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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0203802A / <i>Other Missile Product Improvement Programs</i>
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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	-	-	15.268	10.265	-	10.265	-	-	-	-	-	-
VT9: <i>Lethal Miniature Aerial Missile System (LMAMS)</i>	-	-	2.300	1.800	-	1.800	-	-	-	-	-	-
VV2: <i>TOW</i>	-	-	12.968	8.465	-	8.465	-	-	-	-	-	-

Program MDAP/MAIS Code: PRE

A. Mission Description and Budget Item Justification

VT9: The Fiscal Year (FY) 2022 Direct War/Enduring Operations dollars in the amount of \$1.800 million will continue to support the Lethal Miniature Aerial Missile System (LMAMS). LMAMS is a single man-portable/operable, light-weight organic, beyond line-of-sight, precision guided, loitering aerial missile system capable of locating and engaging obscured and/or fleeing enemy targets that otherwise cannot be engaged by typical direct fire weapon systems.

Funding supports engineering and integration of capability improvements identified by trained operators during an Assessment of Operational Utility (AOU) conducted in 2018. Once integrated into the current LMAMS, Production Verification Testing will be conducted to demonstrate successful incorporation of new technology.

VV2: TOW Weapon System includes the Improved Target Acquisition System (ITAS) and other TOW missile launchers, TOW missiles (BGM-71 series) and other missiles capable of being fired from TOW Missile launchers, and associated tactical training aids/devices. The TOW Weapon System provides long-range, lethal anti-armor and precision assault fires capability for Army Infantry Brigade Combat Teams (IBCT), Stryker Brigade Combat Teams (SBCT) and Armor Brigade Combat Teams (ABCT) within the Active, Reserve, and National Guard components. The United States Marine Corps (USMC) employs the TOW missile from its ITAS derived M41A7 Saber launchers and ATGM vehicles.

The TOW Weapon System improvement program integrates US Army missile and launcher modifications to improve missile safety and reliability, increase system survivability and lethality, and enhance system network capabilities. These capability improvements support Multi-Domain Operations (MDO) as a part of Joint All Domain Operations (JADO) and the Functional Concept for Movement and Maneuver by providing precise lethal capabilities in multiple domains against armored threat systems.

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0203802A / <i>Other Missile Product Improvement Programs</i>
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B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	81.724	54.548	-	54.548
Current President's Budget	0.000	15.268	10.265	-	10.265
Total Adjustments	0.000	-66.456	-44.283	-	-44.283
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-65.837			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-0.619			
• Adjustments to Budget Years	-	-	-44.283	-	-44.283

Change Summary Explanation

\$44.283 million of the base funding adjustment in FY 2022 due to Army decision to not transition CD ATACMS, ATACMS Mods (Program Element (PE) 0203802A Other Missile Product Improvement Programs Project DZ9 ATACMS Mods).

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / Other Missile Product Improvement Programs	Project (Number/Name) VT9 / Lethal Miniature Aerial Missile System (LMAMS)
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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
VT9: Lethal Miniature Aerial Missile System (LMAMS)	-	-	2.300	1.800	-	1.800	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

VT9: Lethal Miniature Aerial Missile System (LMAMS) is a single man-portable/operable, light-weight organic, beyond line-of-sight, precision guided, loitering aerial missile system capable of locating and engaging obscured and/or fleeing enemy targets that otherwise cannot be engaged by typical direct fire weapon systems.

Funding supports engineering and integration of capability improvements identified by trained operators during an Assessment of Operational Utility (AOU) conducted in 2018. Once integrated into the current LMAMS, Production Verification Testing will be conducted to demonstrate successful incorporation of new technology.

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

	FY 2020	FY 2021	FY 2022
Title: LMAMS Capability Improvements	-	2.300	1.800
Description: Joint Urgent Operational Need (JUON) User Required Capability Improvements supporting CC-0556.			
FY 2021 Plans: Develop Improved Datalink to include waveform development and improving anti-jam performance.			
FY 2022 Plans: Complete development of an improved datalink capable of integration into an LMAMS solution.			
FY 2021 to FY 2022 Increase/Decrease Statement: FY21 funding continues the development of the improved datalink efforts and FY22 funding completes the development and includes the integration into an LMAMS solution.			
Accomplishments/Planned Programs Subtotals	-	2.300	1.800

C. Other Program Funding Summary (\$ in Millions)

Line Item	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
• C88001: LETHAL MINIATURE AERIAL MISSILE SYSTEM (LMAMS)	48.300	-	68.278	-	68.278	-	-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / <i>Other Missile Product Improvement Programs</i>	Project (Number/Name) VT9 / <i>Lethal Miniature Aerial Missile System (LMAMS)</i>

C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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Remarks

D. Acquisition Strategy

The Research, Development, Test and Evaluation (RDTE) funding will continue the development and integration of the improved datalink initiated by Combat Capabilities Development Center, Aviation and Missile Command (CCDC AvMC) and transitioned to the Tactical Aviation and Ground Munitions Project Office. LMAMS procurement acquisition will be competed using Other Transaction Authority (OTA) that will begin in FY21. The improved datalink will be incorporated into the LMAMS solution.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army												Date: May 2021			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 7				PE 0203802A / Other Missile Product Improvement Programs				VT9 / Lethal Miniature Aerial Missile System (LMAMS)							
Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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 / Program Management	MIPR	CCDC AvMC : Redstone Arsenal, AL	-	-		0.193	Apr 2021	0.163	Jan 2022	-		0.163	0.000	0.356	-
Subtotal			-	-		0.193		0.163		-		0.163	0.000	0.356	N/A
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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 Development	MIPR	CCDC AvMC : Redstone Arsenal, AL	-	-		2.061	May 2021	0.986	Jun 2022	-		0.986	0.000	3.047	-
Technology Integration	SS/CPFF	TBD : TBD	-	-		-		0.500	Jun 2022	-		0.500	0.000	0.500	-
Subtotal			-	-		2.061		1.486		-		1.486	0.000	3.547	N/A
Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
Component Level Product Verification Testing	MIPR	Dugway Proving Grounds : Dugway, UT	-	-		0.046	Nov 2021	-		-		-	0.000	0.046	-
System Level Product Verification Testing	MIPR	Dugway Proving Grounds : Dugway, UT	-	-		-		0.151	Sep 2022	-		0.151	0.000	0.151	-
Subtotal			-	-		0.046		0.151		-		0.151	0.000	0.197	N/A
Project Cost Totals			-	-		2.300		1.800		-		1.800	0.000	4.100	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army			Date: May 2021		
Appropriation/Budget Activity 2040 / 7		R-1 Program Element (Number/Name) PE 0203802A / Other Missile Product Improvement Programs		Project (Number/Name) VT9 / Lethal Miniature Aerial Missile System (LMAMS)	

Event Name	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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
Product Development																												
Component Level Product Verification Testing																												
Technology Integration																												
System Level Production Verification Testing																												
Engineering Change Proposal Incorporation																					▲ 1							

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / <i>Other Missile Product Improvement Programs</i>	Project (Number/Name) VT9 / <i>Lethal Miniature Aerial Missile System (LMAMS)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Product Development	3	2021	3	2022
Component Level Product Verification Testing	1	2022	3	2022
Technology Integration	3	2022	1	2023
System Level Production Verification Testing	4	2022	2	2023
Engineering Change Proposal Incorporation	3	2023	3	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / Other Missile Product Improvement Programs	Project (Number/Name) VV2 / TOW
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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
VV2: TOW	-	-	12.968	8.465	-	8.465	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

VV2: TOW Weapon System includes the Improved Target Acquisition System (ITAS) and other TOW missile launchers, TOW missiles (BGM-71 series) and other missiles capable of being fired from TOW Missile launchers, and associated tactical training aids/devices. The TOW Weapon System provides long-range, lethal anti-armor and precision assault fires capability for Army Infantry Brigade Combat Teams (IBCT), Stryker Brigade Combat Teams (SBCT) and Armor Brigade Combat Teams (ABCT) within the Active, Reserve, and National Guard components. The United States Marine Corps (USMC) employs the TOW missile from its ITAS derived M41A7 Saber launchers and ATGM vehicles.

The TOW Weapon System improvement program integrates US Army missile and launcher modifications to improve missile safety and reliability, increase system survivability and lethality, and enhance system network capabilities. These capability improvements support Multi-Domain Operations (MDO) as a part of Joint All Domain Operations (JADO) and the Functional Concept for Movement and Maneuver by providing precise lethal capabilities in multiple domains against armored threat systems.

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

	FY 2020	FY 2021	FY 2022
<p>Title: TOW Missile Obsolescence Mitigation and System Improvements</p> <p>Description: These funds will be used for development and qualification of new components, parts, and sub-systems to replace technology and production obsolete components, parts, and sub-systems. These components will be cut into production via Engineering Change Proposal upon qualification.</p> <p>FY 2021 Plans: Initiate TOW Missile Obsolescence Mitigation for critical components required to maintain TOW Missile Production. Initiate Radio Frequency (RF) Data Link (DL) receiver and transmitter development and optimization, component design engineering for the Missile Computer (MC) and Short Wave Infra-Red (SWIR) beacon, missile system specification development, missile system integration engineering, and initiate missile system level technical data package.</p> <p>FY 2022 Plans: Implement the design engineering of the RF DL, MC, and SWIR beacon, and required software to facilitate integration into a tactical system. Build and test components at the component and sub-system level. FY22 engineering efforts culminate in the completion of Design Engineering and a Component Critical Design Review in 1QFY23.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement:</p>	-	12.968	7.693

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
The decrease in funds from FY2021 to FY2022 is due to change in plans for system level integration of components required for TOW Missile obsolescence mitigation.			
Title: Integration and Counter Measure/Threat management	-	-	0.772
Description: These funds will be used to prepare and perform technical assessments, threat analysis, concept studies, demonstrations, tests and risk mitigation efforts to address current and emerging threats.			
FY 2022 Plans: Perform technical assessments, analysis and testing of TOW Missiles against various targets to demonstrate current and required capabilities.			
FY 2021 to FY 2022 Increase/Decrease Statement: Funding increase from FY21 to FY22 due to requirements for concept studies and government testing.			
Accomplishments/Planned Programs Subtotals	-	12.968	8.465

C. Other Program Funding Summary (\$ in Millions)											
Line Item	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
• C59300: TOW 2 System Summary	118.458	112.974	104.412	-	104.412	-	-	-	-	-	-
• C61700: ITAS/TOW Mods	3.469	5.666	4.561	-	4.561	-	-	-	-	-	-

Remarks

D. Acquisition Strategy
TOW Missile obsolescence mitigation design engineering, component hardware build, and component systems integration will be conducted via sole source contracts to Raytheon Missiles and Defense (RMD) as the current TOW Missile Prime contractor and only source that is both facilitated and qualified to produce all TOW Missile configurations.

The Acquisition Strategy uses in-house expertise, Other Government Agencies (OGA), defense industry capabilities, and when appropriate Other Transactional Agreements. The strategy allows the Government the ability to support urgent operational needs and unanticipated requirements, which require immediate and expert attention. This strategy will allow the Government to maintain the TOW Weapon System, and posture for emerging requirements while leveraging new authorities and bringing along as many technologies as funding allows.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army												Date: May 2021				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 7				PE 0203802A / Other Missile Product Improvement Programs				VV2 / TOW								
Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	
Systems Engr/Program Management, Govt	MIPR	Multiple : Redstone Arsenal, AL	-	-		1.359	Apr 2021	1.223	Mar 2022	-		1.223	0.000	2.582	-	
Subtotal			-	-		1.359		1.223		-		1.223	0.000	2.582	N/A	
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	
Component Design Engineering	SS/CPFF	Raytheon : Tucson, AZ	-	-		11.609	Apr 2021	1.933	Mar 2022	-		1.933	0.000	13.542	-	
Component Hardware Build	SS/CPFF	Raytheon : Tucson, AZ	-	-		-		3.129	Jan 2022	-		3.129	0.000	3.129	-	
Integration and Counter Measure/Threat management	Various	Various : Various	-	-		-		0.653	Jan 2022	-		0.653	0.000	0.653	-	
Subtotal			-	-		11.609		5.715		-		5.715	0.000	17.324	N/A	
Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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	
Component/System Test and Evaluation	SS/CPFF	Raytheon : Tucson, AZ	-	-		-		1.527	Mar 2022	-		1.527	0.000	1.527	-	
Subtotal			-	-		-		1.527		-		1.527	0.000	1.527	N/A	
Project Cost Totals			-	-		12.968		8.465		-		8.465	0.000	21.433	N/A	
Remarks																

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / Other Missile Product Improvement Programs	Project (Number/Name) VV2 / TOW	

Event Name	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026							
	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				
Component Design Engineering									████████████████████																							
Component Hardware Build													██████████																			
Component Testing																	██████████															
Component Critical Design Review																					▲											
Integration and Counter Measure / Threat Management																	████████████████████															

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army		Date: May 2021
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Component Design Engineering	2	2021	1	2023
Component Hardware Build	2	2022	4	2022
Component Testing	3	2022	1	2023
Component Critical Design Review	1	2023	1	2023
Integration and Counter Measure / Threat Management	2	2022	2	2023