

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army										Date: May 2017		
Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604823A / Firefinder							
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	-	2.850	9.235	45.605	-	45.605	47.023	49.485	50.638	48.922	Continuing	Continuing
L86: LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)	-	2.850	3.187	2.136	-	2.136	4.239	4.970	5.442	3.500	Continuing	Continuing
L87: Hypervelocity Projectile System	-	0.000	0.000	36.000	-	36.000	36.000	36.000	36.000	36.000	0.000	180.000
L88: Enhanced AN/TPQ 36	-	0.000	6.048	7.469	-	7.469	6.784	8.515	9.196	9.422	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program funds design, development and test of primary target acquisition and counterfire radars to automatically detect, locate and classify hostile indirect fire weapons (mortars, artillery, and rockets). The program directly supports the prioritization, tracking and locating of targets, and dissemination of that information for simultaneous attack of multiple threats. It provides 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. 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).

This program line also funds the Hypervelocity Projectile System (HVP) a next-generation, common, low drag, guided cannon artillery projectile capable of completing multiple missions across different gun systems. HVP's low drag aerodynamic design enables high-velocity, maneuverability and decreased time-to-target. These attributes coupled with accurate guidance electronics provide low-cost mission effectiveness against current threats and the ability to adapt to air and surface threats of the future. Integration with a fire control radar and sensor array will allow targeting of moving and relocatable surface targets beyond the range of conventional artillery as well as live fire intercepts of cruise and ballistic targets. Current estimates for a follow on development effort achieve an integrated system solution by FY22.

Fiscal Year (FY) 2018 Base funding in the amount of \$36.000 million will support the initiation of contract requirements package development, system evaluation, requirements/specification work, integration development and test plans for the Hypervelocity Projectile system. The Army will leverage Strategic Capabilities Office (SCO) prototypes to transition this new start capability into a program of record.

The Fiscal Year (FY) 2018 Base funding in the amount of \$9.605 million will support ongoing AN/TPQ-53 test efforts and Army interoperability certifications (AICs), AN/TPQ-50 and AN/TPQ-53 development and testing of modernization efforts for electronic protection and new and emerging threats, and the performance of technical assessments, concept studies, risk reduction and required documentation.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army				Date: May 2017	
Appropriation/Budget Activity		R-1 Program Element (Number/Name)			
2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)		PE 0604823A / Firefinder			
B. Program Change Summary (\$ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	2.967	9.235	10.814	-	10.814
Current President's Budget	2.850	9.235	45.605	-	45.605
Total Adjustments	-0.117	0.000	34.791	-	34.791
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.117	-			
• Adjustments to Budget Years	0.000	0.000	-1.209	-	-1.209
• HPV	0.000	0.000	36.000	-	36.000
Change Summary Explanation					
FY 2018 Base funding was decreased by \$1.209 million in support higher Army priorities.					
FY 2018 Base funding in the amount of \$36.000 million was added to support New Start Project 87- Hypervelocity Projectile System.					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army										Date: May 2017		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604823A / Firefinder				Project (Number/Name) L86 / LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
L86: LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)	-	2.850	3.187	2.136	-	2.136	4.239	4.970	5.442	3.500	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
<p>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 battle command systems (BCSs) 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 to include support to Operation Inherent Resolve (OIR) and Operation Freedom's Sentinel (OFS).</p>												
<p>The Fiscal Year (FY) 2018 Research, Development, Test and Evaluation (RDTE) funds of \$2.136 million will support the work required to enhance the AN/TPQ-50's capability to address electronic protection against CEMA and other known, new, emerging and evolving threats identified in the System Threat Assessment Report (STAR). This effort also continues to improve detection, tracking and location accuracy as well as reduce false location rate against new threats to the warfighter. Funding also supports the performance of technical assessments, concept studies, risk reduction efforts and required documentation as well as associated testing costs and program support.</p>												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2016	FY 2017	FY 2018	
Title: Electronic Protection									2.162	0.797	-	
Description: The effort develops spectrum management techniques, mitigates electromagnetic interference (EMI) from commercial and military bands in addition to hostile EMI, and improves signal processor protection algorithms to defeat radar targeting armaments.												
FY 2016 Accomplishments: Contract was awarded in July 2016 for developmental efforts to improve spectrum management techniques, mitigate EMI from commercial and military bands, and associated testing costs and program support.												
FY 2017 Plans: Funding will continue the developmental efforts to improve spectrum management, mitigate EMI from commercial and military bands, and includes associated testing costs.												
Title: Modernization & New and Emerging Threats									0.688	2.390	2.136	

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / Firefinder	Project (Number/Name) L86 / LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<p>Description: Program modernization effort which completes the development of hardware (HW) kits and develops advanced electronic protection techniques via software to combat Cyber Electromagnetic Activity (CEMA). This effort funds the development of capabilities to address vulnerabilities identified in the bi-annual release of the System Threat Assessment Report (STAR) and changes on the battlefield due to new tactics, techniques, procedures (TTPs) and/or areas of operation. Increases capability for use as a sensor in the Counter-Unmanned Aerial Systems System of Systems (C-UAS SoS).</p> <p>FY 2016 Accomplishments: Contract was awarded in July 2016 to initiate work required to enhance the AN/TPQ-50's capability to accurately detect, track and locate new threats to the warfighter and includes associated testing costs and program support.</p> <p>FY 2017 Plans: This will continue the work required to enhance the AN/TPQ-50's capability to accurately detect, track and locate new threats to the warfighter and includes associated testing costs.</p> <p>FY 2018 Plans: This will continue the work required to enhance the AN/TPQ-50's capability to address electronic protection against CEMA and other known, new, emerging and evolving threats identified in the System Threat Assessment Report (STAR). This effort also continues to improve detection, tracking and location accuracy as well as reduce false location rate against new threats to the warfighter. Funding also supports the performance of technical assessments, concept studies, risk reduction efforts and required documentation as well as associated testing costs and program support.</p>			
Accomplishments/Planned Programs Subtotals	2.850	3.187	2.136

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

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• B05201: SSN: B05201 Lightweight Counter Mortar Radar	63.472	130.730	20.459	-	20.459	9.618	-	-	8.427	0	232.706

Remarks

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. A favorable full rate production (FRP) decision was achieved on 21 June 2013. The AN/TPQ-50 is now in full rate production; 325 systems have been procured to date against the AAO of 400. A three year extension to the FRP contract was awarded 12 July 2016.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
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>
<p>The Fiscal Year (FY) 2018 Research, Development, Test and Evaluation (RDTE) funds of \$2.136 million will support the work required to enhance the AN/TPQ-50's capability to address electronic protection against CEMA and other known, new, emerging and evolving threats identified in the System Threat Assessment Report (STAR). This effort also continues to improve detection, tracking and location accuracy as well as reduce false location rate against new threats to the warfighter. Funding also supports the performance of technical assessments, concept studies, risk reduction efforts and required documentation as well as associated testing costs and program support.</p> <p>E. Performance Metrics N/A</p>		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army										Date: May 2017		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>				Project (Number/Name) L87 / <i>Hypervelocity Projectile System</i>			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
L87: <i>Hypervelocity Projectile System</i>	-	0.000	0.000	36.000	-	36.000	36.000	36.000	36.000	36.000	0.000	180.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project L87 The Hypervelocity Projectile System (HVP) is a next-generation, common, low drag, guided cannon artillery projectile capable of completing multiple missions across different gun systems. HVP's low drag aerodynamic design enables high-velocity, maneuverability and decreased time-to-target. These attributes coupled with accurate guidance electronics provide low-cost mission effectiveness against current threats and the ability to adapt to air and surface threats of the future. Integration with a fire control radar and sensor array will allow targeting of moving and relocatable surface targets beyond the range of conventional artillery as well as live fire intercepts of cruise and ballistic targets. Current estimates for a follow on development effort achieve an integrated system solution by FY22.

Justification: FY2018 Base funding in the amount of \$36.000 million supports the initiation of contract requirements package development, system evaluation, requirements/specification work, integration development and test plans. The Army will leverage Strategic Capabilities Office (SCO) prototypes to transition this new start capability into a program of record. This is a New Start.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
Title: Hypervelocity Projectile System (HVP)	-	-	36.000
Description: The Hypervelocity Projectile System (HVP) will integrate HVP sensor arrays with a closed loop fire control tracking radar to enable HVP artillery projectiles to engage high value moving surface targets beyond common artillery ranges and cruise and ballistic target intercepts.			
FY 2018 Plans: Supports the initiation of contract requirements package development, system evaluation, and requirements /specification work, integration development and test plans.			
Accomplishments/Planned Programs Subtotals	-	-	36.000

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

Remarks

D. Acquisition Strategy
Strategic Capabilities Office's (SCO) demonstration transition to a new start program of record.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>	Project (Number/Name) L87 / <i>Hypervelocity Projectile System</i>
<p>The Army is transitioning prototype articles from the SCO demonstration to develop a fire control target tracking radar capable of intercepting ballistic targets and engaging tactical range surface targets with hypervelocity projectile artillery rounds. Emerging requirements include communication suite changes, munitions updates, and introduction of new munitions require software and/or hardware updates to ensure full compatibility and maintain operational viability.</p> <p>E. Performance Metrics N/A</p>		

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Army													Date: May 2017		
Appropriation/Budget Activity 2040 / 5							R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>				Project (Number/Name) L87 / <i>Hypervelocity Projectile System</i>				

Product Development (\$ in Millions)				FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 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
HPV Product Development	C/Various	TBD : TBD	0.000	-		-		36.000		-		36.000	0.000	36.000	0.000
Subtotal			0.000	-		-		36.000		-		36.000	0.000	36.000	0.000

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		0.000		36.000		-		36.000	0.000	36.000	-

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Army																Date: May 2017																
Appropriation/Budget Activity 2040 / 5								R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>								Project (Number/Name) L87 / <i>Hypervelocity Projectile System</i>																
Event Name	FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022							
	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				
Hypervelocity Projectile System Development																																

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604823A / <i>Firefinder</i>	Project (Number/Name) L87 / <i>Hypervelocity Projectile System</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Hypervelocity Projectile System Development	1	2018	4	2022

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army										Date: May 2017		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604823A / Firefinder				Project (Number/Name) L88 / Enhanced AN/TPQ 36			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
L88: Enhanced AN/TPQ 36	-	0.000	6.048	7.469	-	7.469	6.784	8.515	9.196	9.422	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 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 will ultimately replace the current AN/TPQ-36 and AN/TPQ-37 Firefinder Radars. The AN/TPQ-53 system interoperates with battle command systems (BCSs) 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 is fielded to multiple Continental United States (CONUS) and Outside Continental United States (OCONUS) locations to include support to Operation Inherent Resolve (OIR).

The Fiscal Year (FY) 2018 funds of \$7.469 million will support ongoing test efforts, Army interoperability certifications (AICs), development and testing of modernization efforts for electronic protection and new and emerging threats, and the performance of technical assessments, concept studies, risk reduction and required documentation.

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

	FY 2016	FY 2017	FY 2018
Title: Test support Description: Funding is provided to support testing efforts FY 2017 Plans: Test activities to include engineering and customer tests, an adversarial assessment, and associated Program Management Office (PMO) and test support costs. FY 2018 Plans: Test activities to include a Tropical Regions test, AIC testing, engineering and customer tests, an adversarial assessment, and associated Program Management Office (PMO) and test support costs. Additional test support in Fiscal Year (FY) 2018 due to new Electronic Protection techniques and data analysis support.	-	2.335	3.783
Title: Electronic Protection / Worldwide Interoperability for Microwave Access (WiMAX) Description: This effort funds the development of radio frequency (RF) management tactical decision aids that improve operational frequency band selection, radar emplacement, and signal processor protection algorithms to defeat radar targeting armaments. The effort also improves spectrum management and mitigates electromagnetic interference (EMI) from commercial and military bands in addition to hostile EMI.	-	2.413	2.396

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army								Date: May 2017					
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604823A / Firefinder				Project (Number/Name) L88 / Enhanced AN/TPQ 36					
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2016		FY 2017		FY 2018	
FY 2017 Plans: Continue to mitigate EMI from military bands, hostile EMI, and the Worldwide Interoperability for Microwave Access (WiMAX) commercial spectrum; this includes associated Program Management Office (PMO) and test support costs													
FY 2018 Plans: Develop additional electronic protection techniques and continue to mitigate Cyber Electromagnetic Activity (CEMA) and the Worldwide Interoperability for Microwave Access (WiMAX) commercial spectrum; this includes associated Program Management Office (PMO) and test support costs.													
Title: New and Emerging Threats								-		1.300		1.290	
Description: This effort funds the development of capabilities not included in the current requirement resulting from the bi-annual release of the system threat assessment report (STAR) and changes on the battlefield due to new tactics, techniques, and procedures (TTPs) and/or areas of operation.													
FY 2017 Plans: Continue developmental efforts to accurately detect, track, and locate new and emerging threats to the warfighter as a result of changes in the battlefield and areas of operation; this includes associated Program Management Office (PMO) and test support costs.													
FY 2018 Plans: Continue developmental efforts to accurately detect, track, and locate new and emerging threats to the warfighter as a result of changes in the battlefield and areas of operation; Begin development efforts for compliance to Counter-Unmanned Aerial Systems (C-UAS) requirements; this includes associated Program Management Office (PMO) and test support costs.													
Accomplishments/Planned Programs Subtotals								-		6.048		7.469	
C. Other Program Funding Summary (\$ in Millions)													
Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
• SSN B05310 AN/TPQ-53: SSN B05310 AN/TPQ-53	198.379	314.509	329.057	-	329.057	148.700	12.300	7.110	7.443	0	1,017.498		
Remarks													

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
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>
<p><u>D. Acquisition Strategy</u></p> <p>The AN/TPQ-53 leverages technology developed in the multi-mission radar advanced technology objective (ATO) program. In 2006, the Government awarded a contract following full and open competition for the design of the AN/TPQ-53 radar and the purchase of four non-recurring engineering (NRE) radars. Twelve additional quick reaction capability (QRC) radars were purchased under the same contract in response to an urgent directed procurement in July 2008. The Milestone Decision Authority (MDA) approved the acquisition of up to 20 more QRC radars. Twenty systems were procured through two separate contract actions in 2010 and 2011. A competitive production contract for Low Rate Initial Production (LRIP) systems was awarded in 2012 and options for additional systems were awarded in 2013, 2014, and 2015. Production and delivery of all QRC/Initial Production (IP) systems are complete, and production of LRIP systems is ongoing. A Full Rate Production (FRP) decision was obtained in December 2015. The FRP contract to fill the remainder of the Army Acquisition Objective (AAO) was awarded in March 2017. Additionally, all initial production systems will be retrofitted to the FRP configuration. The FRP system deliveries will continue through fiscal year (FY) 2021. The system will eventually replace all of the AN/TPQ-36 and AN/TPQ-37 systems in the fleet.</p> <p>The FY 2018 funds of \$7.469 million will support ongoing test efforts, Army interoperability certifications (AICs), development and testing of modernization efforts for electronic protection and new and emerging threats, and the performance of technical assessments, concept studies, risk reduction and required documentation.</p> <p><u>E. Performance Metrics</u></p> <p>N/A</p>		