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Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army **Date:** February 2016

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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	-	22.587	2.967	9.235	-	9.235	10.814	10.170	8.415	9.104	Continuing	Continuing
L86: <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>	-	0.000	2.967	3.187	-	3.187	3.463	3.500	0.000	0.000	0.000	13.117
L88: <i>Enhanced AN/TPQ 36</i>	-	22.587	0.000	6.048	-	6.048	7.351	6.670	8.415	9.104	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 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 Sentinel (OFS). Project L88, AN/TPQ-53 is a highly mobile radar system that will leverage the latest in technology design to accelerate technology infusion and increase range while improving False Alarm 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 Fiscal Year (FY) 2017 funds of \$9.235 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 pre-planned product improvement (P3I) efforts for electronic protection and new and emerging threats, and the performance of technical assessments, concept studies, risk reduction and required documentation.

The FY 2017 funding request was reduced by \$1.063 million to account for the availability of prior year execution balances.

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B. Program Change Summary (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	23.480	6.243	11.314	-	11.314
Current President's Budget	22.587	2.967	9.235	-	9.235
Total Adjustments	-0.893	-3.276	-2.079	-	-2.079
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-3.276			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.893	-			
• Adjustments to Budget Years	-	-	-2.079	-	-2.079

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army										Date: February 2016		
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
L86: <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>	-	0.000	2.967	3.187	-	3.187	3.463	3.500	0.000	0.000	0.000	13.117
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 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 Sentinel (OFS).

The Fiscal Year (FY) 2017 RDTE funds of \$3.187M will support the development and testing of pre-planned product improvement (P3I) for electronic protection and new and emerging threats in addition to the performance of technical assessments, concept studies, risk reduction efforts and required documentation.

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

	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Electronic Protection	-	1.052	0.675	-	0.675
Description: Develop radio frequency (RF) management tactical decision aids to 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.					
FY 2016 Plans: Funding will initiate the developmental efforts to improve spectrum management, mitigate EMI from commercial and military bands, and includes associated testing costs.					
FY 2017 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
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>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Funding will continue the developmental efforts to improve spectrum management, mitigate EMI from commercial and military bands, and includes associated testing costs.					
Title: New and Emerging Threats Description: Changes on the battlefield due to new tactics, techniques and procedures (TTPs) and/or areas of operation will bring new and changing threats not included in current requirement. Based upon bi-annual release of the System Threat Assessment Report (STAR), synthesize requirements; and design, code and test improvements. FY 2016 Plans: This will initiate 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. FY 2017 Base 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.	-	1.915	2.512	-	2.512
Accomplishments/Planned Programs Subtotals	-	2.967	3.187	-	3.187

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>FY 2017 Base</u>	<u>FY 2017 OCO</u>	<u>FY 2017 Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• B05201: SSN: B05201 <i>Lightweight Counter Mortar Radar</i>	29.358	63.472	74.038	25.892	99.930	10.855	9.618	-	-	0	213.233

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; 286 systems have been procured to date. A three year extension to the current production contract is scheduled for award in 2QFY16. Follow on production contracts will be awarded as needed to fulfill the AAO.

The Fiscal Year (FY) 2017 RDTE funds of \$3.187M will support the development and testing of pre-planned product improvement (P3I) for electronic protection and new and emerging threats in addition to the performance of technical assessments, concept studies, risk reduction efforts and required documentation.

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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>

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army												Date: February 2016			
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 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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 Matrix)	Various	Various : Activities	1.155	-		0.144		0.150		-		0.150	0	1.449	0
Subtotal			1.155	-		0.144		0.150		-		0.150	0.000	1.449	0.000
Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
Electronic Protection	C/CPFF	TBD : TBD	0.000	-		0.979		0.615	Jan 2017	-		0.615	0	1.594	0
New and Emerging Threats	C/CPFF	TBD : TBD	0.000	-		1.782		2.122	Jan 2017	-		2.122	Continuing	Continuing	0
Subtotal			0.000	-		2.761		2.737		-		2.737	-	-	0.000
Test and Evaluation (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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	4.751	-		0.062		0.300		-		0.300	Continuing	Continuing	0
Subtotal			4.751	-		0.062		0.300		-		0.300	-	-	0.000
Project Cost Totals			5.906	-		2.967		3.187		-		3.187	-	-	0.000
Remarks															

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Army		Date: February 2016
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
Electronic Protection	2	2016	4	2017
New and Emerging Threats	2	2016	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army										Date: February 2016		
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
L88: <i>Enhanced AN/TPQ 36</i>	-	22.587	0.000	6.048	-	6.048	7.351	6.670	8.415	9.104	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 will be 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) 2017 funds of \$6.048 million will support ongoing test efforts, Army interoperability certifications (AICs), development and testing of pre-planned product improvements (P3I) for electronic protection and new and emerging threats, and the performance of technical assessments, concept studies, risk reduction and required documentation.

The FY 2017 funding request was reduced by \$1.063 million to account for the availability of prior year execution balances.

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

	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Test support	16.107	-	3.300	-	3.300
Description: Funding is provided to support testing efforts					
FY 2015 Accomplishments: Test activities to include the Capstone event, Initial Operational Test and Evaluation (IOT&E) 2, reliability and performance testing, follow-on testing, ammunition, and associated program management office (PMO) and test support costs.					
FY 2017 Base Plans: Test activities to include Army interoperability certification (AIC) testing, engineering and customer tests, an adversarial assessment, and associated PMO and test support costs.					
Title: Electronic Protection / Worldwide Interoperability for Microwave Access (WiMAX)	2.155	-	1.632	-	1.632

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
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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 EMI from commercial and military bands in addition to hostile EMI.					
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<p>FY 2015 Accomplishments: Mitigate electromagnetic interference (EMI) from military bands, hostile EMI, and the WiMAX commercial spectrum. Address and keep pace with new and emerging threats; these efforts include associated program management office (PMO) and test support costs.</p> <p>FY 2017 Base Plans: Continue to mitigate EMI from military bands, hostile EMI, and the WiMAX commercial spectrum; this includes associated PMO and test support costs</p>					
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Title: New and Emerging Threats	2.154	-	1.116	-	1.116
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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.					
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<p>FY 2015 Accomplishments: Initiate 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 PMO and test support costs.</p> <p>FY 2017 Base 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 PMO and test support costs.</p>					
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Title: Signal Data Processor (SDP)	1.992	-	-	-	-
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Description: Development efforts to upgrade the SDP in order to support the high speed processing demands of the radar as well as the latest operating system versions.					
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FY 2015 Accomplishments:					
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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>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
SDP design efforts include software and computing architecture development; this includes associated testing and PMO costs. Funded efforts will continue through FY16.					
Title: Global Positioning System (GPS) Military Code (M-Code)	0.179	-	-	-	-
Description: This supports the development and testing of the interfaces for GPS M-Code to improve AN/TPQ-53 performance in GPS denied environments in order to be compliant with PUBLIC LAW 111-383-JAN. 7, 2011					
FY 2015 Accomplishments: Continue software and design development based on information provided by Assured Positioning, Navigation, and Timing (PNT); this includes associated program management office (PMO) costs. Funded efforts will continue through FY16.					
Accomplishments/Planned Programs Subtotals	22.587	-	6.048	-	6.048

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• SSN B05310 AN/TPQ-53: SSN B05310 AN/TPQ-53	154.520	198.379	314.509	-	314.509	214.317	98.940	86.986	14.893	0	1,082.544

Remarks

D. Acquisition Strategy

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. An FRP contract to fill the remainder of the Army Acquisition Objective (AAO) will be awarded no later than September 2016. 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.

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army Date: February 2016

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

The Fiscal Year (FY) 2017 funds of \$6.048 million will support ongoing test efforts, Army interoperability certifications (AICs), development and testing of pre-planned product improvements (P3I) for electronic protection and new and emerging threats, and the performance of technical assessments, concept studies, risk reduction and required documentation.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army **Date:** February 2016

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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Management Services (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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 (Contractor)	Various	Various : Activities	3.969	-		-		-		-		-	Continuing	Continuing	0
Program Management (Government)	Various	Various : Activities	1.339	0.228	Jul 2016	-		0.210	Mar 2017	-		0.210	Continuing	Continuing	0
Subtotal			5.308	0.228		-		0.210		-		0.210	-	-	0.000

Remarks
Efforts completed before Fiscal Year (FY) 2015 are not included in this R-3 form.

Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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/ Worldwide Interoperability for Microwave Access (WiMAX)	SS/CPFF	Lockheed Martin : Syracuse, NY	0.000	2.155	Mar 2016	-		1.632	Mar 2017	-		1.632	Continuing	Continuing	0
High Clutter Environment	SS/CPFF	Lockheed Martin : Syracuse, NY	10.340	-		-		-		-		-	0	10.340	0
Low Quadrant Elevation (QE) Shots	SS/CPFF	Lockheed Martin : Syracuse, NY	4.865	-		-		-		-		-	0	4.865	0
New and Emerging Threats	SS/CPFF	Lockheed Martin : Syracuse, NY	0.000	2.154	Mar 2016	-		1.116	Mar 2017	-		1.116	Continuing	Continuing	0
Signal Data Processor (SDP)	SS/CPFF	Lockheed Martin : Syracuse, NY	0.000	1.992	Mar 2015	-		-		-		-	0	1.992	0
Global Positioning System (GPS) Military Code (M-Code)	SS/CPFF	Lockheed Martin : Syracuse, NY	1.232	0.179	Mar 2015	-		-		-		-	Continuing	Continuing	0
Wireless Communication Upgrade	SS/CPFF	Lockheed Martin : Syracuse, NY	1.942	-		-		-		-		-	0	1.942	0
Subtotal			18.379	6.480		-		2.748		-		2.748	-	-	0.000

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Army **Date:** February 2016

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
Initial Operational Test and Evaluation (IOT&E) 2	3	2015	3	2015
Full Rate Production (FRP) Decision	1	2016	1	2016
Materiel Release	2	2016	2	2016
Follow-On Testing	1	2016	4	2017
Electronic Protection/Worldwide Interoperability for Microwave Access (WiMAX)	1	2016	4	2021
New and Emerging Threats	1	2016	4	2021
Signal Data Processor (SDP)	2	2015	4	2016
Global Positioning System (GPS) Military Code (M-Code)	2	2015	4	2016
Wireless Communication Upgrade (prior year funding)	2	2015	4	2016