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

February 2002

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

	COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	15961	30437	16014	11447	11611	11898	14023	Continuing	Continuing
296	PYROTECHNIC RELIABILITY & SAFETY	772	897	901	0	0	0	0	0	3970
297	MUN SURVIVABILITY & LOG	4081	4214	4100	4813	4841	5004	5064	0	38327
857	DOD EXPLOSIVES SAFETY STANDARDS	734	768	784	797	816	877	1709	0	7843
858	ARMY EXPLOSIVES SAFETY MANAGEMENT PROGRAM	478	495	496	496	494	492	542	0	3517
859	LIFE CYCLE PILOT PROCESS	0	12917	2503	0	0	0	0	0	15420
862	FUZE TECHNOLOGY INTEGRATION	0	1993	2004	0	0	0	0	0	3997
F21	NATO SMALL ARMS EVAL	471	486	488	487	483	496	501	Continuing	Continuing
F24	CONVENTION AMMO DEMIL	9425	8667	4738	4854	4977	5029	6207	0	63376

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; 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; 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. 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 Legacy transition path of the Transformation Campaign Plan (TCP).

B. Program Change Summary	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2002 PB)	16622	16072	15908
Appropriated Value	16776	30672	0
Adjustments to Appropriated Value	0	0	0
a. Congressional General Reductions	0	-235	0
b. SBIR / STTR	-462	0	0
c. Omnibus or Other Above Threshold Reductions	0	0	0
d. Below Threshold Reprogramming	-199	0	0
e. Rescissions	-154	0	0
Adjustments to Budget Years Since FY2002 PB		0	106
Current Budget Submit (FY 2003 PB)	15961	30437	16014

FY02 funding increased due to Congressional Adds for public private partnering initiative, cryofracture anti-personnel mine disposal system, and Plasma Ordnance Demilitarization System (PODS).

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

February 2002

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

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
297	MUN SURVIVABILITY & LOG	4081	4214	4100	4813	4841	5004	5064	0	38327

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 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. This project supports the Legacy transition path of the Transformation Campaign Plan (TCP).

FY 2001 Accomplishments:

- 784 Completed development and integration of safety and survivability planning information modules, and developed linkage to the Standard Army Ammunition System (SAAS) for the Munitions Survivability Software munitions storage area planning tool. Conducted testing of a prototype with an ordnance battalion which verified that this tool enables soldiers to design an ammunition storage area in only 45 minutes instead of the 80 manhours currently required.
- 350 Designed multi-layer control software for and conducted initial user evaluation of a smart munitions handling crane that will be used to rapidly build warfighter tailored ammunition configured loads
- 94 Demonstrated a Palletized Loading System (PLS) Shoe interface platform that makes Container Roll On / Roll Off Platforms (CROP) compatible with USAF aircraft and a self powered roller platform that facilitates the transfer of 463L pallets between Army and Air Force trucks and materials handling equipment.
- 35 Demonstrated a truck mounted ammunition resupply module and transfer mechanism that will provide the Interim Brigade Combat Team (IBCT) towed howitzer units ready-to-fire ammunition at the firing section.

FY 2001 Accomplishments: (Continued)

•	140	Completed engineering tests and demonstrated forklift automation enhancements that permit rapid building of warfighter tailored ammunition configured loads and increase distribution velocity for all in-theater munitions handling operations.
•	195	Analyzed test results and modified less heat sensitive propellants for M915 and XM916 Dual Purpose Improved Conventional Munition (DPICM) projectiles. Completed Insensitive Munitions (IM) and performance tests for expulsion propellant that reduces the munitions' adverse reaction to unplanned stimuli.
•	471	Designed and fabricated prototype ignition devices for an IM active venting system to help minimize the munitions' reaction in cook-off environments.
•	419	Developed and evaluated alternate low temperature gas generating materials and mixtures that, when added to high explosives, will eliminate violent reaction under cook-off environments, thereby helping the munition meet the requirement to have no adverse reaction to unplanned stimuli.
•	507	Completed warhead shaped charge liner contour design optimization and conducted engineering tests and loading evaluation for PAX2A (a less sensitive High Explosive replacement for Comp A-5 in the Multiple Launch Rocket System (MLRS) M85 grenade that will help MLRS meet the requirement to have no adverse reaction to unplanned stimuli)
•	87	Conducted reviews of munitions in development and production to determine if they meet the DoD 5000.2-R requirement to withstand unplanned stimuli and recommended technical approaches to meeting the requirement
•	148	Conducted baseline tests, modified existing design, fabricated prototypes, and conducted fast/slow cook-off tests of IM packaging for the 2.75" rocket/Hydra 70/Advanced Precision Kill Weapon System (APKWS) family of munitions
•	125	Completed development of and updated Army Insensitive Munitions (IM) compliance status database
•	73	Completed sequential rough handling testing of a thermoplastic/fiberglass composite munitions container that will reduce a munition's adverse reaction to unplanned stimuli.
•	247	Conducted ammunition container scoring stress analysis and successfully tested concepts for using container scoring to improve munitions IM characteristics
•	142	Completed long-term predictive testing and evaluation of corrosion prevention materials suitable for use inside munitions packaging.
•	264	Developed concepts and designed prototype lightweight containers (up to a 50% reduction), utilizing advanced materials, for medium and small caliber ammunition that will reduce the logistics footprint, increase handling efficiency and reduce environmental impact compared to currently fielded containers

Total 4081

FY 2002 Planned Program

- 893 Complete modifications and field testing of a prototype munitions storage area planning software tool and transition to PM Standard Army Ammunition System (SAAS)/Global Combat Support System-Army (GCSS-A) for fielding. Continue software capability upgrades.
- 435 Develop and integrate laser vision software and hardware, implement performance, stability and safety logic enhancements into the controller for the smart munitions handling crane to facilitate the building of ammunition configured loads.
- 100 Develop preliminary design concepts for an aircraft compatible cargo platform that facilitates the movement of munitions from truck to aircraft to in-theater truck.
- 65 Refine and manufacture alternative less sensitive propellants for M915 and XM916 DPICM projectiles and conduct IM tests.
- 265 Complete development and design integration and conduct IM and engineering tests for an active venting sensor system for the 2.75" rocket/Hydra 70/Advanced Precision Kill Weapon System (APKWS) family of munitions
- 571 Continue the development of alternate low temperature gas-generating material and mixtures to help minimize the reaction in cook-off environments. Conduct safety, characterization, stability, long-term, and demonstration tests
- 559 Conduct IM tests on submunitions, refine warhead liner design, and complete manufacturing process development for a less sensitive High Explosive for MLRS
- 77 Conduct reviews of munitions in development and production to determine if they meet the DoD 5000.2-R requirement to withstand unplanned stimuli and recommend technical approaches to meeting the requirement
- 218 Conduct IM testing and vent patch producibility evaluation for IM packaging for the 2.75" rocket/Hydra 70/Advanced Precision Kill Weapon System (APKWS) family of munitions.
- 74 Continue to populate and maintain Army insensitive munitions (IM) compliance status database
- 406 Develop and test a full-scale munitions packaging prototype using IM container scoring technology
- 51 Identify candidate munitions, conduct bullet and fragment tests and evaluation to determine IM thresholds, and down select IM barrier materials that will help reduce the munitions' reaction to unplanned stimuli
- 60 Conduct engineering and IM testing of advanced fireproof paint materials that, when applied to packaging, will aid in thermal management and help munitions meet or enhance IM performance requirements.
- 100 Test and evaluate sealing concepts for munitions packaging corrosion prevention materials and prepare final report

FY 2002 Planned Program (Continued)

- 340 Conduct engineering testing and user evaluation and modify design of prototype lightweight, advanced materials containers for medium and small caliber ammunition

Total 4214

FY 2003 Planned Program

- 839 Complete software design of interactivity enhancements for the Munitions Survivability Software ammunition storage area planning tool
- 338 Upgrade crane software and hardware to permit "in the cab" operations capability. Automate crane deploy / stow operations for the smart munitions handling crane.
- 148 Evaluate material cost/weight trade-offs for aircraft compatible flatrack designs
- 100 Develop a data analysis/presentation software module and a data reader for an advanced munitions environmental monitoring system that improves stockpile management by quickly determining munition health and readiness status
- 100 Evaluate design concept for a prototype smart cargo tie-down system for the PLS CROP, flatracks, and trailer, or truck cargo beds
- 300 Develop concepts for projectile venting systems that relieve gas pressure in DPICM artillery munitions to improve their ability to withstand unplanned stimuli. Complete preliminary hardware component designs.
- 298 Complete full-scale performance, IM, and safety testing of active venting IM technology applied to the 2.75" Rocket/Hydra 70/Advanced Precision Kill Weapon System (APKWS) family of munitions. Evaluate application of active venting IM technology to other munitions
- 400 Conduct full-scale performance, IM, and safety testing of a 2.75" Rocket/Hydra 70/Advanced Precision Kill Weapon System (APKWS) family of munitions warhead with low temperature gas-generating mixture IM technology
- 300 Produce MLRS munitions with less sensitive High Explosive and conduct full scale performance and IM testing and evaluation
- 144 Conduct reviews of munitions in development and production to determine if they meet the DoD 5000.2-R requirement to withstand unplanned stimuli and recommend technical approaches to meeting the requirement
- 133 Continue to populate and maintain Army IM compliance status database
- 200 Complete IM bullet and fragment barrier development and conduct engineering tests for selected munitions
- 300 Evaluate the PAX2A explosive loading process for M864 artillery projectiles and conduct sub-scale IM tests of the M864 with PAX2A.
- 500 Complete final design, conduct full scale test and demonstration, and transition prototype lightweight, advanced materials containers for medium and small caliber ammunition

Total 4100

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

February 2002

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

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
859	LIFE CYCLE PILOT PROCESS	0	12917	2503	0	0	0	0	0	15420

A. Mission Description and Budget Item Justification: This project supports future ammunition development through continuing technology investigations and industrial assessments. It will assess production base capabilities and needs over the life cycle of various ammunition, address the ultimate producibility of ammunition items, transition them to type classification and production, assist PMs/developers in identifying industry capabilities and associated technology requirements, and address the ability of the production base to cost effectively produce quality products on schedule. Total Ownership Cost Reduction is an important part of the Life Cycle Pilot Process (LCPP). LCPP provides the Research, Development, and Acquisition community the resources to prototype critical technologies and the information to establish affordable, environmentally safe and modern processes that support a wide range of munitions needs.

FY 2001 Accomplishments:

Project not funded

FY 2002 Planned Program

- 1200 Perform production base readiness assessments to analyze present capabilities and identify trends in munitions and industrial technology
- 517 Develop "pilot" (prototype) critical technologies necessary to establish a quality, affordable, and environmentally safe process that supports a wide range of munitions
- 700 Identify technologies required to support total life cycle of munitions from research and development to demilitarization/disposal
- 10500 Under the Public Private Partnership program, establish and enhance prototype manufacturing lines utilizing commercially available "off-the-shelf" equipment; upgrade and modernize existing manufacturing equipment.

Total 12917

FY 2003 Planned Program

- 2000 Continue technology investigations and industrial assessments started in FY 2002. Develop concept designs and plans to transfer life cycle pilot process technology into the supplier base
- 503 Pilot projects to reduce cost of manufacturing munitions.

Total 2503

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

February 2002

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

COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
862 FUZE TECHNOLOGY INTEGRATION	0	1993	2004	0	0	0	0	0	3997

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: Advanced proximity fuze sensor technology integration, including Ultrawideband (UWB) sensor and signal processor technology; Micro-electromechanical Systems (MEMS); Safe and Arm (S&A) technology; and Electronic Safe and Arm (ESA) technology for smart munitions. Development and demonstration of fuzing technology will improve munitions effectiveness for the Future Combat System, cannon artillery, mortars, small and medium caliber ammunition, tanks, mines, countermines, demolitions, rockets, and missiles. Proximity fuze technology will improve performance, lower the cost for existing proximity fuzes, and enable new applications in submunitions and medium caliber fuzes. MEMS S&A technology is needed to develop a MEMS S&A device that will meet MIL-STD requirements for direct and indirect fire munitions. ESA technology for smart munitions will miniaturize, ruggedize, and reduce the cost of components currently proven in missile applications and make them relevant to gun-fired munitions. This project supports the Legacy transition path of the Transformation Campaign Plan (TCP).

FY 2001 Accomplishments:

Project not funded

FY 2002 Planned Program

- 680 Evaluate proximity sensor technologies, inclusive of the ultrawideband (UWB), all digital processor and clutter resistant air target sensors
- 250 Develop and evaluate novel penetration techniques
- 190 Investigate medium caliber fuzing ranging technology
- 203 Conduct fuze second environmental sensor evaluation
- 250 Develop MEMS S&A mechanical design. Evaluate micro-energetic initiator methods
- 225 Develop, evaluate and test gun-hardened, reduced volume ESA components

FY 2002 Planned Program (Continued)

- 195 Develop, evaluate, and test gun hardened, reduced volume ESA components

Total 1993

FY 2003 Planned Program

- 642 Continue the evaluation of proximity sensor technologies
- 230 Refine novel penetration designs and conduct further evaluation and tests
- 275 Continue medium caliber technology development, integrate proximity sensor technologies
- 210 Continue second environmental sensor evaluations, develop implementation concepts in fuze architectures
- 200 Continue fuze power source technology evaluations
- 340 Continue MEMS S&A mechanical design evaluations. Further evaluate micro-energetic initiators
- 107 Test and evaluate ESA components and subassemblies and integrate them with smart munitions

Total 2004

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

February 2002

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

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
F24	CONVENTION AMMO DEMIL	9425	8667	4738	4854	4977	5029	6207	0	63376

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.

FY 2001 Accomplishments:

- 3677 Continued testing, evaluation, and prove-out of pilot scale plasma arc technology for Conventional munitions and resource recovery potential
- 3000 Continued cryofracture development for demilitarization of Anti-personnel Landmines (APL) and other munitions
- 1950 Continued prove-out of pilot scale Super Critical Water Oxidation (SCWO) technology
- 648 Continued development of recycle/reuse technology for magnesium/aluminum
- 150 Continued development of smoke generating fog oil recovery technology

Total 9425

FY 2002 Planned Program

- 2000 Continue testing, evaluation and prove-out of prototype plasma arc technology for conventional ammunition and resource recovery potential
- 3000 Continue cryofracture development for demilitarization of APL and other munitions
- 500 Continue prove-out of pilot scale SCWO technology
- 650 Continue development of recycle/reuse technology for magnesium/aluminum

FY 2002 Planned Program (Continued)

•	800	Develop enhanced flexible energetic material handling automation upgrade capabilities sized to real time requirements
•	1717	Initiate development of transportable alternative materials recovery capabilities for various energetic components
Total	8667	

FY 2003 Planned Program

•	956	Complete prove out prototype plasma arc technology for conventional ammunition and resource recovery potential
•	1000	Complete cryofracture development for demilitarization of APL and other munitions
•	1000	Complete prove out of prototype SCWO technology
•	387	Complete development of recycle/reuse technology for magnesium/aluminum
•	495	Continue development of enhanced flexible energetic material handling automation upgrade capabilities sized to real time requirements
•	900	Continue development of transportable alternative materials recovery capabilities for various energetic components
Total	4738	