ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE
6 - Management support	**0605805A - Munitions Standardization, Effectiveness and Safet**

	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	30002	39783	14611	14558	17019	16570	17252
296	PYROTECHNIC RELIABILITY & SAFETY	862	865	791	778	823	866	908
297	MUN SURVIVABILITY & LOG	3754	7694	4156	4160	4386	4592	4817
857	DOD EXPLOSIVES SAFETY STANDARDS	745	762	695	730	1480	1548	1606
858	ARMY EXPLOSIVES SAFETY MANAGEMENT PROGRAM	473	474	421	409	430	391	452
859	LIFE CYCLE PILOT PROCESS	16056	21510	2164	2143	2254	2321	2399
862	FUZE TECHNOLOGY INTEGRATION	1883	1917	1728	1744	1836	1897	1971
F21	NATO SMALL ARMS EVAL	466	466	412	412	434	454	478
F24	CONVENTION AMMO DEMIL	5763	6095	4244	4182	5376	4501	4621

A. Mission Description and Budget Item Justification: This Program Element supports continuing technology investigations. It provides a coordinated tri-service mechanism for the collection and free exchange of technical data on the performance and effectiveness of all non-nuclear munitions and weapons systems in a realistic operational environment. It provides for NATO interchangeability testing (F21); joint munition effectiveness manuals used by all services; development of standardization agreements (STANAGS) and associated Manuals of Proof and Inspection (MOPI); operation of the North American Regional Test Center (NARTC); evaluation of demilitarization methods for existing conventional ammunition (F24); evaluation of useful shelf life, safety, reliability and producibility of pyrotechnic munitions; and improvement of explosives safety criteria for DOD munitions via the DOD Explosives Safety Board (857). Pyrotechnic Reliability and Safety (M296) supports pyrotechnic research, development and testing to identify, characterize and resolve reliability, safety, storage and manufacturing issues that impact production availability and field use of pyrotechnics. It will result in the development and demonstration of new, safe, reliable and environmentally acceptable munitions. Munitions Survivability and Logistics (D297) will make Army units more survivable by testing and demonstrating munitions logistics system solutions that prevent or minimize catastrophic explosive events and accelerate ammunition resupply. The Army Explosives Safety Management Program (M858) was established in FY01. The U.S. Army Technical Center for Explosives Safety use the funds in this project to evaluate current explosives safety standards and develop new, scientific and risk-based standards to meet U. S. Army explosives requirements. The Life Cycle Pilot Program (LCPP) (M859) will assess production base capabilities and needs over the acquisition life cycle of various ammunitions, address the producibility of ammunition, transition to type classification and production, and address the ability of the production base to cost effectively produce quality products on schedule. The Fuze Technology Integration program (D862) will improve performance and lower the cost for existing proximity fuzes and enable new applications in submunitions and medium caliber fuzes, addressing advanced proximity fuze sensor technology, Micro-electromechanical Systems (MEMS), Safe and Arms (S&A) technology, and Electronic S&A (ESA)technology for smart munitions. These systems support the Current transition path of the Transformation Campaign Pla

n (TCP).

B. Program Change Summary	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2004)	30029	19855	19627
Current Budget (FY 2005 PB)	30002	39783	14611
Total Adjustments	-27	19928	-5016
Congressional program reductions			
Congressional rescissions		-350	
Congressional increases		21250	
Reprogrammings	-27	-972	
SBIR/STTR Transfer			
Adjustments to Budget Years			-5016

FY 2004: Funds increased (+$21.3M) due to Congressional Adds for Life Cycle Pilot Process efforts (+$19.8M) and Conventional Ammo Demil efforts (+$1.5M). Funds realigned (-$1.0M) to higher priority requirements.

FY 2005: Funds transferred (-$2.8M) to Operations and Maintenance, Army, in accordance with Army policy to program all base operations in Operations and Maintenance, Army; these funds represent base operations cost for a Research and Development tenant activity. Funds realigned (-$2.2M) to higher priority requirements.

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

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management support	**0605805A - Munitions Standardization, Effectiveness and Safet**	**297**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
297	MUN SURVIVABILITY & LOG	3754	7694	4156	4160	4386	4592	4817

A. Mission Description and Budget Item Justification: This project supports the Army Transformation by making Army units more survivable through the investigation, testing and demonstration of munitions logistics system improvements that prevent or minimize catastrophic explosive events and accelerate ammunition resupply. Key thrusts are munitions storage area survivability, insensitive munitions (IM) technology integration and compliance, weapon system rearm, munitions configured load enablers and advanced packaging and distribution system enhancements. Within each thrust, a broad array of solutions will be identified, tested, and evaluated against developed system measures of effectiveness. Optimum, cost effective solutions that enable the rapid projection of lethal and survivable forces will be demonstrated. The early stages of force deployment are especially critical. Theater ammunition storage areas are vulnerable and present the enemy with lucrative targets. These areas and distribution nodes contain the only available munitions stocks in theater. Loss of these munitions could cripple the force, jeopardize the mission, and result in high loss of life. This project mitigates vulnerabilities and ensures a survivable fighting force.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Develop advanced materials for munitions packaging or ballistic blankets/barriers to minimize the impact of bullets and fragments and therefore reduce reaction to unplanned stimuli. FY03-Conducted market survey and evaluated advanced materials for ballistic barriers.	100	0	0
Develop scoring patterns and techniques for munitions packaging that will create a venting system during propellant burning to reduce internal pressures and minimize explosive reactions. FY03-Conducted IM and rough handling tests of a full-scale prototype scored container for the Modular Ammo Charge System (MACS), evaluated designs for application to tank ammunition. FY04 - Conduct additional IM and rough handling tests of a full-scale prototype scored MACS container and adapt container design for tank munitions.	436	192	0
Develop a Guided Multiple Launch Rocket System (GMLRS) Grenade High Explosive Replacement by substituting PAX2A IM explosive (a less sensitive HE replacement for Comp-A in the M85 Grenade) to enable munitions to burn rather than detonate in cook-off environments. FY03-Conducted IM, performance, and safety tests, completed HE down selection. FY04-Conduct reloaded grenade study, and IM and arena tests, transition.	418	291	0

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Develop a less sensitive high performance melt castable explosive to replace Composition B explosive in mortars, 2.75" rockets/APKWS, and other warheads for reduced sensitivity to unplanned stimuli. FY03-Completed explosive formulation and conducted small scale safety and performance tests. FY04-Conduct large scale IM testing, refine formulation. FY05-Continue large scale IM testing and performance and safety testing, on specific munition items.	365	450	433
Develop alternate low temperature gas generating mixtures that are added to explosives to reduce reaction to unplanned stimuli. As temperature rises during cook-off, this additive produces pressure to rupture the projectile resulting in a controlled burning rather than detonation. FY03- Refined additive formulation, conducted small scale performance, IM, and compatibility tests. FY04-Evaluate explosive and additive formulations, test to determine percentage of additive in selected high explosive warhead. FY05-Conduct bursting warhead demonstration and IM tests on selected warhead, transition.	377	413	395
Conduct reviews of munitions in development and production to determine if they meet DoD 5000.2-R requirement to withstand unplanned stimuli, recommend technical approaches to meet the requirement, update and maintain IM compliance status database. Manage the IM waiver process for the Army. FY03-Conducted quarterly IM reviews, updated IM database. FY04-Conduct quarterly IM reviews, update IM database. FY05- Conduct quarterly IM reviews, update IM database.	86	218	347
Eliminate or minimize the possibility of expelling grenades from the 155mm M864 projectile in heated or fire environment by developing IM expulsion technologies such as IM propellant and a venting system; and eliminate or reduce the violent reactions of the projectile when it is subjected to unplanned stimuli by replacing the Comp A5 with PAX 2A IM explosive. FY04-Optimize expulsion charge explosive formulations, develop propellant neutralization formulations, investigate eutectic materials, and conduct engineering and IM tests. FY05- Down select neutralization technologies, complete IM tests and system level qualification and safety tests, transition.	0	417	374
Evaluate the chemical and mechanical properties of various foreign produced less sensitive RDX explosives. Modify US developed RDX to reduce its sensitivity based on the findings. FY03 – Analyze properties of alternative foreign produced less sensitive RDX explosives FY04 - Complete IM baseline tests and evaluation of alternative foreign produced RDX explosives. FY05 - Implement candidate explosive materials in US developed RDX and conduct small scale IM tests.	114	399	347
Evaluate and develop IM technologies for the M67 Grenade including replacing Comp B explosive with new IM explosive, redesigning the fuze with less sensitive energetic material, changing the location of the fuze, and adding barrier material if necessary. FY03: Completed engineering and IM baseline evaluations. FY04: Conduct evaluation of potential IM technologies. FY05: Complete test and evaluation of final IM grenade design.	41	394	258

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Replace current High Explosive (HE) fill with a less sensitive HE and redesign packaging as necessary to make the 40mm M430A1 HE Dual Purpose cartridge IM compliant and enhance survivability. FY03-Conducted IM explosive evaluation. FY04-Determine best IM solutions, fabricate and test cartridges. FY05-Conduct IM and qualification tests.	134	291	258
Develop an M2A1 single container consolidator device that will eliminate the wirebound wood overwrap currently used to package two containers together. This will reduce the weight, size, and cost of the overall configuration. FY03-Completed prototype fabrication and conducted qualification testing for small caliber ammo containers. FY04 – Transition small caliber ammo container consolidator device and adapt design for mortar ammunition application.	205	127	0
Develop an advanced materials container that will hold 6 M67 Fragment Grenades and reduce hazard classification. This will enable Brigade Combat Teams to meet their requirement to ship and store these grenades in Strategic Configured Loads (SCL) with nearly all other ammunition. FY03-Fabricated prototype containers, conducted rough handling and hazard tests.	129	0	0
Redesign the rims/rings of current square rimmed cylindrical tank and artillery munitions containers to function as external cushioning and withstand stacking loads thereby eliminating the need for internal foam cushioning for shock mitigation. Develop a lightweight vented container cover. These improvements will reduce container weight and cube and improve IM performance. FY04-Design and fabricate rims/rings, fabricate covers and conduct rough handling and limited IM tests FY05-Develop prototype containers using advanced materials, conduct engineering testing, complete evaluation and final report, transition.	0	323	500
Develop a munitions storage area planning software tool that enables soldiers to quickly design a survivable and efficient in-theater storage area given known quantities and types of munitions and terrain features. FY03-Completed software design of interactivity enhancements. FY04-Conduct field tests and modify software. FY05-Complete modifications, conduct final test and transition.	863	660	895
Develop robotic capability for truck or, flatrack mounted modular cranes to enable the rapid in-theater building of mission configured munition loads for improved distribution velocity and mission transition agility. FY03-Developed and integrated laser vision software and hardware, implemented performance, safety, and stability logic enhancements into controller, completed end effector development. FY04-Complete development of software based controller.	390	242	100

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Develop and demonstrate a pallet/individual munition level environmental sensor suite (shock, temperature, humidity, etc.) and reader system that will monitor and predict munitions reliability to ensure that only fully ready munitions move forward through the logistics system to the warfighter. Benefits include reduced logistics footprint, improved surveillance methodology and reduce surveillance operations and support costs. FY03-Developed data reader and completed Ammo Surveillance Information System integration. FY04-Conduct field prototype demonstrations and transition.	96	98	0
Develop and demonstrate multiple sized standardized modules for all classes of supplies including ammunition. The modules interlock with each other and cargo platforms to form a stable palletized mixed supply class configured load. They are automation friendly and rapidly re-configurable to meet changing user needs. FY04 – Develop Sustainment Module requirements and concepts. FY05 – Design modules and interlock devices	0	338	249
Base Operations Cost for a Research and Development Activity.	0	2612	0
Small Business Innovative Research/Small Business Technology Transfer Programs.	0	229	0
Totals	3754	7694	4156

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

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management support	**0605805A - Munitions Standardization, Effectiveness and Safet**	**859**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
859	LIFE CYCLE PILOT PROCESS	16056	21510	2164	2143	2254	2321	2399

A. Mission Description and Budget Item Justification: This project supports the implementation of the Single Manager for Conventional Ammunition (SMCA) Industrial Base Strategic Plan through technology investigations, model based process controls, pilot prototyping, and industrial assessments. It will assess life cycle production capabilities required for all ammunition families, address design for manufacturabililty to facilitate economical production, identify industrial and technology requirements, and address the ability of the production base to rapidly and cost effectively produce quality products. Total Ownership Cost Reduction is an important part of the Life Cycle Pilot Process (LCPP). LCPP provides the resources to prototype critical technologies and develop the knowledge base to establish cost effective, environmentally safe and modern production processes.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Continue ongoing technology investigations. Develop concept designs and plans to transfer life cycle pilot process technology into the supplier base.	2756	1400	884
Perform production base readiness assessments to analyze present capabilities and identify trends in munitions and industrial technology.	500	420	480
Develop "pilot" prototype processes for critical ammunition end items and components necessary to establish quality, affordable, and environmentally safe production.	3700	700	800
Establish framework and operations for NJ Nanotechnology and Micro-Electromechanical Systems (MEMS) consortium in support of ammunition production modernization.	1400	2000	0
Establish framework and operations for Nanotechnology Manufacturing RDE Center in support of ammunition production modernization.	1400	1400	0
Under the Public Private Partnership program, establish and enhance prototype manufacturing utilizing commercially available off-the-shelf equipment.	6300	3150	0
Develop a new x-ray inspection system for munitions using a Cadmium Zinc Telluride (CZT) detector for Automated Munitions Inspections and Surveillance.	0	2400	0
Establish processes to eliminate safety concerns and achieve net-shape manufacturing of Advanced Cluster Energetic materials by developing novel coating and handling processes to support Insensitive Munitions (IM) explosive fill and castable propellant grains.	0	2100	0
Develop generic Micro-Electromechanical Systems Inertial Measurement Unit(MEMS IMU) high volume manufacturing process for precision munitions.	0	1800	0

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Establish Government, Industry and Academia partnership to support the development of Metal Matrix Composite (MMC) prototype Technologies for Munitions application.	0	5500	0
Small Business Innovative Research/Small Business Technology Transfer Programs.	0	640	0
Totals	16056	21510	2164

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

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management support	**0605805A - Munitions Standardization, Effectiveness and Safet**	**862**

COST (In Thousands)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
862 FUZE TECHNOLOGY INTEGRATION	1883	1917	1728	1744	1836	1897	1971

A. Mission Description and Budget Item Justification: This program supports technology investigations in the areas of munition fuzing and safe and arming (S&A). The program addresses four major areas: Second source development, including a battery separator material source development, a second source Monolithic Microwave Integrated Circuit (MMIC) for artillery and mortar fuzes and a second source signal processor for mortars; Block upgrades for artillery ammunition; Block upgrades for mortar ammunition, including a second environmental safety for non-spinning projectiles and a gun hardened electronic S&A for mortars; and Legacy fuze risk reduction, including battery aging studies, increased reliability of ammunition and an alternative self destruct design. Development and demonstration of second sources for fuzing systems will reduce cost by providing competition, update components with the latest technology advances and maintain production when sources or parts are no longer available. Block upgrades for artillery and mortar fuzes will enable the introduction of the latest technologies into fuzing, keep the fuzing design current to avoid obsolescence issues and add capabilities. Legacy fuze risk reduction will allow for the performance enhancement of current ammunition items by conducting aging studies of major fuze components to detect and identify latent defects and weak designs. This project supports the Legacy transition path on the Transformation campaign Plan (TCP).

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Legacy Fuze Risk Reduction: Predict/evaluate fuze stockpile, conduct fuze dud reduction effort, develop self destruct fuze alternatives. Evaluate storage reliability of current artillery batteries/determine possible solutions to battery electrolyte storage instabilities. Develop improvements to stockpiled training and war reserve fuzes to enhance capabilities and/or address deficiencies.	500	350	450
Second Source Development: Develop new sources for battery separator material, tuning fork crystal for artillery time fuzes, new source for Monolithic Microwave Integrated Circuits (MMICs) used in artillery and mortar fuzes, develop new battery and electronics sources for legacy fuzes. Purchased Non-Developmental Item (NDI) batteries for testing and battery aging study.	983	710	578
Block Upgrades for Artillery: Develop drop in proximity upgrades for current artillery fuzing. Complete breadboard design of new artillery processor. Translate medium caliber Microelectromechanical (MEMS) Safety and Arming device to artillery. Develop MEMS environmental impact sensors. Evaluate proximity sensor technologies inclusive of ultrawideband (UWB), all digital and clutter resistant air target sensors. Task order contract awarded to University of Florida to conduct designs and experiments on UWB and clutter resistant air target sensors.	0	500	700

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Block Upgrades for Mortars: Develop second safety sensors for non-spinning projectiles. RF sensors fabricated and tested on mortars. Contract awarded for testing of new magnetic sensor, additional magnetic sensor contract to be awarded in FY03. Develop proximity sensor upgrades for M734A1 and gun hardened Electronic Safety and Arming Devices (ESADs) for mortars. ESAD parts being purchased and assembled for FY03 firing tests. MEMS impact sensor development, PD/DLY fuze upgrades and insertion of inductive setting capability into mortars.	400	300	0
Small Business Innovative Research/Small Business Technology Transfer Programs.	0	57	0
Totals	1883	1917	1728

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February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management support	**0605805A - Munitions Standardization, Effectiveness and Safet**	**F24**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
F24	CONVENTION AMMO DEMIL	5763	6095	4244	4182	5376	4501	4621

A. Mission Description and Budget Item Justification: This project supports a continuing technology evaluation of demilitarization methods for existing conventional ammunition and conventional ammunition recovered from formerly used defense sites (FUDS). It will complete the development and demonstration of new, safe, and environmentally acceptable alternatives to open burning/open detonation (OB/OD) of recovery/recycle/reclamation equipment, and processes to reduce the extremely large stockpile of munitions in the resource recovery disposition account and munitions from FUDS.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Prove-out prototype plasma arc technology for conventional ammunition and resource recovery potential.	3239	1314	0
Install and prove-out Cryofracture demilitarization process for Anti-Personnel Landmines and other munitions.	1484	800	0
Development of integrated cryofracture/plasma arc technology on a mobile platform	0	1500	0
Development of recycle/reuse technology for magnesium/aluminum	260	500	1602
Development of enhanced flexible energetic material handling automation upgrade capabilities sized to real time requirements	0	0	900
Development, installation and prove out of transportable alternative materials recovery capabilities for various energetic components	780	1800	0
Multi-based propellant recovery technology application	0	0	900
Development of advanced resource recovery/reuse technology for explosives	0	0	842
Small Business Innovative Research/Small Business Technology Transfer Programs	0	181	0
Totals	5763	6095	4244