Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army

Appropriation/Budget Activity

R-1 Program Element (Number/Name)

2040: Research, Development, Test & Evaluation, Army I BA 3: Advanced

PE 0603270A I Electronic Warfare Technology

Date: May 2017

Technology Development (ATD)

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	-	31.810	27.893	31.296	-	31.296	34.241	36.859	37.484	38.541	-	-
K12: EW Demonstrations (CA)	-	6.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-
K15: Advanced Comm Ecm Demo	-	7.141	8.103	9.288	-	9.288	10.922	11.623	11.824	12.078	-	-
K16: Non-Commo Ecm Tech Dem	-	18.669	19.790	22.008	-	22.008	23.319	25.236	25.660	26.463	-	-

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates electronic warfare (EW) sensors and software intended to deny, disrupt, locate or destroy the enemy's command, control and communications (C3) systems and intelligence, surveillance and reconnaissance assets. This PE matures both countermeasures (CM) and counter-countermeasures (CCM) to deny the enemy the use of their systems while protecting United States (U.S.) assets from enemy deception and jamming. Project K15 matures and demonstrates capabilities to locate and exploit enemy communication systems including computer networks. Project K16 matures and demonstrates multifunctional EW capabilities (jamming) to enhance platform survivability and provide near real-time situational awareness to the Commander through the detection, identification and geo-location of emitters of interest.

Work in this PE complements PE 0602120A (Sensors and Electronic Survivability), PE 0602782A (Command, Control, Communications Technology), PE 0602270A (Electronic Warfare Technology), PE 0603772A (Advanced Tactical Computer Science) and PE 0603794A (Command, Control and Communications Advanced Technology), and is coordinated with PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602618A (Ballistics Technology), PE 0603003A (Aviation Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0603313A (Missile and Rocket Advanced Technology) and PE 0603794A (Command, Control and Communications Advanced Technology).

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this PE is performed by the Communications-Electronics Research, Development, and Engineering Center (CERDEC), Aberdeen Proving Ground, MD.

PE 0603270A: Electronic Warfare Technology

Army

UNCLASSIFIED
Page 1 of 12

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army **Date:** May 2017

Appropriation/Budget Activity

2040: Research, Development, Test & Evaluation, Army I BA 3: Advanced

Technology Development (ATD)

R-1 Program Element (Number/Name)

PE 0603270A I Electronic Warfare Technology

B. Program Change Summary (\$ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	32.874	27.893	25.767	-	25.767
Current President's Budget	31.810	27.893	31.296	-	31.296
Total Adjustments	-1.064	0.000	5.529	-	5.529
 Congressional General Reductions 	-	-			
 Congressional Directed Reductions 	-	-			
 Congressional Rescissions 	-	-			
 Congressional Adds 	-	_			
 Congressional Directed Transfers 	-	-			
Reprogrammings	-	-			
SBIR/STTR Transfer	-1.064	-			
 Adjustments to Budget Years 	0.000	0.000	5.500	-	5.500
Civ Pay Adjustments	0.000	0.000	0.029	-	0.029

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: K12: EW Demonstrations (CA) Congressional Add: Program Increase

Congressional Add Subtotals for Project: K12

	6.000	-
ngressional Add Subtotals for Project: K12	6.000	-
Congressional Add Totals for all Projects	6.000	-

FY 2017

FY 2016

Change Summary Explanation

Army

In Fiscal Year 2018 funding increased to support needed aircraft survivability and Multifunction Electronic Warfare efforts.

UNCLASSIFIED PE 0603270A: Electronic Warfare Technology

Page 2 of 12

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army										Date: May 2017		
Appropriation/Budget Activity 2040 / 3				,				Project (Number/Name) K12 I EW Demonstrations (CA)				
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
K12: EW Demonstrations (CA)	-	6.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Electronic Warfare Demonstrations.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017
Congressional Add: Program Increase	6.000	-
FY 2016 Accomplishments: Program Increase		
Congressional Adds Subtotals	6.000	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

PE 0603270A: *Electronic Warfare Technology* Army

Page 3 of 12

Exhibit R-2A, RDT&E Project Ju	xhibit R-2A, RDT&E Project Justification: FY 2018 Army										Date: May 2017			
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603270A I Electronic Warfare Technology				Project (Number/Name) K15 I Advanced Comm Ecm Demo					
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		
K15: Advanced Comm Ecm Demo	-	7.141	8.103	9.288	-	9.288	10.922	11.623	11.824	12.078	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates sensor and software technologies to locate and identify modern tactical enemy and blue force (friendly) radio frequency (RF) communications, radars and computer networks and nodes. This Project enables uninterrupted air and ground based intelligence collection and long range targeting operations in a hostile electromagnetic and cyber environment, and enables communications countermeasures (CM) and counter-countermeasures (CCM) to first intercept, identify and locate tactical communications; then degrade threat-computer networks and their components.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the Communications - Electronics Research, Development, and Engineering Center (CERDEC), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018	
Title: Offensive Operations	4.801	5.575	6.177	
Description: This effort matures and demonstrates integrated electronic attack (EA) and computer network operations (CNO) hardware and software to execute force protection (FP), EA, electronic surveillance (ES), signals intelligence (SIGINT), electronic warfare (EW) and cyber missions in a dynamic, distributed and coordinated fashion. This results in the capability to engage a multitude of diverse multi-node, multi-waveform, multi-platform and cyber (internetworked computers) targets while maximizing overall network efficiency and effectiveness, and preserving blue force and non-combatant communications. Work being accomplished under Program Element (PE) 0603270A/project K16 and PE 0602270/project 906 complement this effort.				
FY 2016 Accomplishments: Used representative blue force systems to conduct exploitation of emerging signals of interest (SOI) to determine potential cyber/EW/collection applications for each signal; matured and integrated advanced techniques to enable new mission capabilities to exploit emerging target SOI; and utilized emerging software defined radios as platforms to implement and demonstrate these techniques in an open and modular framework for potential porting into candidate existing and emerging acquisition programs.				
FY 2017 Plans: Will mature interface definitions and data transfer protocol for the inclusion of tactical cyber capability on a single board computer in a common RF chassis as part of an open, modular converged RF architecture to employ multiple electronic support				

PE 0603270A: Electronic Warfare Technology

Army

UNCLASSIFIED
Page 4 of 12

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: N	lay 2017	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A / Electronic Warfare Technology	Project (No K15 / Adva		lame) omm Ecm Der	то
B. Accomplishments/Planned Programs (\$ in Millions)		FY	2016	FY 2017	FY 2018
and electronic attack techniques simultaneously; continue to matur representative software defined radio platforms and demonstrate the					
FY 2018 Plans: Will finalize interface definitions for advanced techniques to perform disrupt, deny) against identified SOIs; mature and demonstrate tech from EW and SIGINT platforms across/within security domains; marelational analysis of data) necessary for the delivery of data producommander with a better cyber electromagnetic activities (CEMA) and conduct modeling and simulation within the laboratory to replicate tools to inform/develop the commander's SU; and replicate the currismulated laboratory environment to facilitate an EW/Cyber tactical	nniques to perform command & control (C2) cyber function at the data models (structure and method for ingest and lects to the intelligence enterprise that provide the tactical situational awareness (SA) and understanding (SU); maturate next generation CEMA architecture and mature analyment offensive cyber operation (OCO) operational state with	re tic			
Title: Stand-off Non-Cooperative Multi-Intelligence (Multi-INT) Tech	hnologies		2.340	2.528	3.11
Description: This effort matures and demonstrates hardware and reconnaissance, planning and effects in a three dimensional urban		:			
FY 2016 Accomplishments: Matured, assessed and demonstrated multi-intelligence and EW te aerial systems (UAS), to identify potential vulnerabilities; and integrand effects to use against identified target UAS to determine their experience.	rated, assessed and demonstrated advanced EW techniq	ues			
FY 2017 Plans: Will design, mature, fabricate and program a circuit card to employ and integrate it into an open, modular converged RF architecture a laboratory environment; assess requirement to coordinate data excoordinated effects on designated threat systems.	nd demonstrate the effectiveness of the capability in a	esired,			
FY 2018 Plans: Will mature and develop techniques focused on executing ES (sens capabilities against peer/near peer threat systems and networks opidentification of measurable characteristics for EW system effects (be integrated with kinetic effect characteristics in support of mission demonstrate EW Planning and Management Tool (EWPMT) Progra	perating within congested and contested environments; be i.e. battle damage assessment) commensurate with and to a planning and employment capabilities; and extend and	egin o			

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED
Page 5 of 12

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A I Electronic Warfare Technology	-,(umber/Name) anced Comm Ecm Demo

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
analysis for the Distributed Common Ground Station – Army (DCGS-A) POR and remote C2/coordination of EW assets and effects for the Multi-Function EW (MFEW) POR and defensive electronic attack (DEA) capabilities.			
Accomplishments/Planned Programs Subtotals	7.141	8.103	9.288

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army										Date: May 2017		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603270A I Electronic Warfare Technology				Project (Number/Name) K16 I Non-Commo Ecm Tech Dem			
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
K16: Non-Commo Ecm Tech Dem	-	18.669	19.790	22.008	-	22.008	23.319	25.236	25.660	26.463	-	-

A. Mission Description and Budget Item Justification

B Accomplishments/Planned Programs (\$ in Millions)

This Project matures and demonstrates non-communication, multi-functional electronic warfare (EW) capabilities that enhance the survivability of Army air and ground platforms and dismounted Soldiers. This Project matures and demonstrates radio frequency (RF), infrared (IR) and electro-optical (EO) sensors and jamming sources to detect, locate, deceive, and neutralize (jam) booby traps, radar-directed target acquisition systems, target-tracking sensors, surface-to-air missiles (SAMs), air-to-air missiles (AAMs), and top-attack and electronically-fuzed munitions. This Project also enables electronic support (ES) hardware and software to detect, identify and geolocate emitters of interest from an effective standoff distance to provide near real-time situational awareness.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the Communications-Electronic Research, Development, and Engineering Center (CERDEC), Aberdeen Proving Ground, MD.

b. Accomplishments/Flaimed Frograms (\$ in millions)	F1 2010	F1 2011	F1 2010
Title: Multispectral Threat Detection and Countermeasures Technologies (formerly titled Distributed Aperture Infrared Countermeasures Technologies (DAIRCM))	3.150	3.326	6.447
Description: This effort matures and demonstrates countermeasure technologies that provide platform protection and integrated cueing against EO, IR and RF guided threats.			
FY 2016 Accomplishments: Continued to mature wideband RF warning sensor and integrate RF warning sensor into representative hardware suite; and conducted sensor performance assessment to demonstrate the performance and readiness of the RF warning system.			
FY 2017 Plans: Will finish requirements and interface definitions for integration of a 2 channel digital RF receiver on a single circuit card assembly for use in modern radar warning receivers, capable of identifying advanced radar threat systems into an open, modular, converged RF architecture; demonstrate system functionality in a representative hardware platform.			
FY 2018 Plans: Will mature and demonstrate cognitive and adaptive threat agnostic (functional against unknown threats to the area) detection and countermeasure algorithms using statistics-based machine learning techniques as part of an integrated survivability suite; use modeling and simulation to ensure the modular architecture framework supports rapid updates for algorithm maturation and			

PE 0603270A: Electronic Warfare Technology

Army

UNCLASSIFIED
Page 7 of 12

R-1 Line #42

EV 2016 EV 2017 EV 2018

	UNCLASSIFIED				
Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: N	lay 2017		
Appropriation/Budget Activity 2040 / 3		PE 0603270A I Electronic Warfare K16 I Non-Commo			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2016	FY 2017	FY 2018	
assessment; design, code and integrate a new class of warning algo and emerging threats; mature and fabricate digital readout integrated mature and validate an integrated software framework that utilizes co information the integrated survivability suite provides.	circuit specifically for threat warning applications; and				
Title: Advanced Tactical EW Countermeasure Technologies (formerly titled Advanced Tactical Radio Frequency Countermeasures Technologies (ATRFCM))		4.716	4.964	5.056	
Description: This effort matures and demonstrates integrated EW/direction finding technologies that provide protection of air, ground and dismounts from emerging RF threats at standoff distances. Work accomplished under Program Element (PE) 0602270A/Project 906 and PE 0603270A/Project K15 complements this effort.					
FY 2016 Accomplishments: Integrated and demonstrated signals intelligence (SIGINT) and cyber a set of standards-based hardware and software open modular architeduce platform size, weight, power and costs; and demonstrated the defensive electronic attack, active electronic support, SIGINT, and cyperformance over-the-air in an anechoic chamber.	tectures to improve capability and interoperability, and e maturity of a multi-function architecture that integrates	ty			
FY 2017 Plans: Will use converged RF architecture to mature and integrate EW tech components, such as software defined radios, sensors, electronic su neutralize RF threats for platform survivability, and demonstrate in a collected from different components to improve platform survivability.	pport and countermeasures to identify, geo-locate and relevant environment; assess types of data that can be				
FY 2018 Plans: Will mature processing and learning algorithms that go beyond tradit by exploiting unused embedded features within sensor data sets to in improved identification, classification, direction finding and counterment the ability of learning algorithms to improve platform survivability; and	ncrease the probability of neutralizing the threat through leasure effectiveness; use modeling and simulation to asse				
Title: EW Counter Countermeasures		3.361	3.500	3.502	
Description: This effort matures and demonstrates hardware and so command, control, communications, computers, intelligence, surveilly accomplished under PE 0603772/Project 243 and 0602270A/Project	ance and reconnaissance (C4ISR) platforms. Work being				
FY 2016 Accomplishments:					
-		1	l		

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED
Page 8 of 12

	UNCLASSIFIED				
Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: N	lay 2017	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A I Electronic Warfare Technology	Project (Number/Name) K16 / Non-Commo Ecm Tech Dem		em	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2016	FY 2017	FY 2018
Analyzed previously conducted testing of counter EW techniques to and documented standard EW technique assessment protocols to e and continued to demonstrate hardware in the loop testing to provid threat and blue force systems.	enable independent validation to be conducted of all resu	ılts;			
FY 2017 Plans: Will utilize current capability to simulate real world effects of red forch hardware in the loop analysis of prioritized emerging threat interfere blue force systems, (i.e. communication, radar) to understand and meffects; develop, mature and assess advanced signal/data processing effects of the threat; begin hardware in the loop analysis of the effects.	ence techniques; replicate potential interactions on emerg nitigate the electromagnetic interference caused by these ng algorithms and cancellation techniques to mitigate the	ging e e			
FY 2018 Plans: Will mature and integrate electronic protection (EP) software and algorous conduct hardware in the loop analysis of prioritized emerging threat emerging blue force systems, (i.e. communication, radar) and apply caused by these effects; mature EP algorithms for detection, localized demonstrate their performance; and enhance hardware in the loop trackieve full closed loop capability.	interference techniques; assess potential interactions or EP algorithms to mitigate the electromagnetic interferen- ation and neutralization of electronic interference, and	า			
Title: Active Protection System (APS) Soft Kill (SK)/Hard Kill (HK) S Kill)	Sensors (formerly titled Active Protection System (APS) S	Soft	6.722	7.250	3.25
Description: This effort matures and demonstrates hardware, software tracking capability to the APS suite. This effort supports the Army's at to reduce vehicle weight by reducing reliance on armor through the detection, and active countermeasures to achieve increased protect accomplished under PE 0602601A/Project C05, PE 0602618A/Project AP 0603313A/Project 263 complements this effort.	APS program to mature and demonstrate technologies use of other means such as sensing, warning, hostile firtion against current and emerging threats. Work being	e			
FY 2016 Accomplishments: Investigated and matured sensor framework to facilitate integration of Protection System (MAPS) architecture; matured algorithm to utilize threat angle of arrival; matured tracking sensor to improve capability characterize threats, provided warning and fire control functions and	e a cueing sensor to enable threat detection and determing to provide accurate threat tracking and false alarm reduced.	ne uction,			

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED
Page 9 of 12

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		·	Date: M	lay 2017	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A / Electronic Warfare Technology	Project (Number/Name) K16 / Non-Commo Ecm Tech Dem		em	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2016	FY 2017	FY 2018
and conducted initial integration testing and demonstration to ass framework.	ess cueing sensor performance when integrated into the N	MAPS			
FY 2017 Plans: Will complete sensor design, fabrication, and physical interface deconduct live fire data collection utilizing the sensor that has been to assess sensor performance within the MAPS framework; continued finitions, protocols and requirements.	integrated into the MAPS framework; characterize data co	llected			
FY 2018 Plans: Will complete SK demonstration and system analysis of sensors, MAPS platform demonstrator; verify sensor interface designs with cueing and handoff of the threat message to the SKCM; continue as integrating new SK techniques into the SKCM demonstration has continue tracking sensor development, demonstrate the integration (cueing and tracking sensors, controller and SKCM); and integrated demonstration.	n modular active protection framework by demonstrating re integration of cueing sensor into the HK demonstration, as nardware to address a wider list of current and emerging the on and threat message pass through of multiple subsystem	eal time s well nreats; ns			
Title: Modeling Simulation and Technique Maturation for Integrate	ed RF Operations (formerly titled Integrated RF Operations	s)	0.720	0.750	1.75
Description: This effort matures and demonstrates a capability to dispersed RF systems to provide a coordinated, collaborative and architecture will allow for rapid, cost effective technique developmenterest and environmental simulations. Work being accomplished complements this effort.	d interoperable suite of EW capabilities. A modular softwar nent and integration of new EW capabilities, target signals	e of			
FY 2016 Accomplishments: Developed improvements to RF M&S capabilities that increase M with various signals of interest (SOI) to enable the evaluation of a to extend SOI models to improve fidelity and provide an accurate	dvanced, emerging EW techniques; and assessed require				
FY 2017 Plans: Will continue to improve RF M&S capabilities to accurately model environments and interactions with relevant SOIs common to urba					

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED
Page 10 of 12

	UNCLASSIFIED			
Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: N	lay 2017	
Appropriation/Budget Activity 2040 / 3				т
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2016	FY 2017	FY 2018
environments with multiple geographically dispersed SOIs and blue provide validated performance estimates to system developers.	force systems in a timely manner with sufficient fidelity to			
FY 2018 Plans: Will continue to evolve the M&S environment capable of assessing effects in a coordinated operation; mature analysis tools to assess a the Cyber Center of Excellence using one or more remotely manag communications, radar, electronic countermeasure) systems; and of waveforms against specific SOIs (i.e., point-to-point, network device of both EW asset and threat network characteristics and parameter receive power thresholds) for the development of concept of operat Army Integrated Electronic Warfare System concept.	and validate employment scenarios in conjunction with ed EW assets against one or more threat categories (i.e., levelop M&S software tools and mature EW techniques and es, emerging modern communications) to allow manipulatios (i.e., density, placement, terrain, transmit power levels, ar	n id		
Title: Intelligence Processing and Architecture Modernization		-	-	2.00
Description: This effort will leverage Intelligence Community inves SOIs to develop a library of open, modular, and scalable software sthe commander with electronic situational awareness while at the sjamming. Work accomplished under PE 0602270A/Project 906 and Fiscal Year (FY) 18 this effort continues work previously reported under the Architecture Modernization.	solutions to address identified capability gaps and to provide ame time protecting his assets from enemy deception and PE 0603772A/Project 243 complements this effort. In			
FY 2018 Plans: Will demonstrate a reference design of a multi-channel electronic sometime of the properties of the prope	gainst regional threats to blue force Programs of Record; ar			
•		tals 18.669	19.790	22.008

D. Acquisition Strategy

N/A

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED
Page 11 of 12

Exhibit R-2A, RDT&E Project Justification: FY 2018 A	Date: May 2017	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A I Electronic Warfare Technology	Project (Number/Name) K16 I Non-Commo Ecm Tech Dem
E. Performance Metrics		
N/A		

PE 0603270A: *Electronic Warfare Technology* Army

UNCLASSIFIED
Page 12 of 12