ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

May 2009

BUDGET ACTIVITY	PE NUMBER AND TITLE
6 - Management support	**0605604A - Survivability/Lethality Analysis**

COST (In Thousands)		FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate
675	Army Survivability Analysis & Evaluation Support	40693	40929	45016

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 BCT based organization. Specific survivability analysis products include assessments of systems such as MRAP, Stryker, Future Combat System and associated spin-out systems, Army fire support systems, direct fire munitions; Army air defense and missile defense systems; Army aviation systems including Unmanned Aerial Vehicles; communications and other systems enabling network enabled battle command and computer network operations (CNO); 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 analysis products funded by this project are integrated 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; information warfare attacks; and high and low power directed energy weapons. This survivability information permits developers, users, and decision makers to fully understand the technical details of the most important survivability tradeoffs for both systems and Soldiers. 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 AR 5-5 studies process. Work program is prioritized principally by the 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 HQDA G2 MANPRINT program. 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 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 highly technical specialized information warfare and information operations survivability analysis of Army communications and electronic equipment and communications architectures essential to network enabled battle command. Supports ATEC and other electronic warfare vulnerability testers by developing and providing

highly technical specialized field countermeasure environments that threat forces may employ against Army air defense and other systems. In conjunction with PMs and Army intelligence agencies, analyzes technical vulnerabilities of foreign weapons, network related systems, and intelligence EW systems to U.S. Army Electronic Warfare (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.

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B. Program Change Summary	FY 2008	FY 2009	FY 2010
Previous President's Budget (FY 2009)	41681	41066	42456
Current BES/President's Budget (FY 2010)	40693	40929	45016
Total Adjustments	-988	-137	2560
Congressional Program Reductions	-266	-137	
Congressional Rescissions			
Congressional Increases			
Reprogrammings	-225		
SBIR/STTR Transfer	-497		
Adjustments to Budget Years			2560

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Accomplishments/Planned Program:	FY 2008	FY 2009	FY 2010
Conduct integrated survivability, lethality, vulnerability analyses for developmental aviation, ground, soldier and munition systems including JCA, MRAP, Stryker, GSS, Excalibur, IMS and MRM. In FY08, conducted LF testing and completed ballistic survivability/vulnerability analysis on 4/7 ARH subsystems before ARH program termination. Completed ballistic survivability/vulnerability analysis for MRAP T&E, GMLRS Unitary IOT&E and Excalibur LFT&E SET-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. FY09-FY11 plans include conducting engineering and crew casualty analyses for MRAP "Lite", JLTV and PIM LFT&E test events. SLAD will conduct LF testing and ballistic survivability/vulnerability analyses for both the JCA and LB Apache Block III LFT&E test events and conduct HWIL investigations on JCA & LB Apache Block III. SLAD will conduct EW vulnerability assessments for IMS, MRM, Excalibur and JAGM. SLAD will conduct ballistic survivability/lethality analysis for Excalibur, MRM, JAGM, GMLRS Alternate Warhead Program (AWP) and Excalibur Increment 1b. SLAD will provide ballistic and non-ballistic survivability/vulnerability/lethality analysis support to new Army carbine program and provide technical data required by ATEC for the Systems Evaluation Report. Provide ballistic survivability/vulnerability analysis support to Army studies. This effort provides the Army Future Combat Systems stakeholders withcomprehensive survivability, lethality, and vulnerability assessments and vulnerability reduction recommendations that will enhance these attributes of the system-of-systems. CONTINUED BELOW...	18958	19270	20800
...CONTINUED FROM BLOCK ABOVE. Advanced FCS technologies such as ActiveProtection Systems, hybrid propulsion, and advanced armors are evaluatedthrough precision experimentation and modeling and simulation. Methodology enhancements for simulation of new FCS technologies and system-of-systems operational constructs will be performed as required. Ballistic vulnerability analyses were completed on four of the FCS Manned Ground Vehicles (MGV) in FY08 and the data was provided to the PM, LSI, and for use in Army studies. These data and other engineering support contributed to the system functional review and the initial preliminary design review. A survivability based functional analysis and functional decomposition contributed to the development of the system-of-systems specification. Soldier survivability assessments were completed, including one for the NLOS-C special interest project. Additional vulnerability analysis of MGV platforms will be conducted in FY09 and the data will contribute to two scheduled program milestones; the FCS SoSPDR and OSD DAB; and provide guidance to FCS teams for engineering design and networking. Planning and execution of congressionally mandated LFT&E programs will be performed inconjunction with ATEC and OSD DOT&E including armor coupon testing. Further analysis and LFTE activities will continue in FY10-11. Ballistic vulnerability analysis of the FCS MGV will be conducted in support of planned CDRs, LFT&E activities, and initial qualification tests. Network analysis efforts will also continue during this time frame. Findings and recommendations for survivability enhancements will be disseminated to appropriate FCS stakeholders.			
This effort produces assessments of the survivability of C4ISR systems in Electronic (EW) and Information Warfare (IW) threat environments and conducts Information assurance (IA) projects that reveal critical vulnerabilities in C4ISR systems. It also defines,	13528	14205	15410

demonstrates, and recommends mitigation options to proponents and evaluators of C4ISR.Survivability analyses conducted in FY08 reduced the vulnerability of C4ISR such as Warfighter Information Network-Tactical (WIN-T), Joint Tactical Radio System (JTRS), Single Channel Anti-Jam Man-Portable Terminal, Secure Mobile Anti-Jam Reliable Tactical Terminal and Single Channel Ground and Airborne Radio System Advanced System Improvement Program; ISR systems such as Global Broadcast System; C2 systems integral to air and missile defense systems; GPS components integrated with weapon systems; and software blocking architectures. An IW vulnerability database is maintained for the benefit of the community. Priority testing and analyses will be conducted from FY09-11 including EW/IA modeling, JTRS waveforms and hardware, WIN-T increment 2 and 3, ACS, DGCS-A, FCS, and software blocking. Modeling and simulation tools will be developed as required. Also from FY09-11 this project will continue to analyze the evolving EW threat to GPS as integrated into Army weapons. Capabilities will be developed to simulate and evaluate mobile ad-hoc networks which are critical to future Army mobile networks and during FY09-11 they will be used to analyze Army networks and enhance their survivability. This will include vulnerability analyses of tactical internet components to radio frequency directed energy weapons (RFDEW). System-of-Systems Common Operating Environment (SoSCOE) assessments are also conducted. An IA assessment of SoSCOE was conducted in FY08 and from FY09-11 IA testing and analysis of evolving SoSCOE versions, Battle Command software and T-AIDR, and FCS spinouts will be conducted.			
Conduct integrated survivability, lethality, vulnerability 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. In FY 08 SLAD developed state of the art hardware systems to test the PATRIOT system upgrades in countermeasure environments, conducted a risk assessment of the BMDS global communication networks, conducted extensive countermeasure testing and data analysis of the Sentinel radar and SLAMRAAM system, provided detailed recommendations for countermeasure and Information Assurance (IA) testing for the THAAD LUT, and provided detailed design plans to upgrade SLAD's target simulator to support FY 10 JLENS testing. FY 09 - 11 plans include providing the Missile Defense Agency (MDA) with assessments of BMDS Red/Blue IA testing, develop target simulator capability for extensive JLENS developmental testing, conduct additional SLAMRAAM countermeasure testing, provide test planning and conduct of Air and Missile Defense LUT activities, continued upgrade of extensive hardware assets providing realistic threat environments for system testing. In addition, SLAD will continue to provide survivability testing analyses and recommendations to Counter Rocket Artillery and Mortar (C-RAM) during spiral development, and provide innovative solutions and proof of principle testing to the Counter-MANPADS efforts.	5400	5500	6606
System-of-systems survivability simulation (S4) - FY08: integrated higher-fidelity ballistics effects into S4 to enable analysis of threat effects in a mission context; FY09: extend S4 analytical capability by integrating engineering-level EW and CNO effects into the simulation; FY10: demonstrate MUVES3 V/L service to S4; This capability will enable SLV analysis of the networked-enabled future force. FY11: Continue to improve capability to simulate IW and EW attacks on network-centric battle commands.	1238	1561	2200
Complete engineering design, site preparation work and concrete pad construction for rotorcraft Survivability Assessment Facility. This is a congressional add. Not a new start.	1569		
Small Business Innovative Research/Small Business Technology Transfer Programs		393	
Total	40693	40929	45016