ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2004

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

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
Total Program Element (PE) Cost		34921	41860	44648	42102	45079	44894	44967
675	ARMY SURVIVABILITY ANALYSIS & EVALUATION SUPPORT	34921	41860	44648	42102	45079	44894	44967

A. Mission Description and Budget Item Justification: Increased funding supports previous Congressional requests to increase funding for Information Operation Survivability Analysis.

This Program Element (PE) funds activities and functions to conduct objective and integrated survivability and lethality analyses (SLA) on systems of the Stryker and Future Forces of Army Transformation and other major and designated non-major Army systems as appropriate. The analyses quantify the effects of electronic warfare (EW) and ballistic battlefield threats and meteorological conditions on Army individual soldiers and systems. This PE also funds vulnerability assessments of digitized systems. The work is accomplished through threat research, theoretical and engineering analyses, signature measurements, modeling, simulations, laboratory experiments, and field investigations. Activities in progress include assessment of the effects of atmospherics, passive countermeasures, tactics, lasers, high-power microwave, electro-optical/radio frequency (EO/RF) jammers, electromagnetic environment effects (E3), information warfare (IW), decoys, and conventional ballistics on Army soldiers and systems. The PE work efforts provide U.S. Army decision makers, materiel and combat developers, system users, and the Army's Test and Evaluation Command (ATEC) critical soldier and system survivability analyses that quantify the soldier/system's survivability effectiveness in battlefield threat environments. Recommendations are provided to the materiel and combat developers on how to mitigate soldier/system deficiencies and enhance their survivability. This survivability/lethality engineering analyses is required to support the Army's vision to move to lighter more deployable systems while maintaining effectiveness. The analysis is required to properly down-select the appropriate mix of technologies for future platforms of the Transformed Forces. The proper mix of lethality and survivability provides the required force effectiveness for the Transformation Force. This PE funds civilian salaries, travel, development and maintenance of equipment and facilities, general management, administrative and contractor support required for program execution. The U.S. Army Research Laboratory (ARL) Survivability/Lethality Analysis Directorate (SLAD) conducts this effort.

This PE provides support for all transition paths of the Transformation Campaign Plan (TCP).

B. Program Change Summary	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2004)	35236	39138	41647
Current Budget (FY 2005 PB)	34921	41860	44648
Total Adjustments	-315	2722	3001
Congressional program reductions		-1360	
Congressional rescissions			
Congressional increases		4200	
Reprogrammings	-315	-118	
SBIR/STTR Transfer			
Adjustments to Budget Years			3001

Change Summary Explanation: Funding - FY 2004 Funds (+4200) - Congressional funding increase provides Information Operations Survivability Analysis and Decision Related Structure methodology testbed.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management support	**0605604A - Survivability/Lethality Analysis**	**675**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
675	ARMY SURVIVABILITY ANALYSIS & EVALUATION SUPPORT	34921	41860	44648	42102	45079	44894	44967

A. Mission Description and Budget Item Justification: This project funds the investigation of the survivability, lethality and vulnerability (SLV) of designated Army systems to all battlefield threats. It supports transforming the Army to a highly effective mobile force depending on symmetry between Survivability, Lethality, Mobility, MANPRINT, Deployability, and Sustainability. The challenge of the Army Transformation is to examine holistically the contribution of platforms to force effectiveness. This project provides lethality and survivability data of potential systems in the Stryker and Future Forces to achieve symmetric mix of force effectiveness. The analysis is integrated across all battlefield threats (i.e., conventional ballistic, electronic warfare, and directed energy). The results are used by each Project Manager (PM) and the Program Executive Officer (PEO) to direct weapon system development efforts and structure product improvement programs; by the Army Test and Evaluation Command's Army Evaluation Center (ATEC/AEC) when they provide system evaluations in support of milestone decisions; by the user to develop survivability/lethality requirements, doctrine and tactics; and by decision makers in formulating program/production decisions.

Additionally this project supports survivability analysis, information warfare, and information operations of Army communications, electronic equipment and digitized forces against friendly and enemy threats. Provides field threat environment support for Electronic Warfare Vulnerability Analysis (EWVA). Analyzes vulnerabilities of foreign threat weapons and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) and Intelligence Electronic Warfare (IEW) systems to U.S. Army EW systems. Provides threat weapon electronic design data to countermeasure developers and technical capability information to the intelligence community. Supports Army initiatives in vulnerability reduction of C4I/IEW systems against battlefield threats, including information warfare. Provides analysis for understanding potential vulnerabilities of Digitized Force developmental systems. Supports Army Warfighting Experiments and associated Information Operations Vulnerability Assessments for Digitized Force Architecture. Supports vulnerability analysis of situational awareness data of the Transformation Force.

Analysis includes survivability and vulnerability analysis of ground systems of the Stryker and Future Force for Army Transformation and other Army ground combat systems; Army air defense and missile defense systems; Army aviation systems and Unmanned Aerial Vehicles (UAV); Army fire support weapons (smart and conventional); Horizontal Technology Integration systems, Advanced Technology Demonstration initiatives, and proposed survivability enhancements to weapon platforms.

This PE provides support for all transition paths of the Transformation Campaign Plan (TCP).

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Developed a set of analytical tools, techniques and methodologies to over come shortcomings of current Information Operations Vulnerability Survivability Assessments (IOVSA). Improved Communications Electronic Warfare Instrumentation Suite (CEWIS) to allow analysis of software based radios to complement improved threat signal capture and spoofing techniques. Conducted integrated electronic and information operations survivability analysis for U.S. Army communications systems: Warfighter Integrated Network- Terrestrial, the Near Term Digital Radio, Joint Tactical Radio System, SINCGARS ASIP, and AEHF. Conducted limited integrated electronic and information operations effects survivability analysis for U.S. Army command and control systems. Conducted information operations vulnerability analysis of the following systems: FBCB2, Advanced Field Artillery Tactical Data System, Maneuver Control System, FAAD-C2I, All Source Analysis System, the Information System Controller, Advanced Missile Defense Warning System and ABCS Foundation Products development. Continued information warfare vulnerability assessment program to further determine exploitable weakness in the Digitized Forces to include Stryker and FCS and to recommend mitigating solutions. Focused on the Commanders Vehicle and Infantry Carrier Vehicle components of the Stryker BCT and determined the limitations of system performance in information warfare (IW) threat environment. Updated the information warfare vulnerability database, and performed vulnerability analyses of selected Tactical Internet components to radio frequency directed energy weapons (RFDEW).	8113	0	0
Conducted electronic warfare countermeasure analysis support during NetFires PAM, LBHMMS P3I, MRM and Viper Strike field investigations. Provided detailed NetFires LAM comparative analyses on the degradation effects of weather and countermeasures on several UAV/munition pairings, supporting Congressional tasking for HQDA General Officer Steering Committee (GOSC).	2010	0	0
Completed the main fuel subsystems test series on an operational aircraft for the Live Fire Test and Evaluation (LFT&E) of the Joint Army/Navy Black Hawk live fire program. Provided ballistic lethality analysis support for GMLRS w/DPICM, GMLRS Unitary, PGMM, NetFires LAM, CKEM and LOSAT.	6392	0	0
Continued to support Stryker LFT&E on production 8 vehicles (provided pre-shot predictions, performed damage assessments, post-shot analyses and input to Independent Evaluation).	5404	0	0
Continued developing a methodology to address FCS survivability from the component and platform level up through the System of System. Provided subsections to the FCS System Evaluation Plan, the FCS Test and Evaluation Master Plan and the System Evaluation Report. Completed a Soldier Survivability Assessment (MANPRINT) on the FCS for milestone B decision. Continued the Vulnerability Methodology Test Bed effort in Active Protection, structural ballistic shock analysis, hybrid electric power vulnerability, Band Track vs. wheels analysis, spall analysis of composite materials.	7754	0	0

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Provided formal survivability characterization of Army GMD components. Integrated Army and AF component assessments to provide system-level survivability characterization. Continued to design/develop advanced EW countermeasure concepts to support Block 02-06 Patriot upgrade. Planned testing support for captive carry exercises associated with THAAD system effectiveness study to the MDA Black Team. Completed Stinger Block I HWIL simulation model. Developed MEADS Survivability Analysis Plan.	5248	0	0
Conduct integrated survivability, lethality, and vulnerability analyses on Army Transformation systems. Complete non-ballistic survivability/lethality analysis for Stryker variants/configurations. Support Stryker Mobile Gun System and NBC Reconnaissance vehicle Live Fire Test and Evaluation and non-ballistic survivability analysis in 04-05. For these two variants, provide pre-shot predictions, perform damage assessments after live fire tests, post-shot analyses and provide technical data required by ATEC for the Systems Evaluation Reports.	0	4095	4216
Conduct integrated survivability, lethality, and vulnerability analyses for Army Future Combat System (FCS) and Future Force systems. Initiate modeling, analysis and simulation efforts supporting the FCS program, to include Active Protection Systems (APS) and FCS Lethality. Contribute to the Development of the Systems of Systems analysis methodology for Unit of Action (UA) survivability. Investigate the vulnerability/survivability implications of FCS advanced technologies including new armors and Hybrid Electric Propulsion systems. Develop the methodologies necessary to support the characterization and assessment of FCS platforms equipped with these systems. Aid FCS platform designers and technology suppliers to enhance the survivability of these technologies. Identify and manage Soldier Survivability related issues during FCS system design to include fratricide prevention and crew protection. Support the planning and execution of the ballistic vulnerability and Title 10 LFT&E programs on the FCS, in conjunction with ATEC and DOT&E. Conduct a ballistic vulnerability analysis on the initial Manned Ground Vehicle (MGV) platform design. Further support FCS program by providing documentation and briefings on survivability of concepts in support of the PDR in FY 2005.	0	9104	11774

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Conduct integrated survivability, lethality, and vulnerability analyses for Army Modernization/Current systems that will be in the field with newer systems. Complete CH-47F LFT&E survivability evaluation. Prepare multi-threat survivability analysis data for CH-47F milestone C decision. Provide Blackhawk and Apache LFT&E support. Continue Comanche Army qualification tests. Conduct electronic warfare vulnerability assessments for developmental U.S. Army munition systems such as Precision-Guided Mortar Munition, Advanced Precision Kill Weapon System (Hydra 70 Rocket), XM 982 Excalibur, Guided Multiple Launch Rocket System x/DPICM, NetFires (NLOS LS), Joint Common Missile, Intelligent Munition System (IMS), Non Self-Destruct Alternative (NSD-A) and MRM. Conduct ballistic survivability/lethality analysis for U.S. Army munitions systems to include ATACMS (Penetrator), Excalibur, MRM, PGMM, LOSAT, Guided MLRS w/DCIPM, GMLRS Unitary, CKEM, Joint Common Missile and Medium Caliber. Conduct obscurant and atmospheric effects survivability analysis for U.S. Army munitions systems. Support LFT&E of GMLRS w/DCIPM.	0	7043	7347
Conduct integrated electronic and information warfare effects survivability analysis on command and control systems, and various Army weapon platforms as they integrate C4ISR components with internal information/computer processors controlling automotive, flight, fire control and sensor functions. This effort supports the full set of Army Battle Command Systems: FBCB2, Advanced Field Artillery Tactical Data System, Maneuver Control System, FAAD-C2I, All Source Analysis System, Combat Service Support Control System, and Advanced Missile Defense Warning System. Continue to expand information warfare vulnerability assessment program to determine exploitable weakness in the Digitized Forces (including FCS) and recommend mitigating solutions. Focus on processor components of the Stryker Force to determine the limitations of system performance in information warfare (IW) threat environment. Conduct integrated electronic and information operations survivability analysis for U.S. Army communications systems such as Warfighter Integrated Network-Terrestrial, the Near Term Digital Radio, Joint Tactical Radio System, and SINCGARS ASIP. Includes update of information warfare vulnerability database, and vulnerability analyses of Tactical Internet components to radio frequency directed energy weapons (RFDEW). Develop modeling and simulation to examine impacts of EW and IW attacks on the survivability of FCS.	0	10550	14012

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Conduct integrated survivability, lethality, vulnerability analyses for developmental air defense and missile defense systems, pre-planned product improvements of current systems, and recently fielded systems. Systems to be addressed include Ballistic Missile Defense System (BMDS), Theater High Altitude Air Defense (THAAD), Patriot, Medium Extended Air Defense System (MEADS), SLAMRAAM, JLENS, M3P and Sentinel. Provide interim survivability reports. Recommend survivability enhancements. Project also funds Anti-Radiation Missile (ARM) Counter-Arm efforts that assess threat technologies against THAAD and GMD, Patriot, MEADS, and Forward Area Air Defense-C21 (FAAD-C21) ground based sensors. Includes work on Focal Plane Array Countermeasures (FPACM) (Project Agreement Partner: United Kingdom): Continue characterization and assessment of advanced focal plane array missile seekers and develop electronic countermeasures (ECM) to defeat them through simulation, modeling and lab testing. Continue development of models and simulations to analyze missile system performance in countermeasure environments. Conduct lab and field investigations to refine countermeasure techniques. Support development of GMD Evaluation Test Bed. Provide survivability analysis for THAAD Block 04 Activities.	0	6002	7299
Using Decision Related Structures (DRS), develop a System of Systems Survivability (S4) engineering model used with the Combined Arms and Support Task Force Evaluation Model (CASTFOREM) and its successor, Combat XXI. The S4 model provides details of how combat outcomes are dependant on understanding the way quality of military decision-making is conditioned by information flow on the battlefield. This model will advance the understanding of Information Operations and Information Warfare.	0	4200	0
Small Business Innovative Research/Small Business Technology Transfer Programs	0	866	0
Totals	34921	41860	44648