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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 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</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	-	18.278	-	-	-	-	0.000	0.000	0.000	0.000	0.000	18.278
L86: <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>	-	5.179	-	-	-	-	-	-	-	-	0.000	5.179
L88: <i>Enhanced AN/TPQ 36</i>	-	13.099	-	-	-	-	-	-	-	-	0.000	13.099

A. Mission Description and Budget Item Justification

The Research Development Test & Evaluation (RDT&E) funds for the AN/TPQ-50 and AN/TPQ-53 programs fund the design, development and test of primary efforts. The programs directly support the prioritization, tracking and locating of targets, and dissemination of that information for simultaneous attack of multiple threats. They provide the Warfighter with continuous and responsive counterfire target acquisition systems for all types and phases of military operations. Project L86, Lightweight Counter Mortar Radar (LCMR), version AN/TPQ-50 provides 360 degrees of azimuth coverage from ranges of 500 meters to 10 kilometers. Project L88, AN/TPQ-53 is a highly mobile radar system that leverages the latest in technology design to accelerate modernization and increase range while improving false location rate, reducing obsolescence and increasing reliability. The AN/TPQ-53 provides a system with increased range and accuracy throughout a 90 degree search sector (stare mode) as well as 360 degree coverage (rotating) for locating mortar, artillery and rocket firing positions. The AN/TPQ-50 and AN/TPQ-53 radars are currently fielded to multiple Continental United States (CONUS) and Outside Continental United States (OCONUS) locations to include operational support to Operation Inherent Resolve (OIR) and Operation Freedom's Sentinel (OFS).

B. Program Change Summary (\$ in Millions)

	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023 Base</u>	<u>FY 2023 OCO</u>	<u>FY 2023 Total</u>
Previous President's Budget	18.278	0.000	0.000	-	0.000
Current President's Budget	18.278	0.000	0.000	-	0.000
Total Adjustments	0.000	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>				Project (Number/Name) L86 / <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>			
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
L86: <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>	-	5.179	-	-	-	-	-	-	-	-	0.000	5.179
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The AN/TPQ-50 Lightweight Counter Mortar Radar (LCMR) is a highly mobile radar that automatically detects, classifies, tracks, and locates the point of origin of projectiles fired from mortar, artillery, and rocket systems with sufficient accuracy for first round fire for effect. It mitigates close combat radar coverage gaps by providing 360 degrees of azimuth coverage from ranges of 500 meters to 10 kilometers and is capable of being deployed in two configurations, standalone or vehicle mounted. The AN/TPQ-50 system interoperates with mission command systems to provide the maneuver commander increased counterfire radar flexibility. The AN/TPQ-50 is deployed as part of the Counter-Rocket, Artillery, Mortar (C-RAM) system of systems. It provides data to the Forward Area Air Defense Command and Control (FAAD C2) node for the sense and warn force protection capability. The AN/TPQ-50 is currently fielded to multiple Continental United States (CONUS) and Outside Continental United States (OCONUS) locations including support to Operation Inherent Resolve (OIR), Operation Freedom's Sentinel (OFS), and Joint Urgent Operational Need (JUON) 0558 which provides simultaneous air surveillance and counter target acquisition (CTA) capabilities .

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

	FY 2021	FY 2022	FY 2023
Title: Modernization & Emerging Threats	5.179	-	-
Description: Funding supports software updates required to address electronic protection and mitigate the effects of electromagnetic interference (EMI) and combat CEMA. These capabilities address vulnerabilities identified in the bi-annual release of the VOLT and changes on the battlefield due to new tactics, techniques, and procedures (TTPs) and/or areas of operation.			
Accomplishments/Planned Programs Subtotals	5.179	-	-

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
• B05201: <i>Lightweight Counter Mortar Radar</i>	5.332	-	0.000	-	0.000	-	-	-	-	0.000	5.332

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>	Project (Number/Name) L86 / <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>

D. Acquisition Strategy

The AN/TPQ-50 Lightweight Counter Mortar Radar was developed in 2009 to meet Training and Doctrine Command (TRADOC) Capabilities Production Document (CPD) requirements. The program achieved a full rate production (FRP) decision on 21 June 2013. The AAO increased from 400 to 452 systems in January 2019; 400 systems procured to date. The AN/TPQ-50 program transitioned into the sustainment phase on 1 October 2019.

Research, Development, Test and Evaluation (RDT&E) funding supports modernization development task orders under the national maintenance contract (NMC).

The FY 2021 funds of \$5.179 million continue development required to address electronic protection against CEMA and threats identified in Validated Online Lifecycle Threat (VOLT) report. This funding enables the program to develop and integrate sensor protect capabilities into the software baseline, develop advanced protection techniques which take advantage of hardware upgrades, and develop documentation for hardware and software capability improvements in support of multi-domain operations to address peer and near-peer threats. Funding supports associated test costs and program support.

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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 / 5				PE 0604823A / Firefinder				L86 / LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)								
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	
Program Management (Government Support)	Various	Various : Activities	2.541	0.624	Feb 2021	-		-		-		-	0.000	3.165	-	
Program Management (Contractor Support)	C/CPFF	Various : APG, MD	0.979	1.164		-		-		-		-	0.000	2.143	-	
Subtotal			3.520	1.788		-		-		-		-	0.000	5.308	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	
Modernization & New and Emerging Threats	SS/CPFF	Various : Various	10.257	1.431	Jan 2021	-		-		-		-	0.000	11.688	-	
Subtotal			10.257	1.431		-		-		-		-	0.000	11.688	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	
Test Support (Government)	Various	Various : Activities	6.511	1.960	Nov 2021	-		-		-		-	0.000	8.471	-	
Subtotal			6.511	1.960		-		-		-		-	0.000	8.471	N/A	
Project Cost Totals			20.288	5.179		-		-		-		-	0.000	25.467	N/A	
Remarks																

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army			Date: April 2022		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>		Project (Number/Name) L86 / <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>	

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
Modernization and Emerging Threats - Fiscal Year FY 2019 VOLT	████████																											
Modernization Testing - FY 2019 VOLT					████████																							
Modernization, Emerging Threats, and Testing - FY 2021 VOLT	████████				████████																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>	Project (Number/Name) L86 / <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Modernization and Emerging Threats - Fiscal Year FY 2019 VOLT	1	2019	1	2021
Modernization Testing - FY 2019 VOLT	1	2020	1	2022
Modernization, Emerging Threats, and Testing - FY 2021 VOLT	1	2021	4	2022

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Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>				Project (Number/Name) L88 / <i>Enhanced AN/TPQ 36</i>			
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
L88: <i>Enhanced AN/TPQ 36</i>	-	13.099	-	-	-	-	-	-	-	-	0.000	13.099
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Enhanced AN/TPQ-36 (AN/TPQ-53) Counterfire Target Acquisition Radar System is a highly mobile radar set that automatically detects, classifies, tracks, and locates the point of origin of projectiles fired from mortar, artillery, and rocket systems with sufficient accuracy for first round fire for effect. It mitigates close combat radar coverage gaps by providing a 90 degree search sector (stare mode) as well as 360 degree coverage (rotating) and replaces the AN/TPQ-36 and AN/TPQ-37 Firefinder Radars. The AN/TPQ-53 system interoperates with mission command systems to provide the maneuver commander increased counterfire radar flexibility. The AN/TPQ-53 is deployed as part of the Counter-Rocket, Artillery, Mortar (C-RAM) system of systems. It provides data to the Forward Area Air Defense Command and Control (FAAD C2) node for the sense and warn force protection capability. The AN/TPQ-53 currently supports contingency operations to include Operation Inherent Resolve (OIR) and is fielded to Brigade Combat Teams (BCTs), Field Artillery Brigades (FABs) and Division Artilleries (DIVARTYs).

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

	FY 2021	FY 2022	FY 2023
Title: Electronic Protection and Emerging Threats	8.579	-	-
Description: This effort improves spectrum management and mitigates electromagnetic interference (EMI) from commercial and military bands. This effort also develops and improves radar electronic protection (EP) algorithms which counter electronic threats. Lastly, this effort funds the development of capabilities to address emerging threats identified in the biennial release of the Validated Online Lifecycle Threat (VOLT) report and changes on the battlefield due to new adversarial tactics, techniques, and procedures (TTPs) and/or areas of operation.			
Title: Extended Range	0.959	-	-
Description: This effort extends the radar's detection and identification range through associated development, integration, and testing in support of the Army's number one modernization priority of long range precision fires (LRPF).			
Title: Test support	3.139	-	-
Description: Funding supports associated program test costs.			
Title: Program Management Support	0.422	-	-
Description: Funding supports associated Program Management Office (PMO) requirements.			
Accomplishments/Planned Programs Subtotals	13.099	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / Firefinder	Project (Number/Name) L88 / Enhanced AN/TPQ 36
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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
• B05310: AN/TPQ-53 Counterfire Target Acquisition Radar	71.404	-	91.233	-	91.233	-	-	-	-	Continuing	Continuing
• BA5315: AN/TPQ-53 MOD-IN-SERVICE LINE	-	26.694	70.975	-	70.975	101.825	119.283	120.089	120.035	Continuing	Continuing
• 0607148A: AN/TPQ-53 Counterfire Target Acquisition Radar System	-	47.752	62.559	-	62.559	55.312	33.874	8.737	8.822	Continuing	Continuing

Remarks

D. Acquisition Strategy

The AN/TPQ-53 leverages technology developed in the multi-mission radar advanced technology objective (ATO) program. The system replaces all of the AN/TPQ-36 and AN/TPQ-37 systems in the fleet. The program obtained a Full Rate Production (FRP) decision in December 2015 and awarded an FRP contract in March 2017. The program will retrofit all initial production systems to the FRP configuration. The Army Acquisition Objective (AAO) increased from 174 to 189 systems in May 2017. Following the approval of a new acquisition category (ACAT) IC acquisition program baseline (APB) in April 2019, the program procured the last 15 FRP systems on contract in the same month. The Army approved a Total Army Analysis (TAA) force structure change in FY 2020.

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

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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			
Program Management (Government)	Various	Various : Various	3.259	0.422	Jan 2021	-		-		-		-	0.000	3.681	-
Program Management (Contractor)	Various	Various : APG, MD	4.814	-		-		-		-		-	0.000	4.814	-
Subtotal			8.073	0.422		-		-		-		-	0.000	8.495	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			
Electronic Protection and Emerging Threats	SS/FPIF	Lockheed Martin : Syracuse, NY	9.072	8.579	Oct 2020	-		-		-		-	0.000	17.651	-
Extended Range	SS/FPIF	Lockheed Martin : Syracuse, NY	13.623	0.959	Dec 2020	-		-		-		-	0.000	14.582	-
Subtotal			22.695	9.538		-		-		-		-	0.000	32.233	N/A

Support (\$ 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			
Program Support	SS/CPFF	Georgia Tech Research Institute (GTRI) : Atlanta, GA	1.926	-		-		-		-		-	0.000	1.926	-
Subtotal			1.926	-		-		-		-		-	0.000	1.926	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			
Test Support	Various	Various : Activities	56.812	3.139	Oct 2020	-		-		-		-	0.000	59.951	-
Subtotal			56.812	3.139		-		-		-		-	0.000	59.951	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>	Project (Number/Name) L88 / <i>Enhanced AN/TPQ 36</i>
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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
Extended Range (ER)																												
ER Testing																												
ER Limited Operational Test																												
EP and Emerging Threats - Fiscal Year (FY) 2019 VOLT																												
Modernization Testing - FY 2019 VOLT																												
EP, Emerging Threats, and Modernization Testing - FY 2021 VOLT																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>	Project (Number/Name) L88 / <i>Enhanced AN/TPQ 36</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Extended Range (ER)	4	2018	4	2021
ER Testing	4	2019	2	2022
ER Limited Operational Test	3	2021	3	2021
Ongoing Tests - Electronic Protection (EP) and Emerging Threats	1	2016	2	2019
EP and Emerging Threats - Fiscal Year (FY) 2019 VOLT	2	2019	1	2021
Modernization Testing - FY 2019 VOLT	2	2020	1	2022
EP, Emerging Threats, and Modernization Testing - FY 2021 VOLT	2	2021	4	2022