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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	15.268	10.265	9.027	-	9.027	0.000	0.000	0.000	0.000	0.000	34.560
VT9: <i>Lethal Miniature Aerial Missile System (LMAMS)</i>	-	2.300	1.800	-	-	-	-	-	-	-	0.000	4.100
VV2: <i>TOW</i>	-	12.968	8.465	9.027	-	9.027	-	-	-	-	0.000	30.460

Program MDAP/MAIS Code: PRE

A. Mission Description and Budget Item Justification

A portion of this funding line is a key enabler of the Army Modernization Priorities in support of the Next-Generation Anti-Tank Guided Missile program..

VT9: 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.

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.

FY23 funding in the amount of \$9.027M is for TOW missile obsolescence mitigation, system improvements, and integration and countermeasure/threat management.

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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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	15.268	10.265	0.000	-	0.000
Current President's Budget	15.268	10.265	9.027	-	9.027
Total Adjustments	0.000	0.000	9.027	-	9.027
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	9.027	-	9.027

Change Summary Explanation

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
VT9: Lethal Miniature Aerial Missile System (LMAMS)	-	2.300	1.800	-	-	-	-	-	-	-	0.000	4.100
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

VT9: 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.

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

	FY 2021	FY 2022	FY 2023
Title: LMAMS Capability Improvements	2.300	1.800	-
Description: Joint Urgent Operational Need (JUON) User Required Capability Improvements supporting CC-0556.			
FY 2022 Plans: Complete development of an improved datalink capable of integration into an LMAMS solution.			
FY 2022 to FY 2023 Increase/Decrease Statement: No additional funding required after FY22 to complete data link integration.			
Accomplishments/Planned Programs Subtotals			-

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

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• C88001: LETHAL MINIATURE AERIAL MISSILE SYSTEM (LMAMS)	-	61.408	37.937	-	37.937	-	-	-	-	0.000	99.345

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army												Date: April 2022			
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 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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	May 2022	-		-		-	0.000	0.356	-
Subtotal			-	0.193		0.163		-		-		-	0.000	0.356	N/A
Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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	-		-		-	0.000	3.047	-
Technology Integration	SS/CPFF	TBD : TBD	-	-		0.500	Jun 2022	-		-		-	0.000	0.500	-
Subtotal			-	2.061		1.486		-		-		-	0.000	3.547	N/A
Test and Evaluation (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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	-		-		-	0.000	0.151	-
Subtotal			-	0.046		0.151		-		-		-	0.000	0.197	N/A
Project Cost Totals			-	2.300		1.800		-		-		-	0.000	4.100	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army			Date: April 2022		
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 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	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																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
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 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 7					R-1 Program Element (Number/Name) PE 0203802A / Other Missile Product Improvement Programs				Project (Number/Name) VV2 / TOW			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
VV2: TOW	-	12.968	8.465	9.027	-	9.027	-	-	-	-	0.000	30.460
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.

FY23 funding in the amount of \$9.027M is for TOW missile obsolescence mitigation, system improvements, and integration and countermeasure/threat management.

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

	FY 2021	FY 2022	FY 2023
Title: TOW Missile Obsolescence Mitigation and System Improvements	12.968	7.384	8.540
Description: These funds will be used for development and qualification of new components, associated parts, and sub-systems such as the Radio Frequency Data-Link (RF DL), Missile Computer (MC), and Short Wave Infra-Red (SWIR) beacon. These components will be cut into production via Engineering Change Proposal upon qualification.			
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.			
FY 2023 Plans: Resolve potential issues uncovered in the CDR or component testing. Build components and hardware at the system level and complete component level testing. Hardware funded in FY23 will validate producibility of previously designed and tested components. Enable warhead improvements to keep pace with emerging threats as			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / Other Missile Product Improvement Programs	Project (Number/Name) VV2 / TOW

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
determined by threat assessments and analysis.			
FY 2022 to FY 2023 Increase/Decrease Statement: The increase in funds from FY2022 to FY2023 is due to an increase in requirements to validate producibility of previously designed and tested components for TOW Missile obsolescence mitigation, and an adjustment for inflation in FY23 in the amount of \$316K.			
Title: Integration and Counter Measure/Threat management 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 2023 Plans: Perform technical assessments, analysis and testing of missiles against various targets to demonstrate current and future capabilities. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease from FY22 to FY23 due to reduced requirements for concept studies and government testing.	-	0.772	0.487
Title: SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC 638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC 638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 638	-	0.309	-
Accomplishments/Planned Programs Subtotals	12.968	8.465	9.027

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u> <u>Base</u>	<u>FY 2023</u> <u>OCO</u>	<u>FY 2023</u> <u>Total</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• C59300: TOW 2 System Summary	112.974	101.912	105.423	-	105.423	122.602	124.577	124.461	124.491	0.000	816.440
• C61700: ITAS/TOW Mods	5.666	4.561	5.154	-	5.154	-	-	-	-	0.000	15.381

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

<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u> <u>Base</u>	<u>FY 2023</u> <u>OCO</u>	<u>FY 2023</u> <u>Total</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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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 facilitized 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 allows the Government to maintain TOW Weapon System effectiveness and posture for emerging requirements while leveraging new authorities and incorporating new technologies.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army **Date:** April 2022

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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Management Services (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Systems Engr/Program Management, Govt	MIPR	Multiple : Redstone Arsenal, AL	-	1.359	Apr 2021	0.914	Jun 2022	0.792	Jan 2023	-		0.792	0.000	3.065	-
SBIR/STTR Transfer	TBD	Various : Various	-	-		0.309		-		-		-	0.000	0.309	-
Subtotal			-	1.359		1.223		0.792		-		0.792	0.000	3.374	N/A

Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Component Design Engineering	SS/CPFF	Raytheon : Tucson, AZ	-	11.609	Apr 2021	1.933	Jun 2022	0.524	Jan 2023	-		0.524	0.000	14.066	-
Component Hardware Build	SS/CPFF	Raytheon : Tucson, AZ	-	-		3.129	May 2022	4.993	Jan 2023	-		4.993	0.000	8.122	-
Integration and Counter Measure/Threat management	Various	Various : Various	-	-		0.653	May 2022	0.428	Jan 2023	-		0.428	0.000	1.081	-
Subtotal			-	11.609		5.715		5.945		-		5.945	0.000	23.269	N/A

Test and Evaluation (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Component/System Test and Evaluation	SS/CPFF	Raytheon : Tucson, AZ	-	-		1.527	Jun 2022	2.290	Jan 2023	-		2.290	0.000	3.817	-
Subtotal			-	-		1.527		2.290		-		2.290	0.000	3.817	N/A

	Prior Years	FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract												
		Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost															
Project Cost Totals													-	12.968		8.465		9.027		-		9.027	0.000	30.460	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army			Date: April 2022
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 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	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 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203802A / <i>Other Missile Product Improvement Programs</i>	Project (Number/Name) VV2 / TOW

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Component Design Engineering	2	2021	1	2024
Component Hardware Build	2	2022	4	2023
Component Testing	3	2022	1	2024
Component Critical Design Review	1	2023	1	2023
Integration and Counter Measure / Threat Management	2	2022	2	2024