ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE
3 - Advanced technology development	**0603004A - Weapons and Munitions Advanced Technology**

	COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
	Total Program Element (PE) Cost	95165	85981	73697	76273	79563	79284	81047
232	ADVANCED MUNITIONS DEM	46612	31216	38084	39748	40132	34592	35234
43A	ADV WEAPONRY TECH DEMO	25469	28955					
L94	ELECTRIC GUN SYS DEMO	13038	9511	11578	11826	12976	17646	18160
L96	HIGH ENERGY LASER TECHNOLOGY DEMO	9056	15280	23009	23671	25427	25995	26579
L97	SMOKE AND OBSCURANTS ADVANCED TECHNOLOGY	990	1019	1026	1028	1028	1051	1074
L98	HIGH EXPLOSIVE AIRBURST AMMUNITION AND WEAPONS SYS							

A. Mission Description and Budget Item Justification: This program element (PE) matures and demonstrates advanced weapons and munitions technologies to increase battlefield lethality and survivability for the Future Force and, where possible, the Current Force. The goal of this program is to provide the warfighter with weapons and munitions that provide equivalent or greater lethality (or other desired effects) at greater ranges, with greater precision, in lighter weight systems and at affordable costs when compared to current weapon systems. Project 232 matures and demonstrates munitions enhancements and emerging technologies in lightweight structures, smart materials, acoustic/seismic sensors and in-flight update architectures that enable equivalent or greater lethality (or other desired effects) at greater ranges, with greater precision, in lighter weight systems and at affordable costs when compared to current weapon systems. Project 232 provides enhanced capabilities beyond the baseline line-of-sight/beyond-line-of-sight (LOS/BLOS) armament and munition suite and matures the Mid Range Munition (MRM) to add an objective dual-mode hardened seeker for autonomous and designated engagement modes. The Common Smart Submunition effort matures and demonstrates component technologies for a next generation precision kill and target-discriminating submunition that can be used in a variety of delivery systems. The Fuze and Power for Advanced Munitions effort integrates enabling fuze technologies such as Micro-Electro-Mechanical Systems (MEMS), proximity sensors, Electronic Safe and Arm Devices (ESADs) and hybrid power systems in end item munitions for demonstration purposes. The Non-Lethal Payloads for Personnel Suppression effort matures and demonstrates the munitions to suppress activity or deny access to designated areas using non-lethal means. The Multi-mode High Powered Microwave (HPM) and Laser Induced Plasma Channel (LIPC) Technology efforts are focused on improvised explosive devices (IEDs) and electronically controlled materiel threats. The Scalable Technology for Adaptive Response (STAR) effort demonstrates muniton and weapon concepts that can be gun or missile launched to deliver a broad spectrum of effects, while reducing collateral damage. The Military Operation in Urban Terrain (MOUT)/Urban Lethality Technologies effort demonstrates the next generation of explosive wall breaching and shoulder launched warhead technologies. The Soldier and Small Unit Lethality Integration provides a modular, configurable open architecture, net centric fire control, target hand-off and integrated effects decision support capability for dismounted Soldier/Leader. The Ground Based Munitions Technologies effort creates an integration approach allowing ground based munition delivery to a precise location once deployed from the primary delivery mechanism such as the multiple launch rocket system, unmanned aerial systems, fixed or rotary wing platforms, etc. The Lightweight Cannon Integration effort applies novel recoil attenuation techniques to large caliber weapons for future spirals of FCS weapon systems. Project 43A funds congressional special interest items. Project L94 matures subsystem technologies for an Electromagnetic (EM) Gun armament system demonstrations in FY08. Based on successful completion of the subcomponent technology, Project L94 will

initiate the design, fabrication, and test of an integrated EM armament system demonstrator. Project L96 matures and demonstrates technologies that comprise a high energy power, solid-state laser weapon. Project L97 matures and demonstrates smoke and obscurant technologies with potential to enhance personnel and platform survivability. Work in projects 232 and L94 is related to, and fully coordinated with, efforts in PE 0602624A (Weapons and Munitions Technology), and PE 0602618A (Ballistics Technology). Work in project L96 is related to, and fully coordinated with, efforts in PE 0603005A, project 441 (Pulse Power for FCS) PE 0602307, project 042 (High Energy Laser Technology) and PE 62120, project 140. Work in this PE associated with project L97 is related to and fully coordinated with, efforts in PE 0602622A, project 552 (Smoke/Novel Obscurant Munitions). Work in this PE is performed by the US Army Armament Research, Development, and Engineering Center (ARDEC), Picatinny, NJ, the Edgewood Chemical and Biological Center, Edgewood, MD, and the Space and Missile Defense Command (SMDC). The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement.

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B. Program Change Summary	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	92054	59389	74072
Current BES/President's Budget (FY 2009)	95165	85981	73697
Total Adjustments	3111	26592	-375
Congressional Program Reductions		-2548	
Congressional Rescissions			
Congressional Increases		29140	
Reprogrammings	5541		
SBIR/STTR Transfer	-2430		
Adjustments to Budget Years			-375

Fourteen FY08 congressional adds totaling $29140 were added to this PE.

($800) Lightweight Cannon Recoil Reduction
($1000) Common Smart Submunition (CSS)
($1000) Knowledge Driven Manufacturing System (KDMS)
($1000) Reactive Nanocomposite Materials
($1440) Development of Truck-deployed Explosive Containment Vessel
($1600) Advanced Tungsten Penetrators end Ballistic Materials
($1600) Disruptive Technology Acceleration
($1600) Integrated Aircraft Test Bed
($1600) RAMAN Chemical Identification System
($2400) Rapid Insertion of Developmental Technologies
($2500) Micro Electrical Mechanical Systems (MEMS) Application for Armor and Munitions
($3600) Nanotechnology Fuze-on-a-Chip
($4000) Lightweight Munitions and Surveillance System (LMSS) for Unmanned Air & Ground Vehicles
($5000) Rapid Prototyping for Special Projects

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603004A - Weapons and Munitions Advanced Technology**	**232**

COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
232 ADVANCED MUNITIONS DEM	46612	31216	38084	39748	40132	34592	35234

A. Mission Description and Budget Item Justification: This project matures and demonstrates munitions enhancements and emerging technologies in lightweight structures, smart materials, acoustic/seismic sensors and in-flight update architectures that enable equivalent or greater lethality (or other desired effects) at greater ranges, with greater precision, in lighter weight systems and at affordable costs when compared to current weapon systems. A major effort completed in FY07 was the MCS and Abrams Ammunition System Technologies (MAAST). MAAST supports the maturation and demonstration of hardened dual mode seeker technology for the Mid-Range Munition (MRM) (a gun-launched precision munition for the Mounted Combat System (MCS) capable of defeating high-value heavy armor and other targets out to 12km). The MAAST effort also matured technologies such as Low Cost Precision (LCP) components and subsystems for command-guided projectiles, which enhance the capabilities of the MCS and the M1A2 through spiral insertion and upgrades. Ongoing major efforts include the Common Smart Submunition (CSS), which pursues critical subsystem evaluations leading to system demonstrations of a submunition that offers increased operational efficiency through multiple kills per munition, affords greater flexibility for carrier applications, and enables use of a variety of delivery systems; Robotic and Network Technologies, which addresses various aspects of making armaments and munitions part of the networked battlespace; and warhead and fuze safe and arm development supporting the Kinetic Energy Active Protection System (KEAPS), which is developing munitions and countermeasures for Active Protection Systems (APS) to enhance survivability for lightly armored, or very lightweight vehicles. Other efforts in this project include: Fuze and Power for Advanced Munitions, which matures technologies that reduce munition sizes while adding tailorable effects to advanced munitions, and also improves advanced on-board munition power systems with increased power densities, increased mission time, improved temperature performance, and reduced volume and weight; Countermine/Surface Laid and Buried Mine Neutralization which matures and assess Laser Induced Plasma Channel (LIPC) technology to defeat surface laid and buried mines; and Extended Area Protection and Survivability, which demonstrates the use of command-guided medium caliber projectiles for the interception and destruction of incoming rockets, artillery, and mortar rounds. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. This work is performed by the US Army Armament Research, Development, and Engineering Center (ARDEC), Picatinny, NJ, in cooperation with the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD, the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL. The APS countermunition efforts are developed and collaborated with the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

Accomplishments/Planned Program:	FY 2007	FY 2008	FY 2009
MAAST-MRM: In FY07, completed fabrication and assembly of integrated dual-mode MRM target acquisition, guidance, and counter active protection systems; demonstrated gun-fired multi-mode MRM at a BLOS target. Efforts described here are coordinated and complimentary to related efforts in PE/project 0602624A/H28.	10000		
MAAST: In FY07, fabricated, assembled, and demonstrated multi-function warhead for LOS-MP/MRM and demonstrated advanced propellant and robust cartridge case technologies; fabricated, assembled, and demonstrated in-flight tracking and maneuver control performance of projectile with LCP technologies.	16044		
Pulsed Laser Technologies: In FY08, mature Laser Guided Energy (LGE) technology using Ultra Short Pulse lasers (USPL) to		6225	5172

demonstrate feasibility at militarily relevant ranges. In addition, mature and demonstrate advanced solid state High Power Microwave (HPM) device designed to reduce the size and weight over that of existing solid state power HPM devices; increase the length of the Laser Induced Plasma Channel(LIPC) using novel laser technology; and demonstrate HPM stackable, modular, and higher power density modules. In FY 09 will begin design to integrate compact solid state High Power Microwave sources and high voltage sources using LIPC for laser guided energy (LGE) in a directed energy weapon system demonstrator; will model LIPC interaction with various directed energy sources and down select mature LGE technology. Efforts described here are coordinated and complimentary to related efforts in PE/Projects: 0602624A/H18 and H19.			
Ground Based Munitions Technologies: In FY09, will conduct initial design for a delivery system capable of deploying existing and future ground based munition systems to a precise location once released from the primary delivery mechanism such as MLRS, UAS, Fixed and Rotary wing platforms, etc. Will focus on an approach to guide sensors, communication nodes and effects devices to the ground once released from the carrier, in a pattern that allows optimal interaction among the components, eliminates communications degradation and provides an optimal engagement pattern. Will assess numerous means for providing maneuverability to an object in a drop test. Will also develop a concept which will integrate technologies that allow precision emplacement of Intelligent Munitions Systems (IMS) from a standoff distance that is as effective as hand emplaced IMS (PE 654808/D016). Will demonstrate in a drop test the maneuverability device and will develop a concept plan for expulsion from round. Efforts described here are coordinated and complimentary to related efforts in PE/Project 0602624A/H19.			3113
Scaleable Effect Weapons and Munitions System: In FY08, establish and evaluate baseline modeling of experimental hardware for evaluation of next generation explosives, reactive materials, and advanced warhead liners. In FY09, will define and evaluate system selectability requirements to allow for controlled lethality against less-than-lethal, controlled lethal area, and extremely lethal target requirements; will evaluate warhead tailoring methodologies to control munition energy output and will verify modeled scalability effects in reduced munition sizes for man-portable classed systems; will fabricate and test prototype hardware for evaluation of multipurpose capabilities. Efforts described here are coordinated and complimentary to related efforts in PE/project(s): 0602624A/H18 and H28.		3095	5165
Fuze and Power for Advanced Munitions: In FY07, continued explosive compatibility and safety tests of Microelectromechanical systems (MEMs) in surrogate test vehicle; demonstrated prototype battery designs in laboratory and conducted air gun high-g tests for new thermal and liquid reserve batteries and hybrid power systems; began alternative/hybrid energy systems evaluations. In FY08, integrate Electronic Safe and Arm devices (ESAD) subsystem. Conduct demonstration of gun launched multipoint warhead initiation. Conduct performance testing of MEMS S&A device and MEMS impact switch performance in 155 mm projectile. For sensors: demonstrate gun launch RADAR proximity fuze capability in direct fire application, validate stand-off improvements and size reduction. Achieve mortar configuration for LADAR sensor using advanced laser and detector. For power: demonstrate prototype organic chemistry based liquid reserve batteries and thermal management battery improvements with flight tests in a gun-launched munition. Efforts described here are coordinated and complimentary to related efforts in PE/project(s): 0602624A/H18. In FY09, will demonstrate pre-programmed maneuver and guide to hit capabilities in a mature prototype precision guided 105mm projectile.	4402	4750	3543
Common Smart Submunition (CSS): In FY07, matured sensor and algorithms for follow-on captive flight test (CFT) to achieve 0.95 probability of discriminating and firing at a target of interest; baselined Autonomous Target Recognition (ATR) performance and identified future iteration work building toward multi-target discrimination capability (Army, Air Force, Navy targets); provided test data for system analysis model and developed and validated a CSS system model for end-to-end simulation evaluation. In FY08, demonstrate (drop) full up functional CSS prototype submunitions at the suspended cable facility at Sandia; demonstrate sensor and algorithm Technical Readiness Level (TRL) during CFT (Phase 2); verify LADAR/IR sensor and ATR discrimination algorithms in a dynamic Captive Carry Test (CCT); verify all ATR performance sub-sets such as registration, target detection, key feature extraction, and target	7970	8703	

recognition during CCT; conduct evaluations to serve as entrance criteria for System Design Review (SDR #2) and follow on efforts; conduct demonstrations of Warhead TRL and integration of multiple systems; finalize interface design for warhead to support integration of warhead with submunition; conduct final demonstration of CSS with live warhead and self-destruct capabilities at end of FY08. Efforts described here are coordinated and complimentary to related efforts in PE/project(s): 0602624A/H18 and H19 and 0603004/232.			
Lightweight Cannon Integration: In FY09, will demonstrate novel recoil attenuation techniques to large caliber weapons for future spirals of FCS weapon systems; will validate design concepts for the next generation of highly mobile cannon-based firing platforms with significantly enhanced firepower, i.e., the set of weapons beyond the current NLOS-C or MCS 120mm systems; will mature and assess RArefaction waVE guN (RAVEN) technologies, momentum cancellation techniques, and rapid fire initiatives.			3100
Soldier and Small Unit Lethality Integration: In FY09, will demonstrate mission tasking, target geo-location (GPS fused, Selective Availability Anti-Spoofing Module [SAASM] compliant), de-confliction & automated target hand-off from an small unmanned ground vehicle (UGV)/Soldier platform to a small unit effects network; will demonstrate initial target hand-off /effects node processing within 10 seconds and target geo-location accuracy of 10 meters; will mature and validate modular software & algorithms for Ground Soldier Systems (GSS) incremental capability. Efforts described here are coordinated and complimentary to related efforts in PE/project 63001/J50.			3000
Dual Use Composites (DUC): In FY07, optimized DUC munition to increase accuracy and lethality through test demonstrations in an operational environment; developed most promising light weight solutions for remote weapon stations on robotic vehicle. Assessed current and developmental unmanned platforms which would benefit from DUC and tailor technical parameter of the DUC material to increase the physical properties of the material. In FY08, optimize DUC munition to increase accuracy and lethality through test demonstrations in an operational environment. Mature most promising lightweight solutions for remote weapon platforms. Select one or two unmanned platforms from the candidates identified during FY07 and produce complex, high fidelity DUC components. In FY09, will optimize and integrate complex high fidelity DUC components (classified) into the unmanned platforms selected during FY08; will demonstrate the quality, integrity and lethality through tests in an operational environment	1081	878	2970
Tunable Pyrotechnics: In FY08, evaluate the efficacy of tunable pyrotechnic formulations by integrating and combining pyrophoric reactive materials, nano technology and pyrotechnic chemistry. Evaluate the key processes, products, and physical parameters. In FY09, will use the successful candidate formulations and conduct energetic characterization, sensitivity studies, and initial prototype application for counter measures and battlefield effects simulators; will develop and test low visibility infrared decoy flare compositions to protect aircraft from IR guided missiles without revealing aircraft position during night operations; will conduct signature and performance measurements of new nano pyrophoric and pyrotechnic formulations.		1032	2886
Countermine/Surface Laid and Buried Mine Neutralization: In FY07, integrated directed energy power source technologies onto a ruggedized skid to demonstrate and assess the feasibility of further maturing and developing this technology for mine destruction. Efforts described here are coordinated and complimentary to related efforts in PE/project 0602624A/H19.	1920		
Extended Area Protection and Survivability (EAPS): In FY07, integrated advanced warhead and fuze configurations within the EAPS projectile and conducted live fire demonstrations to validate lethality against static RAM targets. In FY08, integrate projectile design based on results of "A" and "B" round developments and conduct demonstration firings. Efforts described here are coordinated and complimentary to related efforts in PE/project 0602624A/H28.	1392	2813	
Military Operations in Urban Terrain (MOUT)/Urban Lethal Technologies: In FY07, for shoulder launched munitions, matured multi-mode, high-blast/anti-armor warhead designs for single warhead configurations and also the forward precursor charge designs for tandem	3803	3100	3494

warhead configurations. For the lightweight breaching system, matured the system design and used data to demonstrate several full size prototypes that met the threshold penetration requirements; used designs for modeling and fabrication of prototype warheads for experimental validation. In FY08, conduct initial modeling and experimental validation of multi-mode warhead design concepts and fuze requirements which enable demonstration and refinement of the precursor charge for shoulder launched munitions; for the light weight wall breaching system, demonstrate maturing linear shaped charge liner and multipoint initiation. In FY09, will evaluate advanced fuzing options of multimodal warheads and mature the bash-through warhead on shoulder launched munitions; for the light weight wall breaching system, will refine liner and initiation concepts for system integration and demonstrate a one-shot, on-target tandem wall breaching system against appropriate targets; Will demonstrate multi-purpose capability (multiple targets) from a single shoulder launched munition; Will demonstrate a single shot demolition device for the purpose of creating soldier-sized entry holes in double rebar reinforced concrete walls in a single step.			
Kinetic Energy Active Protection System: In FY09, will mature warhead technologies and use modeling and simulation (M&S) and verification testing to validate performance against all classes of threats; will demonstrate warheads and enhanced blast explosives through M&S and verification testing in near tactical environments; will refine fuze Safe & Arm (S&A) device for warheads and explosives and will demonstrate in near tactical environment. Efforts described here are coordinated and complimentary to related efforts in PE/Project 062624/H28 and are developed and collaborated with efforts in PE/Project 063005/221 and 063313/550.			4642
Reliability for the Future Force: In FY09, will develop probabilistic models for micro-electrical-mechanical system (MEMS) failure physics that will measure performance degradation and/or predict system failure; will develop reliability models for each failure mode building from sub-component and material levels up through component, subassembly to integrated Inertial Measurement Unit (IMU) and safe & arm levels; will develop optimization process for technology and design trades and process control sensitivities to improve the inherent reliability and process effectiveness; will mature life enhancement technology features and define inherent reliability improvements.			999
Small Business Innovative Research/Small Business Technology Transfer Programs		620	
Total	46612	31216	38084

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603004A - Weapons and Munitions Advanced Technology**	**L94**

COST (In Thousands)		FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
L94	ELECTRIC GUN SYS DEMO	13038	9511	11578	11826	12976	17646	18160

A. Mission Description and Budget Item Justification: This project matures and demonstrates Electromagnetic (EM) armament subsystems and the enabling technologies for tactically relevant gun systems. EM Guns have the potential to revolutionize the future battlefield by their unique performance characteristics (hypervelocity and reduced-signature launch), elimination of vulnerable propellants, synergistic relationship with hybrid electric vehicles, and reduction in sustainment burden. In addition to designing, fabricating, and demonstrating subsystem components, the project confronts system level technology challenges including synchronization/compatibility of twin counter-rotating machines, technology scalability, thermal management, and full energy system performance. After successful demonstration of the critical components and subsystems at tactical scale, a follow-on effort is planned to integrate next generation subsystems into an armament prototype, comprising robust launcher, pulsed power supply, launch packages, prime power, cooling and auxiliaries, to demonstrate system performance. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. This project is executed by the Armaments Research, Development, and Engineering Center (ARDEC) at Picatinny, NJ, in cooperation with the Army Research Laboratory (ARL), Adelphi, MD, and The University of Texas at Austin (a University Affiliated Research Center). This work complements and is fully coordinated with efforts in PE/project(s) 0602618A/H75 and PE 0601104A/H56.

Accomplishments/Planned Program:	FY 2007	FY 2008	FY 2009
EM Gun System Demonstration: In FY07, completed fabrication of a one-half length (2 meter) railgun test bed and demonstrated strength of design and scaling effects by testing at full scale launch peak loading conditions. Verified fuze performance for safe & arm in an inert configuration and completed high explosive (HE) risk reduction ballistic tests in an EM environment. Completed acceptance/verification testing of Pulsed Power Supply (PPS) components and manufactured the major rotating machine sub-assemblies. In FY08, build a lightweight cantilevered high fidelity (4 meter) railgun with integrated breech and muzzle shunt and demonstrate threshold performance at hypervelocity and multi-round launchability; test fire an integrated HE, fuzed launch package from a laboratory EM gun; integrate the compact, twin counter-rotating pulsed alternator power supply, conduct subsystem functional tests and accomplish high fidelity breadboard PPS demonstrations that establish and validate requisite performance criteria. In FY09, will build upon the test beds to mature next generation EM gun subsystem hardware; will conduct upfront requirements analysis and prepare point-of-departure performance specifications to support evolutionary concepts for an integrated EM armament system prototype selected on best balance of technical achievability and military utility; will configure the high fidelity (4 meter) railgun, pulsed power supply, and launch package components/subsystems to enable full firing chain demonstration in FY10 to assess system level functionality.	13038	9295	11578
Small Business Innovative Research/Small Business Technology Transfer Programs		216	
Total	13038	9511	11578

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February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603004A - Weapons and Munitions Advanced Technology**	**L96**

COST (In Thousands)		FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
L96	HIGH ENERGY LASER TECHNOLOGY DEMO	9056	15280	23009	23671	25427	25995	26579

A. Mission Description and Budget Item Justification: This project matures and demonstrates advanced technologies for Future Force High Energy Laser (HEL) weapons technology. The major effort under this project is the development of a mobile one-hundred kilowatt (kW) class Solid State High Energy Laser Technology Demonstrator (HEL TD) that is traceable to the form, fit, and function requirements of the Future Force. HEL systems have the potential to address the following identified Army capability gaps: 1) Defeat In-Flight Projectiles such as rockets, artillery, mortars, anti-tank guided missiles, and man-portable surface-to-air missiles; 2) Ultra-Precision Strike with little to no collateral damage; 3) Disruption of Electro-Optical (EO) and Infra-Red (IR) sensors; 4) Neutralizing surface-laid mines and other ordnance from a stand-off distance; and 5) Ultra precise lethal / non-lethal effects against a wide variety of targets. HEL TD possesses the characteristics required to support future Joint / Army requirements for a lethal capability that is deployable, mobile, and self-sustaining, while capable of operating in a full spectrum, networked, information-based battlefield environment. HELs are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems. The HEL TD program utilizes a modular building block approach with open systems architecture to ensure growth and interoperability. This modular approach ensures opportunity for technology insertions for maturation of laser, beam control, sensor/radar, integration of power (pulsed), and Battle Management Command, Control, and Computers (BMC3). At weapon system power levels of around 100 kW, Solid State Laser (SSL) technology has the potential to enhance survivability by addressing the capability gaps identified above. The SSL technology effort in PE 0602307A addresses technical issues such as high average power output from compact and more efficient lasers; precision optical pointing and tracking; laser effects degradation due to atmospheric effects; lethality against a variety of targets; and effectiveness against low-cost laser countermeasures. The HEL TD effort plans to use and integrate the Pulse Power Supply developed in PE 0603005A scheduled for completion in FY08 and available for integration in FY09. The supporting effort under this project is the development of a Force Encampment Protection System (FEPS) radar designed to detect, track, discriminate, and predict impact / launch points of rockets, artillery, and mortars (RAM) launched from any direction. Its goal is to meet the demanding 360 degree, short-timeline search requirements imposed by rockets fired directly into defended encampments on depressed trajectories. A novel three-tier antenna configuration enables fast horizon searches as well as track of targets up to 80 degrees elevation, providing near hemispherical radar coverage at a fraction of the cost of a conventional phased array antennas. The FEPS radar design is capable of providing a highly-accurate and reliable sense and warn capability. In order to accomplish this mission, FEPS will detect, discriminate, and provide impact and launch point prediction on RAM threats. It also provides precision track data to directed energy and kinetic energy munitions used to intercept these targets. There are currently no sensors that provide this total capability. The Counter-Rocket, Artillery, and Mortar (C-RAM) program office has identified the FEPS radar technology as key in filling a gap in the search, track, discrimination, and impact point prediction of RAM targets. The FEPS effort transitions to PE 0603313A in FY08. Work in this project is related to, and fully coordinated with, efforts in PE 0602307A, PE 0602890D8Z, PE 0603005A, and PE 0603924D8Z (High Energy Laser Joint Technology Office), PE 0605605A (DOD High Energy Laser Systems Test Facility), PE 0603005A/441 (Combat Vehicle and Automotive Advanced Technology), and PE 0603313A (US Army Aviation and Missile Research, Development, and Engineering Center). The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work is performed by Aberdeen Proving Ground, MD, and US Army Space and Missile Defense Command Technical Center, Huntsville, AL.

Accomplishments/Planned Program:	FY 2007	FY 2008	FY 2009
High Energy Laser Technology Demonstrator (HEL TD): In FY07, began the design of the HEL TD ruggedized beam control system	6456	14852	23009

(BCS), which incorporates technologies that improve pointing accuracy and minimize jitter to optimize the amount of laser energy placed on a target ensuring its destruction. This included defining detailed BCS specifications and conducting design-to-capabilities trades. In FY08, complete the BCS design, including structural / vibration support platform, beam steering / focusing mechanisms, with on board target acquisition (pointing / tracking camera), and functional software; Purchase some long lead item procurements; and begin HEL TD systems engineering efforts to enable the integration of technologies into a mobile and tactically relevant weapon system capability, including development of detailed system specifications and detailed interface requirements. Develop detailed system requirements for power, thermal management, and BMC3 (includes Fire Control) and analyze, assess, and select appropriate tactical vehicle platform. In FY09, will continue HEL TD system engineering efforts; will begin the fabrication, assembly, and testing of the BCS; and will begin the design of the miniaturized and ruggedized high energy solid state laser (SSL) component that will provide the lethal laser energy to destroy a target, while also being capable of withstanding the shock and vibration from a combat vehicle platform operating in a tactical environment. This program may use one of the SSLs developed in PE 0602307A as the basis of the design for the miniaturized and ruggedized SSL component.			
Force Encampment Protection System (FEPS) radar: In FY07, developed primary Ku-band antenna components, Rotman lens, slotted waveguide radiators, and interconnecting waveguide pieces manufactured from plated plastic. Developed slotted waveguide emitter antenna design and a prototype receiver capable of receiving signals from up to four channels. Developed two elements of the radar array and performed high power, heat dissipation and monopulse tracking tests. At the end of FY07 this program transitioned to the US Army Aviation Missile Research, Development, and Engineering Center (AMRDEC) as part of the C-RAM tracking and fire control effort in PE 0603313A.	2600		
Small Business Innovative Research/Small Business Technology Transfer Programs		428	
Total	9056	15280	23009

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February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603004A - Weapons and Munitions Advanced Technology**	**L97**

COST (In Thousands)		FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
L97	SMOKE AND OBSCURANTS ADVANCED TECHNOLOGY	990	1019	1026	1028	1028	1051	1074

A. Mission Description and Budget Item Justification: This project matures and demonstrates smoke and obscurant technologies with potential to enhance personnel/platform survivability by degrading threat force surveillance sensors and defeating the enemy's target acquisition devices, missile guidance, and directed energy weapons. Dissemination systems for new and improved obscurants are developed with the goal of providing efficient and safe screening of deployed forces. A major effort will demonstrate the dissemination of newly developed advanced infra-red (IR) obscurants having four times the previous performance. Mature modeling and simulation tools developed in PE 0602622A to predict performance and analyze strategic use of obscurants on the battlefield. Other efforts mature dissemination, delivery, and vehicle obscurant enabling technology with potential to increase survivability through increased standoff and threat protection. After successful demonstration, these technologies transition to the Family of Tactical Obscuration Devices, and other System Development and Demonstration programs. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the Army Research, Development, and Engineering Command, Edgewood Chemical Biological Center, Edgewood, MD.

Accomplishments/Planned Program:	FY 2007	FY 2008	FY 2009
Obscurant Enabling technologies: In FY07, refined design of prototype packaging/dissemination concepts; developed prototype system for advanced IR obscurant for use in grenades, artillery rounds and other smoke generating systems. Conducted experiments of new dissemination techniques in a relevant operational environment. In FY08 mature, fabricate, and test the selected grenade concept as necessary to meet TRL-6 prototype requirements. In FY09, will evaluate dissemination methods and will conduct modeling and analysis of advanced IR obscurants for artillery and mortar applications.	990	991	1026
Small Business Innovative Research/Small Business Technology Transfer Programs		28	
Total	990	1019	1026