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

February 2003

BUDGET ACTIVITY
3 - Advanced technology development

PE NUMBER AND TITLE
0603004A - Weapons and Munitions Advanced Technology

COST (In Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
Total Program Element (PE) Cost		34244	63230	47752	72404	75395	62289	69678	77511
232	ADVANCED MUNITIONS DEM	30877	58861	28091	52779	42063	44653	46127	48090
43A	ADV WEAPONRY TECH DEMO	3367	4369	0	0	0	0	0	0
L94	ELECTRIC GUN SYS DEMO	0	0	19661	19625	19606	0	0	0
L96	HIGH ENERGY LASER TECHNOLOGY DEMO	0	0	0	0	13726	17636	23551	29421

A. Mission Description and Budget Item Justification: This Program Element (PE) matures and demonstrates affordable, smaller and/or lighter advanced weapons and munitions technologies to increase battlefield lethality and survivability for the Future Combat Systems (FCS) and the Objective Force. Within Project 232 specific efforts include: FCS Multi-Role Armament and Ammunition System (MRAAS) Advanced Technology Development (ATD); Mid Range Munition (MRM); Multi-Purpose Extended Range Munition (MP-ERM); Advanced Light Armament for Combat Vehicles; Responsive Accurate Mission Module (RAMM); and High Energy Laser Technology Demonstrations. The FCS Multi-Role Armament effort utilizes Electrothermal-Chemical (ETC) propulsion and provides single armament module configurations to support both maneuver and fire support missions. The corresponding FCS Multi-Role Ammunition effort, consisting of a three-cartridge suite, provides overwhelming lethality at ranges up to 50 km (based on chassis configuration) with greater precision and accuracy, and with reduced logistics footprint. RAAM demonstrates a semi-autonomous, turreted mortar system. The significant increase in FY03 funding (Project 232) accelerates development of the MRM to meet the need for a beyond line-of-sight munition for FCS. The MP-ERM effort demonstrates an increase in armor penetration and combat overmatch against the full target spectrum by using a cartridge containing advanced explosively formed penetrator (EFP) warheads that exploit energetics, liner materials and modeling/simulation technologies. The Fire Control-Node Engagement Technology (FC-NET) program will develop a common fire control system for FCS gun and missile weapon systems. Advanced Acoustic Seismic Sensors provides networked acoustic/seismic sensors and aeroacoustic propagation models for the Networked Sensors for the Objective Force ATD. Beginning in FY06, FCS Armament Munitions will mature technologies used for affordable sub-munitions, smart mortar munitions and lighter weight launchers for the next generation of armaments and munitions. Beginning in FY04, Project L94 will mature enabling technologies for an electromagnetic armament system which has the potential to revolutionize the future battlefield by its unique performance characteristics, leading to a system demonstration in FY06. Also, in FY06 a new project designed to integrate a solid-state laser device into a high energy laser weapons system will begin. This program adheres to Tri-Service Reliance Agreements on conventional air-surface weaponry, with oversight provided by the Joint Directors of Laboratories. Work in this PE is related to, and fully coordinated with, efforts in PE 0602624A (Weapons and Munitions Technology), PE 0602618A (Ballistics Tech), PE 0604802A (Weapons and Munitions - Engineering Development), and PE 0602307A (Advanced Weapons Technology). The cited work is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance. The program element contains no duplication with any effort within the Military Departments. Work is performed by the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, New Jersey. This system supports the Objective Force transition path of the Transformation Campaign Plan. No Defense Emergency Response Funds have been provided to this program.

B. Program Change Summary	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2003)	35381	66514	36959	62123
Current Budget (FY 2004/2005 PB)	34244	63230	47752	72404
Total Adjustments	-1137	-3284	10793	10281
Congressional program reductions		-4500		
Congressional rescissions		-1225		
Congressional increases		4550		
Reprogrammings	-167	-363		
SBIR/STTR Transfer	-970	-1746		
Adjustments to Budget Years			10793	10281

Change Summary Explanation: Funding – FY 2004/2005: Funds increased to mature enabling technologies for an electromagnetic armament system.

FY03 Congressional Adds: Development Mission Integration, Project 43A ($3500); Blended Metals Technology Small Arms Ammunition, Project 43A ($1050)

Projects With No R-2A:

($3500) Development Mission Integration, Project 43A: The objective of this one year Congressional add is to provide demonstrations of integrated armament technologies for armament systems to include integration activities on surrogate ground/air platforms. No additional funding is required to complete this project.

($1050) Blended Metals Technology Small Arms Ammunition, Project 43A: The objective of this one year Congressional add is to support government-wide testing of revolutionary small arms ammunition with full spectrum of lethal and penetrating effects. No additional funding is required to complete this project.

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

COST (In Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
232 ADVANCED MUNITIONS DEM	30877	58861	28091	52779	42063	44653	46127	48090

A. Mission Description and Budget Item Justification: This project matures and demonstrates munitions enhancement for the MRAAS and matures emerging technologies in lightweight structures, smart materials, acoustic/seismic senosrs and in-flight update architectures. MRM is a gun launched precision munition capable of defeating high value heavy armor and other targets out to 8km. The objective of this accelerated FY02-03 effort is to modify existing munition components, including reducing the size of the guidance and control elements, and demonstrate the BLOS capability for FCS block I. The MP-ERM program evaluates warhead designs against various range targets. The Advanced Light Armament for Combat Vehicles (ALACV) program will develop air bursting munitions and advanced kinetic energy penetrators for medium caliber applications. RAMM will be developed under this project. A Mid-Range Munition (MRM) and the MRAAS Cargo Round provide additional lethality options for FCS. FC-NET will provide a common software package that will recommend weapon-target pairings for missiles and guns and will be expandable to include future weapon types. Advanced Acoustic Seismic Sensors demonstrates networked acoustic/seismic sensors for target tracking and cueing of secondary sensor systems. A Congressionally funded effort to mature and demonstrate Shoulder-Launched Multipurpose Assault Weapon (SMAW) and associated munitions for use in confined spaces will be completed 4QFY02. In-house efforts are accomplished by ARDEC, Picatinny Arsenal, New Jersey and the Army Research Laboratory, Aberdeen Proving Ground, MD. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP). No Defense Emergency Response Funds have been provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
- RAMM: In FY03, fabricate preliminary subsystem hardware of the RAMM mortar module. In FY04, complete RAMM preliminary subsystem integration and testing; conduct RAMM module hardstand test. In FY05, finalize RAMM module software, integrate into a mobile platform and conduct a coordinated demonstration.	0	2800	4300	7200
- ALACV: In FY02, conducted modeling and simulation and laboratory analysis to optimize air bursting warheads and advanced KE penetrators. In FY03, demonstrate integrated medium caliber air bursting projectile lethality of four-fold increase in lethal area over traditional point-detonating warhead against personnel targets. Demonstrate 30% increase in behind armor effects using advanced penetrators.	1760	2100	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
- MRAAS: In FY02, completed detailed design of lightweight, low impulse multi-role cannon & auto ammo handling system; demonstrated best technical approaches for ETC propellant with increased energy & lower sensitivity; developed design tradeoffs & laboratory demonstrations of fire control software. Conducted airframe and lethality demonstrations of MP-ERM. Developed Smart Cargo projectile preliminary design to include guidance & control; demonstrated best tech approaches for dynamic retargeting to locate & defeat time critical targets; used modeling & simulation to demonstrate maximized payload volume by application of smart materials, structures & metal matrix composites for airframe. In FY03, demonstrate firing of multi-role cannon with integrated cartridge; demonstrate, at subscale, feasibility of achieving 25% increase in energy (retaining current sensitivity) using Gen II ETC propellant; demonstrate fire control software & hardware in a System Integration Laboratory; conduct secondary armament turreted system slew & firing demonstration; conduct testing of auto ammo handling system and load/unload sequence reliability; complete turret design; initiate fabrication of turret structure. Demonstrate defeat of advanced threat armor at extended ranges with integrated novel penetrator & composite sabot; demonstrate critical Guidance & Control & hi-G components for MP-ERM; complete airframe design for Smart Cargo round to achieve deliveries of lethal payloads to 50km. In FY04, conduct BLOS projectile airframe structural integrity demonstration; demonstrate composite sabot with integration of novel penetrator against armor; complete non-line-of-sight projectile design; conduct BLOS projectile warhead demonstration vs armor targets; continue seeker hi-G tests. In FY05, for FCS Multi-role MP-ERM projectile, conduct demonstrations of the system/subsystems of the precision munition including guide to hit demonstration of multimode seeker and warhead.	18221	21357	22041	43829
- Advanced Acoustic Seismic Sensors: In FY04, demonstrate an acoustic/seismic propagation model and networked acoustic/seismic sensors. In FY05, integrate the suite of acoustic/seismic sensors into the Networked Sensors for the Objective Force ATD demonstration.	0	0	1000	1000
- FC-NET:In FY02 develop baseline weapon/missile targeting pairing algorithm. In FY03 Adapt to Fire Control Computer and support feasibility demonstration. In FY04 optimize algorithms and architecture to support TRL5 demonstration. In FY05 provide full functional Enhanced Combat Decision Aid Software with track management configured for demonstration.	500	950	750	750
MRM: FY02, demonstrate in a relevant environment, a representative system/subsystem gun launched guided projectile defeating targets at extended range. In, FY03 demonstrate all remaining subsystems/systems in a relevant environment; fabricate guidance and control hardware and seeker/sensor hardware and conduct hi-g testing; demonstrate prototype MRM projectile in a guide-to-hit test conducted at ambient temperature that shall launch, survive, deploy, sense, maneuver and hit a target at 5km.	8000	31654	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
- The objective of this one year Congressional add for the Shoulder-Launched Multipurpose Assault Weapon (SMAW) and Munitions Engineering Development is to mature, demonstrate and complete technology to launch SMAW in confined spaces. No additional funding is required to complete this project.	2396	0	0	0
Totals	30877	58861	28091	52779

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February 2003

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

COST (In Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
L94	ELECTRIC GUN SYS DEMO	0	0	19661	19625	19606	0	0	0

A. Mission Description and Budget Item Justification: This project will demonstrate the state of technology of an integrated electromagnetic armament system at a tactical scale; develop a comprehensive end-to-end system simulation, and resolve system level issues including synchronization/compatibility of twin machines, technology scalability, thermal management, and full-energy system performance. Electromagnetic guns will revolutionize the future battlefield by their unique performance characteristics, such as hypervelocity and stealth launch, their elimination of vulnerable propellants, their synergistic relationship with hybrid electric vehicles, and by their significant reduction in sustainment burden.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Electric Gun System Demo: In FY04, develop detailed armament system design and subsystem designs for Pulsed Power Supply (PPS), launcher, and Integrated Launch Package (ILP); mature models and simulations and demonstrate system simulations including solid model, component performance, end-to-end and system-level performance; perform critical material/component tests including tests on composite rotors and barrels, low-density and high-strength metals, insulation systems, thermal management systems, high energy/high power switches; fabricate and test subscale launcher and ILP; and order long-lead items. In FY05, fabricate prototype PPS rotating machines; test machines (separately); design pulse power supply torque management system and mount; design, fabricate and test full scale launcher, mount, recoil, and ILPs, including both kinetic energy and high-explosive projectiles; interface system simulation with FCS Simulation and Modeling for Acquisition, Requirements, and Training (SMART) process; begin preparations for armament system demonstration at the end of FY06.	0	0	19661	19625
Totals	0	0	19661	19625