. Efforts will include: complete fabrication of production representative articles; begin testing to achieve Urgent Materiel Release; and continue the development and finalization of the required program documentation.

Additionally, FY2019 funds will continue development of an objective M-SHORAD Family of Systems, to include: complete the objective M-SHORAD Family of Systems Analysis of Alternatives (AoA); complete development and approval of all Milestone A documentation; begin Concept Design Development for all M-SHORAD Family of Systems variants, and continue Contract Package development.

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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	20.000	0.000	-	0.000
Current President's Budget	0.000	20.000	95.085	23.000	118.085
Total Adjustments	0.000	0.000	95.085	23.000	118.085
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	95.085	23.000	118.085

Change Summary Explanation

FY2019 increases of \$95.085 (Base) and \$23.000M (OCO) were due to the realignment of funding from PE0604319A Project DU3 Indirect Fire Protection Capability Increment 2-Intercept (IFPC2).

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Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i>					Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>		
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
F14: <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	-	0.000	20.000	95.085	23.000	118.085	102.806	122.558	267.217	255.788	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Army has a need to improve capabilities to defend maneuver formations and other tactical echelons from low altitude air attack and surveillance. Adaptive threats have developed a suite of airborne threat capabilities, supported by an integrated mix of surface-to-air and surface-to-surface shooters that threaten the ability of maneuver forces to conduct operations. Specifically, maneuver formations require improved air defense identification and defeat capabilities to counter Fixed Wing (FW), Rotary Wing (RW), Unmanned Aerial Systems (UAS) and Rocket Artillery and Mortar (RAM) threats.

This additional capability will be provided through a multi-phase approach that enables rapid fielding of an initial capability, culminating in a program of record that will field a full capability. Initially, the Army will field an interim M-SHORAD solution using an Army Senior Leader Directed Requirement, informed by an FY 2017 M-SHORAD Demonstration. The system or system-of-systems solution will provide the capability to identify, track, and neutralize or destroy low-altitude air threats to include Fixed Wing (FW), Rotary Wing (RW), and Group 1 - 3 Unmanned Aircraft Systems (UAS) while keeping pace and surviving with the maneuver Brigades. This interim solution will be fielded in up to three M-SHORAD battalions. The objective solution is needed to counter FW, RW, UAS, and indirect fires (RAM) threats. Both mounted and dismounted capabilities are required. As part of the objective solution, the 50 kilowatt laser will be assessed for possible transition from Science and Technology to an objective M-SHORAD program in FY2022.

FY 2019 base dollars in the amount of \$95.085 million and FY 2019 OCO dollars in the amount of \$23.000 million will continue the interim M-SHORAD capability development and integration of the identified solution into existing maneuver formation equipment. Efforts will include: complete fabrication of production representative articles; begin testing to achieve Urgent Materiel Release; and continue the development and finalization of the required program documentation. Additionally, FY2019 funds will continue development of an objective M-SHORAD Family of Systems, to include: complete the objective M-SHORAD Family of Systems Analysis of Alternatives (AoA); complete development and approval of all Milestone A documentation; begin Concept Design Development for all M-SHORAD Family of Systems variants, and continue Contract Package development.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Interim Solution Materiel Development/Integration	-	15.000	85.085	23.000	108.085
Description: Funding is provided for the following efforts:					
FY 2018 Plans:					

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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i>	Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<ul style="list-style-type: none"> - Leveraged information gathered during the Maneuver - Short Range Air Defense (M-SHORAD) Demonstration to begin hardware/software modifications and integration of sensors and defeat mechanisms based on the Directed Requirement. - Prepared and approved the Demonstration Report - Formed the interim M-SHORAD team - Prepared documentation including the Acquisition Strategy, System Engineering Plan, Test and Evaluation Master Plan, Life-Cycle Sustainment Plan, and Information Support Plan. - Continued development of the Contract requirements - Began the fabrication of production representative articles for testing purposes. <p>FY 2019 Base Plans:</p> <ul style="list-style-type: none"> - Complete fabrication of production representative articles - Begin testing to achieve Urgent Materiel Release - Continue the development and finalization of the required program documentation <p>FY 2019 OCO Plans:</p> <ul style="list-style-type: none"> - Complete fabrication of production representative articles - Begin testing to achieve Urgent Materiel Release - Continue the development and finalization of the required program documentation <p>FY 2018 to FY 2019 Increase/Decrease Statement: The increase supports the cost of prototypes and testing in FY2019.</p>					
<p>Title: Objective Family of Systems Development/Integration</p> <p>Description: Funding is provided for the following efforts:</p> <p>FY 2018 Plans:</p> <ul style="list-style-type: none"> - Began Product Office staffing - Began Contract Package development - Developed the Analysis of Alternatives (AoA) Study Guidance and Plan - Began development of the objective M-SHORAD Family of Systems AoA. - Funded the Validated On-Line Life-Cycle Threat (VOLT) - Conducted Market Research - Conducted the Affordability Analysis - Conducted the objective M-SHORAD Milestone Development Decision 	-	5.000	10.000	-	10.000

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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i>	Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Began development of the Milestone A Regulatory and Statutory documentation to include the Acquisition Strategy, Clinger-Cohen Act Compliance, Concept of Operations/Operational Mode Summary/Mission Profile, Core Logistics Determination/Core Logistics and Sustaining Workloads Estimate, Cyber Security Strategy, Life-Cycle Cost Estimate, and Life-Cycle Sustainment Plan					
<i>FY 2019 Base Plans:</i>					
- Conduct activities in support of the Materiel Solutions Analysis Phase (pre-Milestone A)					
- Continue Contract Package development					
- Complete the objective M-SHORAD Family of Systems AoA					
- Complete development and approval of all Milestone A Regulatory and Statutory documentation					
- Begin Concept Design Development for all M-SHORAD Family of Systems variants					
<i>FY 2018 to FY 2019 Increase/Decrease Statement:</i>					
The increase supports the initiation of the Materiel Solutions Phase.					
Accomplishments/Planned Programs Subtotals	-	20.000	95.085	23.000	118.085

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2019 Base</u>	<u>FY 2019 OCO</u>	<u>FY 2019 Total</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• CE8710: AVENGER MODS	35.979	62.931	48.670	-	48.670	86.807	165.928	454.994	291.600	0.000	1,146.909

Remarks
M-SHORAD procurement is funded through CE8710 (FY2020-FY2023).

D. Acquisition Strategy
Multi-phase approach using the Maneuver Short Range Air Defense (M-SHORAD) Demonstration as the initial basis to identify near-term interim solutions. The acquisition strategy is to use an Other Transactional Authority (OTA) contract for the purchase of 12 interim solution prototypes according to the content of the directed requirement.

The objective M-SHORAD Family of Systems Product Office sought a Materiel Development Decision in 2QFY2018. The M-SHORAD Family of Systems Product Office plans to conduct a Milestone A and award funds in 2QFY2020 for the competitive development of each M-SHORAD variant with a demonstration of variants from multiple vendors during Technology Maturation and Risk Reduction with a down-select in FY2021. Milestone B is planned for 2QFY2022.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army												Date: February 2018			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604117A / Short Range Air Defense (M-SHORAD)				F14 I Maneuver - Short Range Air Defense (M-SHORAD)							
Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
Product Management	PO	Trident, Intuitive Research and others : Huntsville, Alabama	-	-		2.255		3.095	Mar 2018	-		3.095	Continuing	Continuing	Continuing
Subtotal			-	-		2.255		3.095		-		3.095	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
System Engineering and Integration	C/CPIF	TBD : TBD	-	-		1.517		6.522	Jun 2019	-		6.522	Continuing	Continuing	Continuing
Engineering and Technical Support	MIPR	Aviation and Missiles Research Development and Engineering Center : Redstone Arsenal, AL	-	-		0.491		3.010	Jun 2019	-		3.010	Continuing	Continuing	Continuing
System Development and Integration	C/CPIF	TBD : TBD	-	-		13.171		69.821	Jun 2019	23.000	Jun 2019	92.821	Continuing	Continuing	Continuing
Subtotal			-	-		15.179		79.353		23.000		102.353	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
Support Costs	MIPR	Aviation and Missiles Command (AMCOM) : Redstone Arsenal, AL	-	-		0.758		3.960	Mar 2018	-		3.960	Continuing	Continuing	Continuing
Subtotal			-	-		0.758		3.960		-		3.960	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
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Event Name	FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				
	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	
Directed Requirement					▲ 1	Directed Requirement																							
Interim Solution Material Development/Integration									Interim Solution Material Development/Integration																				
Interim Solution Initial Operational Capability (IOC)																					▲ 4	Interim Solution IOC							
Objective M-SHORAD Materiel Development Decision									▲ 2	Objective M-SHORAD MDD																			
Objective M-SHORAD Materiel Solution Analysis									Objective M-SHORAD Materiel Solution Analysis																				
Objective M-SHORAD Milestone A													▲ 3	Objective M-SHORAD Milestone A															
Objective M-SHORAD Technical Maturity and Risk Reduction																	Objective M-SHORAD TMRR												
Objective M-SHORAD Milestone B																					▲ 5	Objective M-SHORAD Milestone B							
Objective M-SHORAD Milestone Engineering Manufacturing Development																									Objective M-SHORAD EMD				

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i>	Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Directed Requirement	2	2018	2	2018
Interim Solution Material Development/Integration	2	2018	2	2020
Interim Solution Initial Operational Capability (IOC)	4	2021	4	2021
Objective M-SHORAD Materiel Development Decision	2	2018	2	2018
Objective M-SHORAD Materiel Solution Analysis	2	2018	1	2020
Objective M-SHORAD Milestone A	1	2020	1	2020
Objective M-SHORAD Technical Maturity and Risk Reduction	1	2020	2	2022
Objective M-SHORAD Milestone B	2	2022	2	2022
Objective M-SHORAD Milestone Engineering Manufacturing Development	2	2022	4	2024