Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army											Date: February 2016	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 6: *RDT&E Management Support*					R-1 Program Element (Number/Name) PE 0605604A / *Survivability/Lethality Analysis*							
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	-	33.210	33.246	38.571	-	38.571	33.909	30.250	31.314	32.652	-	-
675: *Army Survivability Analysis & Evaluation Supp*	-	33.210	33.246	38.571	-	38.571	33.909	30.250	31.314	32.652	-	-

A. Mission Description and Budget Item Justification

This project funds analytical products necessary for inherently-governmental Army Test & Evaluation Command/Army Evaluation Center's (ATEC/AEC) mission. Products result from investigating, analyzing, assessing, and reporting on the survivability of Soldiers, and on the survivability, lethality and vulnerability (SLV) of the highest priority Army systems whether those systems are employed during stability, support, defensive, or offensive missions. Developed through measurement, experiment, test support, and modeling and simulation (M&S), the products funded by this project are used in many ways to make the Army force more survivable. The project provides quantitative lethality and survivability analyses and data for fielded and developmental systems as the Army makes the required choices to decisively transform into a modular Brigade Combat Team (BCT) based organization. Products concern Army fire support systems, direct fire munitions; Army air defense and missile defense systems; Army aviation systems including Unmanned Aerial Vehicles; network communications and other network enabled battle command and communication systems; and selected joint services systems particularly relevant to the Army's joint and expeditionary role. Products also include analysis and data concerning individual Soldier items including protective equipment such as helmets and vests. These survivability products are leveraged into rapid-equipping initiatives and other technical support for operational forces involved in the current fight. Continued development of these products also guarantees preservation of the Army's vitally needed technical corporate memory for expert survivability advice.

Survivability analyses funded by this project are conducted across the spectrum of battlefield threats to include guns, missiles, mines and other methods of inflicting physical damage; jammers, countermeasures, and other electronic warfare techniques; cybersecurity and computer network operations; and directed energy weapons. This survivability information enables developers, users, and decision makers to perform credible survivability tradeoffs for both Soldiers and materiel. These technical survivability details enable properly informed decisions concerning systems and tactics that maximize both the combat power and survivability of Army forces. Survivability data and analysis results funded by this project are efficiently leveraged for many different Army uses, reducing total cost to the Army by eliminating the need for duplicative capabilities funded by individual system developers. Central funding of this mission assures the Army accurate and consistent treatment of survivability across all classes of systems, across all formal system Evaluations, and across the Army's Army Regulation (AR) 5-5 studies process. Work program is prioritized principally by the Army Test and Evaluation Command/ Army Evaluation Center (ATEC/AEC) and is used by them in the Army's formal Evaluation process in such a way that ATEC can comply with its legally mandated responsibility to assess system survivability along with effectiveness and suitability. Program Managers (PM) and the Program Executive Officers (PEO) use the survivability analyses and data funded by this project to make design decisions that are optimized for survivability, to direct specific weapon system development efforts that are needed for survivability enhancement, and to structure product improvement programs. Soldier survivability data and analysis is leveraged to support the survivability portion of the Headquarters' Department of the Army (HQDA) Deputy Chief of Staff, Personnel (G1) Human Systems Integration (HSI) program. U.S. Army Training and Doctrine Command (TRADOC) combat developers exploit the survivability products funded by this project to initiate and improve survivability/lethality requirements, and to develop and refine doctrine and tactics. Also, the quantitative analytical results funded by the project are leveraged as core inputs to formal AR 5-5 studies and other studies as directed by Army leaders. While the Army is at war, analytical results

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funded by this project are also directly leveraged for survivability support to current operations. Finally, for particularly urgent or controversial survivability issues, data and analysis funded by this project are used directly by senior Army decision makers to assure technically sound program/production decisions.

This project also supports cybersecurity survivability analysis of Army battle command/networked systems as well as Army network architectures and technology. Supports ATEC and other electronic warfare vulnerability testers and evaluators by developing and providing highly technical specialized field countermeasure environments that threat forces may employ against Army communications networks, air defense and other systems. In conjunction with PMs and Army intelligence agencies, analyzes technical vulnerabilities of foreign weapons, network related systems, and intelligence Electronic Warfare (EW) systems to U.S. Army EW systems. Without the survivability products funded by this project, ATEC would not have a technically credible account of survivability issues at milestone decision points and systems could be fielded with unknown vulnerabilities leading to unnecessary US casualties. PMs would make design choices that failed to properly optimize survivability, TRADOC would generate requirements that were not technically credible, and the Army studies process would rest on an inaccurate and inconsistent basis.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	33.294	33.246	28.243	-	28.243
Current President's Budget	33.210	33.246	38.571	-	38.571
Total Adjustments	-0.084	0.000	10.328	-	10.328
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.084	-			
• Adjustments to Budget Years	-	-	10.328	-	10.328

Change Summary Explanation

FY 2017 increase supports additional C4ISR System Survivability Assessment efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army											Date: February 2016	
Appropriation/Budget Activity 2040 / 6					R-1 Program Element (Number/Name) PE 0605604A / *Survivability/Lethality Analysis*				Project (Number/Name) 675 / *Army Survivability Analysis & Evaluation Supp*			
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**
675: *Army Survivability Analysis & Evaluation Supp*	-	33.210	33.246	38.571	-	38.571	33.909	30.250	31.314	32.652	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
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This project also supports highly technical cyber survivability analysis of Army battle command/networked systems as well as Army network architectures and technology. Supports ATEC and other electronic warfare vulnerability testers and evaluators by developing and providing highly technical specialized field countermeasure environments that threat forces may employ against Army communications networks, air defense and other systems. In conjunction with PMs and Army intelligence agencies, analyzes technical vulnerabilities of foreign weapons, network related systems, and intelligence Electronic Warfare (EW) systems to U.S. Army EW systems. Provides survivability analysis to System of Systems Network Vulnerability Assessments, to Chief Information Office (CIO) G6, Network Integration Evaluation (NIE), to triad (the Brigade Modernization Command (BMC), ATEC, and the System of Systems Integration (SoSI) Directorate. Without the survivability products funded by this project, ATEC would not have a technically credible account of survivability issues at milestone decision points and systems could be fielded with unknown vulnerabilities leading to unnecessary US casualties. PMs would make design choices that failed to properly optimize survivability, TRADOC would generate requirements that were not technically credible, and the Army studies process would rest on an inaccurate and inconsistent basis.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Survivability, Lethality, Vulnerability Analyses (SLVA) for Ground, Aviation, Munitions, and Soldier Systems	15.477	14.654	14.654

Description: Conduct integrated survivability, lethality, vulnerability analyses for developmental aviation, ground, soldier and munition systems including Stryker, Ground Soldier System, Excalibur, and Intelligent Mine System (IMS). Completed ballistic survivability/vulnerability analysis for Mine Resistant Ambush Protected (MRAP) vehicle Test & Evaluation, Guided Multiple Launch Rocket system (GMLRS) Alternative Warhead Initial Operational Test and Evaluation (IOT&E) and Excalibur Live Fire Test and Evaluation (LFT&E) System Engineering Test-P1 test events, which included providing pre-shot predictions, performing damage assessments after each live fire test, completing post-shot analyses, behind armor debris (BAD) test/analyses, and crew survivability analysis and providing technical data required by ATEC for the Systems Evaluation Reports. Additionally, results and recommendations from our crosswalk of MRAP LFT&E assessed casualty/selected Theater casualty incidents were briefed to MRAP PM & vendors, ATEC, HQDA and the Director, Operational Test & Evaluation resulting in vehicle design improvements for MRAP platforms.

FY 2015 Accomplishments:
Conducted ballistic SLVA on AEC's highest priority platform and weapon systems, supporting LFT&E pre-shot predictions, damage assessments, post-shot analysis, and crew survivability analysis and provide technical data for system evaluation reports. Provided vulnerability reduction recommendations to PMs for those systems supported. For systems analyzed will provided data to the Army Materiel Systems Analysis Activity (AMSAA) for support of AR 5-5 and other Army studies. Conducted conventional and under-body blast vulnerability analyses for the M270A1 MLRS. Performed pre-shot predictions and prepared for the start of Paladin Integrated Management program's Full Up-System Level USL (FUSL) live-fire test in 1QFY16.

FY 2016 Plans:
Conduct ballistic SLVA on AEC's highest priority platform and weapon systems, supporting LFT&E pre-shot predictions, damage assessments, post-shot analysis, and crew survivability analysis and providing technical data for system evaluation reports. Provide vulnerability reduction recommendations to PMs for those systems supported. For systems analyzed will provide data to AMSAA for support of Army Analyses of Alternatives. Make the necessary preparations for the start of Armored Multi-PurposeP

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Vehicle (AMPV) and Bradley full-up system-level LFT&E in FY17. Perform damage and crew casualty assessments as well as post-shot analyses during the Joint Light Tactical Vehicle (JLTV) and the Joint Assault Bridge (JAB) LFT&E programs; collected data incorporated into the DOT&E live-fire report to Congress as well as the System Evaluation Reports prepared by ATEC. ***FY 2017 Plans:*** Will conduct ballistic and other needed SLVA on AEC's highest priority platform and weapon systems, supporting LFT&E pre-shot predictions, damage assessments, post-shot analysis, and crew survivability analysis and providing technical data for system evaluation reports. Will provide vulnerability reduction recommendations to PMs for those systems supported. For systems analyzed will provide data to AMSAA for support of Army Analyses of Alternatives; collected data will be incorporated into the DOT&E live-fire report to Congress as well as the System Evaluation Reports prepared by ATEC.			
Title: Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) System Survivability Assessments ***Description:*** This effort produces assessments of the survivability of C4ISR systems in Electronic Warefare (EW) and cybersecurity threat environments and conducts Electronic Attack (EA) and Cybersecurity projects that reveal critical vulnerabilities in C4ISR systems. It also defines, demonstrates, and recommends mitigation options to proponents and evaluators of C4ISR. A cyber vulnerability database is maintained for the benefit of the community. ***FY 2015 Accomplishments:*** Conducted Electronic Protection (EP) and Cybersecurity survivability analysis investigations to help identify and mitigate capability gaps in areas such as: C4ISR, battle space awareness, joint fires, intelligence fusion with secure data sharing and combat identification. Worked in conjunction with AEC, product developers and TRADOC user communities to provide integrated SSurvivability/Vulnerability (SV) solutions that are necessary to counter increasingly smart and sophisticated evolving EW and cyber threats. Provided analysis of systems and networks during System-of-Systems Network Vulnerability Assessments and Network Integration Evaluations. Conducted modeling, simulation and testing on Warfighter Information Network – Tactical WIN-T Incincrement 3 in support of AEC's survivability evaluation of Joint C4ISR radio's Milestone (MS) C decision scheduled for FY16. Conduct analysis on both legacy and new Commercial Off-the-Shelf (COTS)Ts radios and waveforms as required. Conducted EW and cyber studies on Medium Altitude Reconnaissance and Surveillance System (MARSS), Distributed Common Ground GCSystem (DCGS), Prophet and Unmanned Aerial Systems (UAS) ISR, Advanced Field Artillery Tactical Data System (AFATDS) and Improved Position and Azimuth Determining System (IPADS). Advanced development of SAGE communication modeling environment in support of NIE and other field test environments. Developed a methodology to investigate and test Global Positioning System (GPS) reliant systems in an anechoic chamber. Continued developing tools and techniques to conduct software code analysis and the subsequent development of potential exploits. Furthered development of a large-scale mobile ad-	16.179	17.038	22.363

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
hoc network simulation environment to determine potential vulnerabilities in systems before Developmental Test/Operational Test (DT/OT) test events. ***FY 2016 Plans:*** Analyze data for Joint Tactical Radio System (JTRS) Mid-Tier Networking Vehicular Radios (MNVR) Initial Operational Test & Evaluation (IOTE) (NIE 16.1) and Follow-On Operational Test & Evaluation (FOTE) (NIE 16.2). Analyze test data for the JTRS airborne radio systems. Conduct experimental and modeling analysis in support of Military GPS User Equipment (MGUE) Increment1/2 [support of ACD&P, Technical Risk Reduction, Electro-Motive Division / Production Phases, and MS_B/C]. Conduct experimental and modeling analysis in support of DCGS-A Development and Test Inc 2 Rel 1 Software, [support of DCGS-A(D07)Increment 2-Development Contract Award Increment 2 and MS_B 2QFY16]. Conduct experimental and modeling analysis in support of AFATDS Increment 2 V.7.0 Implementation / Deployment [support of Project DU5 Partial Deployment Decision (PDD) for V.7.0]. Conduct experimental and modeling analysis in support of Avenger Fire Control Computer (AFCC) software and hardware upgrades for Forward Area Air Defense (FAAD) [support AFCC-Revision (AFCC-R) Development ensure the system meets the latest Information Assurance (IA) requirements]. ***FY 2017 Plans:*** Will analyze Electronic Protection (EP) and cybersecurity for systems under test and systems under investigation in NIEs 16.1 and 16.2., and for additional highest priority technologies and developmental systems as specified by ATEC so as to reduce costs of downstream development by identifying and fixing vulnerabilities earlier and to assure that formal Army evaluations at Milestone decision points are fully informed on EP and cyber issues. Will mature cyber-attack M&S tools so as to more accurately assess the operational impact of such attacks on small unit mission accomplishment.			
Title: Survivability, Lethality, Vulnerability (SLV) Analyses for Developmental Air and Missile Defense Systems	1.554	1.554	1.554
Description: Conduct integrated SLV analyses for developmental air and missile defense systems, pre-planned product improvements of current systems, and recently fielded systems. These systems include the Ballistic Missile Defense System (BMDS), Terminal High Altitude Air Defense (THAAD), PATRIOT, Surface-Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM), Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS), and Sentinel. ***FY 2015 Accomplishments:*** Designed, developed, and employed advanced electronic attack countermeasures to assess Army Integrated Air and Missile Defense (AIAMD) system of systems. Provided advanced EA for Patriot PDB-08 limited user testing. Conducted cybersecurity testing on next iteration of Counter-Rocket Artillery and Mortar. Completed live-fire test and evaluation lethality assessment of the Patriot MSEMissile Segment Enhancement (MSE) missile. ***FY 2016 Plans:***			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Design, develop, and employ advanced electronic attack countermeasures to assess AIAMD system of systems. Provide advanced EA and cybersecurity testing for Patriot Post Deployment Build-08 user operational test events. Provide additional EA and cybersecurity testing on other AMD systems as needed. ***FY 2017 Plans:*** Will design, develop, and employ advanced electronic attack countermeasures to assess AIAMD system of systems. Will provide advanced EA and cybersecurity testing for Patriot PDB-08 user operational test events. Will provide additional EA/EP and cybersecurity analysis for other Air Missile Defense systems as prioritized by ATEC.			
Accomplishments/Planned Programs Subtotals	33.210	33.246	38.571

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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