Exhibit R-2, RDT&E Budget Item Justification								Date: February 2005
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3			R-1 Item Nomenclature: Joint DoD/DOE Munitions PE 0603225D8Z					
Cost ($ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Total PE Cost DoD/DoE Munitions/P225	23.843	25.202	25.102	25.460	26.613	26.074	26.608	27.220

(U) A. Mission Description and Budget Item Justification:

(U) The Joint DoD/DOE Munitions Technology Program has the mission of exploration and development of technologies intended to bring about major improvements in non-nuclear munitions technology. A memorandum of understanding between DoD and DOE provides the necessary basis for long-term commitment of resources of the DOE and a similar long-term commitment of the enabling DoD support for this effort. The continuous fusion of DOE technology with Service needs has provided major advances in warfighting capabilities and plays a crucial role in the exploration, development, and transition of new technologies of interest to the Services. The program provides a unique opportunity for the collaboration of DoD and DOE scientists to explore technologies of programmatic interest to both departments, within a structured program of established Departmental reviews and milestones. The interdepartmental collaboration allows exchange of information and the focusing on achievement of goals of interest to the Department, utilizing the substantial investment in the scientific resources of the DOE. The budgeted program funds represented here are supplemented by additional matching DOE funds.

(U) Over the last four years, there has been an increased programmatic emphasis on developing technologies of particular value to counter-terrorism capabilities and asymmetric warfare. Initial successes have already emerged from this focus with products currently in the field. The increase in Budget for FY 2004 and beyond was designed specifically to focus additional program efforts on exploring and developing technologies to transform the operational capabilities of the warfighter. Two specific efforts were targeted for this increase: The first is a new and rapidly emerging technology employing inert-loaded explosives which will enable precision lethality munitions usable in urban settings with minimal collateral damage; The second is the significant payoffs in capability and life cycle costs resulting from an understanding of sub-detonic response of energetic materials. This understanding is vital to addressing insensitive munition requirements compliance as well as exploiting deflagration and other sub-detonic response to achieve selectable weapon output. The inclusion of precision lethality munitions within the Joint Program is significant from a number of points of view. The program goal is the development of the understanding as well as the demonstration of the capability for a precision lethality munition, which combines substantially increased lethality within a prescribed region, with a low collateral damage beyond that region. Other anticipated characteristics of the precision lethality munitions are a reduced size over current munitions and satisfaction of insensitive munition requirements. The attainment of this goal requires simultaneous developments in the multiple program areas of energetic materials, computations and modeling, composites, penetration and warhead technology. This integrated effort within the Joint Program is a new approach which we believe will speed the transition of new technology through the development process. This effort has the strong support of all the Services and Special Operations Command. The sub-detonics mode of energetic material response is an area of research which has not received much attention. However, the ability to reliably predict the behavior of energetics subject to various insults such as bullet/fragment impact and thermal cook-off is essential to the acquisition approval of all new systems. In addition, this same regime of sub-detonic behavior can be exploited to achieve multi-function, special purpose, and selectable yield weapons. All Services have programs which will greatly benefit from the results of these efforts.

(U) The program effort is divided into five technology areas of interest to Department munitions, each of which is described below. The names of some of the technology areas have been modified to better reflect the content of the projects contained within.

(U) Sensors and fuzing are critical components in every Department munition system. A fuze must ensure personnel safety by preventing unintended weapon detonation, know when to allow arming of a firing mechanism, detect the target through the use of sensors, and initiate detonation when required. With a current need for robust hard target defeat capability, advanced fuze systems must be able to survive and function in increasingly higher-velocity, higher-g penetration environments. One method of surviving high-g environments is through the miniaturization, integration, and/or robust packaging of conventional fuze components such as detonators, switches, transformers, capacitors, and sensors. In support of this technology area this program continues to demonstrate advances in miniaturizing high-voltage Electronic Safe and Arm Devices (ESAD) through research and development of low-energy detonator / booster combinations and miniature capacitive discharge units (CDUs). This focus builds on recent advances in micro-detonic/energetic materials research, and MEMS Safe and Arm Devices (MEMS-SAD). Efforts in this portion of the program generally advance fuze technology development and ultimately provide the DoD and DOE with viable fuzing components for all weapons, particularly hard-target-defeat munitions (penetrators) and small, intelligent low-cost applications (artillery). Over the next five years this portion of the program will work toward demonstrating emerging technologies that support robust, intelligent fuzing that can survive and function in environments exceeding 30,000 G's. Advanced initiation technology is an enabler for the next generation of warheads that will be aimable, target adaptable, and survivable.

(U) There is a requirement in the United States to develop weapons that offer the dual advantages of enhanced lethality against a variety of targets and increased safety of handling, transportation, and logistics. To realize this goal, energetic materials (EM) and their response to planned and unplanned insults must be developed, characterized, understood, and predictable. Lighter and/or less bulky munitions significantly impact the logistics burden on military actions. Similarly, a decrease in hazard classification brought about by the use of insensitive energetic materials and better design will greatly decrease transportation and storage logistics costs. Smarter munitions, capable of selectable, differential output, are another boon to military agility. Hence, there is also need for advanced EMs that can be used in small-scale devices such as distributed fuzing systems. In addition, as the intended environments have become more severe, EM's must survive setback forces in guns and severe impact forces in hard-target penetration applications.

Work in energetic materials is aligned with the recommendations from the DoD 2004 Weapons Technology Area Review and Assessment (TARA) and is coordinated with the national initiative in advanced energetic materials. This aspect of the program is aimed at developing the next-generation of EMs that have increased energy density over those in our current inventory while remaining insensitive to extreme environments. An additional requirement is that the energy be released in an appropriate time scale to allow optimized coupling to the target. For enhanced lethal effects the energy must be released either in the detonation reaction zone, or early enough in the expansion so that it couples to impulse loading or sustains high temperatures. Material ingredients that contribute to energy release later than that offer no enhancement in lethality. A fundamentally new approach to increasing lethality while simultaneously reducing collateral damage is being investigated. Holding much potential for modern warfighting scenarios, this new material formulation provides increased performance while meeting insensitive munition standards. For microdevices suitable for distributed fuzing systems the requirement on energy release is very exacting in order to sustain reaction propagation in environments with extensive shock and heating losses.

A new area of interest and effort is to understand and characterize the sub-detonic, non-detonation region, of explosive behavior. This response results from stimuli that are insufficient in intensity to initiate a full detonation of the material, but sufficient to cause a sub-detonic response, such as combustion or deflagration. This area of behavior is vitally important to the design of Insensitive Munitions compliant weapons and can be exploited to produce selectable yield, multi-function weapons. Like advanced initiation, advanced energetic materials understanding is an enabling technology for the next generation of weapon systems that will be safer, more affordable, and more lethal.

(U) The ability to accurately predict the behavior of weapons in their operating environment of extreme pressure, temperature, and velocity is essential to the development of lethal, accurate, and cost effective systems. To meet the needs of the DoD and DOE communities, there is a requirement for validated capabilities using high-performance computing hardware and software that are sufficient to carry out a broad class of continuum mechanics simulations where shock waves, nonlinear dynamics, and multi-material gas dynamics are important. In particular, this aspect of the program focuses on numerical and algorithmic improvements to enhance our problem solving capabilities for munitions development, advanced energetics, and target lethality predictions with significantly improved material models that accurately represent the material in dynamic states. Three general classes of codes offer solutions to the varied requirements posed by the defense community in the shock analysis regime. Eulerian shock physics tools are effective for a large number of conventional weapons and advanced energetics related simulations. Anywhere there is very large material deformation and turbulent mixing, Eulerian formulations are the most efficient. A second class of codes addresses the large, nonlinear dynamics that can be important for weapons design and development. Such Lagrangian calculations provide design information that complements information provided by the Eulerian shock physics codes. For example, many penetration problems involve detailed structural mechanics that are not appropriate for Eulerian codes. A third class of tools combines capabilities by using arbitrary Lagrangian-Eulerian (ALE) algorithms to solve the conservation equations appropriate for shock analysis. This class of codes performs a range of simulations such as penetration mechanics, thermal cook-off, and fragment impact where multi-physics phenomena descriptions are required across a wide range of time scales, which cannot be addressed adequately with either Eulerian or Lagrangian codes. These codes and associated validated material models represent the future in modeling complex dynamics encountered in a broad spectrum of applications across the defense community. To date, the Department utilization of these capabilities is primarily in the S&T community. It is desirable to extend developing modeling and simulation tools into the engineering design community and this program will continue to provide supporting computational tools.

(U) There is a worldwide trend to harden more military facilities. Increasingly, these are being buried in layered earth and concrete "cut and cover" constructions, tunneled into mountainsides, or mined into rock far beneath the earth's surface. Buried structures accounted for a significant number of targets attacked by our forces during the Gulf, Afghanistan, and Iraq wars, and much of our military planning is being devoted to defeating them. A major thrust of this program continues to be hard target defeat. As hard target weapons evolve, several technical issues need to be addressed. Specifically, penetrators striking targets with obliquity or with high angles of attack experience violent dynamic responses that can fail their cases or interfere with the functionality of fuzes. Similarly, oblique, low velocity target impacts can result in ricochet, undesirable shallow trajectories, or bouncing out of the target. In general, new delivery vehicles tend to be smaller and faster, requiring smaller penetrators that carry less payload and must survive more stressing impacts. Developing improved penetrating weapons depends on a solid understanding of the physics of penetration as well as affordable materials and processes to execute new designs that require more strength and durability from the penetrator. Although we can predict penetration depth with acceptable confidence, there are some targets for which we have insufficient data and experience; consequently, predicting the path a penetrator will take and whether it will survive is much less certain. This program provides a fundamental penetration technology base that addresses many of these issues and enables our future strike weapons. Additionally, warhead concepts which greatly extend the current range of capabilities in speed and tailored target effects are being explored. With increasing emphasis and interest in defeating targets of military interest in civilian areas, and of defeating and neutralizing WMD facilities, the application of energy to target must be thoroughly controlled and understand. This requirement places need demands on warhead output, which are being pursued under this program.

(U) DoD and DOE efforts toward munitions lifecycle technologies including stockpile aging, surveillance, demilitarization and disposal are coordinated under the auspices of this program. The Department has a large and growing inventory of conventional munitions in its demilitarization stockpile. Currently, the stockpile includes more than 400,000 tons and it is expanding by about 70,000-100,000 tons per year. As the long term focus for demilitarization and disposal in DoD turns from open-burn and open-detonation to resource recycle and recovery, alternative technologies are required to turn waste materials into useful products. The technologies developed in this portion of the program enhance DoD capabilities to field safe, cost-effective processes for disposal, resource recovery, and reutilization of munitions and munitions components. For an aged weapons stockpile that has not reached end of useful life, reliability and surety will change with time because of the age-related degradation of constituent materials. Existing stockpile assessment methods typically focus on addressing materials aging and reliability problems after they occur, rather than on anticipating and avoiding future problems or failure mechanisms. The predictive materials aging and reliability portion of this program is focused on improving our ability to understand, measure, predict, and mitigate safety and reliability problems caused by materials aging degradation in weapons systems. Together with complementary demilitarization technologies, this focus provides a base of scientific knowledge and understanding that enhances the Department's ability to efficiently support the late phases of weapon lifecycle. Efficient management of existing stockpile assets is an economically necessary precursor to weapon system modernization.

B. Program Change Summary:

	FY 2004	FY 2005	FY 2006	FY 2007
Previous President's Budget:	24.648	23.319	25.256	25.552
Current FY2006 President's Budget Submission:	23.843	25.202	25.102	25.460
Adjustments to Appropriated Value:	-0.805	+1.883	-0.154	-0.092
Congressional Program Reductions:	-0.186	-0.567		
Congressional Rescissions:				
Congressional Increases:		+2.450*		
Reprogrammings:				
SBIR/STTR Transfers:	-0.619			
Other:			-0.154	-0.092

*Congressional increase will be transferred to DARPA for execution

C. Other Program Funding Summary: N/A

D. Acquisition Strategy. N/A

E. Performance Metrics: An annual Five Year Plan is prepared for this program which contains detailed descriptions of the approximately forty individual projects under this funding line. Each project description includes a task schedule with associated milestones, whereby progress against the end goals can be measured. Technical progress against these milestones is reviewed by DoD participants at semi-annual Technical Coordinating Group meetings.

Exhibit R-2a, RDT&E Project Justification							Date: February 2005	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number Joint DoD/DOE Munitions PE 0603225D8Z				
Cost ($ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
DoD/DOE Munitions/P225	23.843	25.202	25.102	25.460	26.613	26.074	26.608	27.220

(U) A. Mission Description and Budget Item Justification:

(U) This R&D program is a cooperative, jointly funded effort between DoD and DOE to pursue new and innovative warhead, explosive, and fuze technologies in order to bring about major improvements in non-nuclear munitions. This program supports the development and exploration of new munitions concepts and technology preceding system engineering development. Through our funding arrangement with DOE, DoD resources are matched. More importantly, this relatively small DoD contribution effectively taps the annual billion-dollar DOE RDT&E investment by accessing the specialized skills, scientific equipment, facilities and computational tools not available in DoD.

(U) The effort exploits the extensive and highly developed technology base resident in the National Laboratories relevant to achieving the goal of developing capable, cost-effective conventional munitions, and leverages DoD investments with matching DOE investments. The current program supports 44 projects in warhead technology, energetic materials, advanced initiation and fuze development, munitions lifecycle technology, and munitions modeling and simulation. A specific Service laboratory sponsors each of these projects. The program is administered and reviewed by a Joint Technical Advisory Committee composed of members from the Army, Navy, Air Force, Special Operations Command, OSD, and DOE. Projects are peer-reviewed semi-annually by DoD Service Laboratory/Technical Center personnel in order to monitor technical excellence and ensure that the technologies under development address priority DoD needs. The program is integrated with Service efforts through the Project Reliance Weapons Panel and participation in the Defense Technology Area Plan for Conventional Weapons. The program is reviewed under the Technology Area Review and Assessment process. After reviewing the program, the most recent Weapons TARA panel assessed the program as follows: broad range of products transitioned to DoD as a result of program efforts; effectively leverages DOE expertise and funding; critical computational tools provided to DoD; well integrated into Service efforts; Technology Coordination Groups provide an effective forum for technical collaboration.

B. Accomplishments/Planned Program

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Initiation, Fuzing, and Sensors	5.021	4.920	4.990	4.484

(U) FY 2004 Accomplishments:

(U) A new project was started with a focus on millimeter scale initiation and detonation. This work attempted to understand the behavior and response of thin layers and small quantities of explosives, as are required for all MEMS based fuzing and microfiresets. This was a key enabling technology for miniature munitions and remains a largely unstudied field. Specific work plans for 2004 included measurement of run to detonation and failure diameter studies on HNS-IV, CL-20 and high surface area PETN. Development and demonstration of improved components and architectures for robust, low-cost, miniature safing, arming and firing systems will continue. Individual control of multiple initiation sites within a warhead using silicon fireset circuits was demonstrated. Initial testing of extrudable explosive formulations was completed with a focus on the energy required for direct slapper initiation. Component development and evaluation continued and commercial sources for a robust manufacturing technology base were explored. An integrated capacitor and switch in a single package was demonstrated for use as a next generation microfuze component. Current state of the art micro-fuze technology was applied and focused on Special Operations Forces (SOF) requirements in order to enhance and expand SOF capabilities in various mission scenarios. The latest miniaturization technology was transitioned to production-type facilities and to the Services in order to begin exploitation. The study to understand and predict instabilities in multiple-slapper, highly miniaturized systems was completed towards the design of highly reliable and uniquely flexible ordnance systems. Experiments was performed that enabled development of the theory and models of explosive behavior in very small geometries (microdetonics). Materials resulting from new formulations and the sol-gel process were characterized and performance tested. MEMS devices were characterized and tested in stressing high-g environments. Completed most subsystems of the miniSAR and formed an industrial partnership to develop components, where appropriate.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Conduct tests to demonstrate and evaluate the utility of rapidly prototyped multipoint initiation systems to enhance the performance of munitions. Evaluate reduction in development cycle time and cost achieved by rapid prototyping, as well as improvement in multi-point bridge performance gained from careful control of individual bridge geometry. Continue component miniaturization and cost reduction efforts. Demonstrate a packaged microtransformer for use in miniaturized munitions. Complete streak photography and VISAR diagnostic measurements for improved slapper detonator efficiency. Perform Detonation Shock Dynamics (DSD) analysis of initiation system transfer into a main charge. Implement viable multipoint diagnostics, such as magnetic probes or PVDF gauges, onto an array for use in warhead evaluation tests. Continue Development of MEMS CDU components. Demonstrate a packaged MEMS-SAD. Complete set of environmental tests on second generation Silicon Fireset assemblies. Implement a 6 kV single n-MCT switch sufficient for initiating a multipoint array. Design a minimum energy slapper and extrudable explosive system for use in adaptable warheads. Towards a miniature, optically charged fireset, complete development of very small 10 layer capacitors and begin integration of nanostructure multilayer capacitor and switch. Continue detonator designs requiring reduced micro joules of stored energy to fire. Complete prototype impact triggered MEMS fuze. Transition rapid prototyping technology. Complete and fly the initial phase 1 version of miniSAR.

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Energetic Materials	6.123	5.911	6.901	7.116

(U) FY 2004 Accomplishments:

(U) Efforts to synthesize, characterize and scale-up new energetic materials with increased or tailored performance and decreased sensitivity were continued. Coordination with the national advanced energetics initiative also continued towards re-invigorating the energetic materials skill base within the Department. A summary report documenting the synthesis and scale up of LLM-105 as a booster explosive was distributed to the energetics and fuzing communities in completion of the effort. FY 2003 advances in sol-gel metal oxide chemistry were applied and focused on applications development and testing in support of specific Service requests for readily processed reactive materials and high performance thermitics. Energy and performance measurements of CO-derived and nitrogen HEDM's macro-samples were completed and the synthesis of additional extended solid HEDMs were explored. In FY 2004, Cheetah 4 released to the DoD community for performance predictions of an extended set of energetic materials. Development of ignition phenomenology models and design of ignition location experiments were completed in support of the effort to validate and expand codes for predicting weapon system performance and response in accident situations. The effort to preserve and transition energetic materials technology generated by the community continued with the distribution of an extended APEX database that will include over 500 energetic materials of different molecular structure. Support of enabling energetic materials technologies for low collateral damage munitions expanded with the development of near-field and far-field product equations of state for the baseline explosive fill selected in FY 2003. Energetic materials requirements for SOF focused microfuze technology activities were supported through testing of different nano-fuel/oxidizer formulations and incorporation of multi-layer energetic materials into propagation micro-channels.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Continue development of nanoscale, microscale and mesoscale energetic materials with enhanced performance that are less sensitive and cost effective enablers for defense transformation. Demonstrate and characterize sensitivity and burning of hydrogen and nitrogen mixtures with nano-metals. Continue processing, scale–up, and performance characterization of low collateral damage energetic materials. In the area of high nitrogen energetic materials, continue measurements of burn rates and pressure-time histories for burning HN mixtures with nano Al, metals, and MIC; complete performance and sensitivity testing of azo-formamidines. Continue updating APEX explosives database on an 18 month cycle. Complete synthesis of ANTZ based target molecules as a new insensitive energetic material ingredient and synthesis precursor. Complete sol-gel metal oxides weaponization. Complete analysis of Navy fast cookoff experiments. Deliver high explosive grain scale continuum model for use in predicting the performance of plastic bonded explosives.

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Computational Mechanics and Material Modeling	6.112	6.213	7.391	7.216

(U) FY 2004 Accomplishments:

(U) Note that the large increase in funding for this technology area stems from the re-allocation of projects which previously were located in the Energetic Materials area. The increase in funding level does not indicate significant increase in activity. The new projects in this area relate to the modeling of the mechanical properties of explosive, polymers, and the generation of test data to validate the computational models. The development of Eulerian, Lagrangian, coupled and ALE codes relevant to the design and evaluation of munitions continued. Efforts continued in the development, implementation and validation of material constitutive and failure models supporting the simulation of warhead formation and warhead/target interactions. The program also provided a conduit to the improved materials models emerging from the DOE Advanced Strategic Computing Initiative providing high resolution, accurate predictions of materials behavior and failure relevant to the analyses of weapon systems. The transition and support of these tools and models along with user training were provided as needed. A particular growing effort in this year was the development of a mixed phase flow calculational capability to describe inert particle loaded explosives. This capability is essential to the understanding of low collateral damage phenomena.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Continue to develop, extend and apply the hydrocodes and associated materials models for warhead design and evaluation. Ongoing code and material model development will continue to focus on greater accuracy, improved physics, and extension to mixed phase flow problems. Continue to support the transition of these tools, the training, and consulting for the DoD user community. Complete tensile plasticity and damage model extension for use within warhead design codes. Towards a robust, mesh free warhead design tool, begin extension of Dual Particle Dynamic (DPD) methodology to three dimensions. Complete integration of CTH and NEVADA design tools. Complete fragment explosive initiation modeling in support of DoD initiatives. Continue advanced material model implementation for warhead design and evaluation. Validate predictive capability for low collateral damage munition performance and effect..

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Warhead Technology & Integration	3.999	3.272	3.014	4.124

(U) FY 2004 Accomplishments:

(U) Integration of all the components necessary for a low collateral damage munitions concept occurred. Energetic formulation, composite, case, and performance predictions based on modeling to date, were combined in this effort. Near term applications of this technology are believed possible based on these tests. Efforts to provide enabling technologies for defeat of hardened military targets continued. Dynamic compression studies of ES-1 and high-alloy steels were completed and documented. Three axis oblique penetration experiments into concrete targets to generate a data base for the DoD and DOE communities for code and model benchmarking. The focus was on obtaining data that revealed the dynamic rotations of the penetrator during entry and the resulting trajectory. The data provided to the DoD community for use in validating and benchmarking hard target design tools. Several new tasks were initiated to look at penetration in multi-layer targets, angle of attack effects on penetration and payload survivability, and a boosted penetrator concept as a means to increase penetration depth. The development and integration of the computational, explosive, penetration, and composite material technologies required for an enhanced alternative to the use of inert munitions against soft targets in urban areas were accelerated. Low collateral versions of existing bomb, such as Mk 82, are being fabricated and prepared for comparative test evaluation. The processing contribution of metal liner materials to enhanced performance continued with the emphasis on studying special grain boundaries. Previous work in the commercial arena has demonstrated significant mechanical and corrosion resistance properties are achievable through control of grain boundaries. Temperature measurements of shocked materials were applied to a variety of metals shocked to various stress states. Focus continued on the science-based technology projects relating warhead performance to material properties under dynamic conditions as a prelude to improved computational modeling and the transition of improved warhead designs to developmental and fielded weapon systems. The simulations of the Ta liner test-bed experiments continued in order to assess the utility of the new materials models in the warhead design process.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Continue low collateral damage verification and validation testing in comparison with current best baseline munition. Use test data to evaluate simulation capability in predicting target damage. Continue the study of advanced hard target penetrator concepts and adapt designs to state-of-the-art materials and manufacturing methods. Complete instrumented oblique penetration tests using the 3 axis data recorder. Complete target size penetration tests aimed at reducing the cost of penetration tests for the community by obtaining evidence of a size scale effect. Continue target diameter benchmarking efforts in support of size-scale effect testing. Continue improvements in modeling of target entry dynamics and trajectory predictions via field testing and analysis. Complete characterization of low cost, high hardness candidate penetrator materials. In the area of design improvements for hard target penetrators, complete survivability design concepts. Continue improvements to the hard target response predictive capability established in the Peridynamic design tool. Complete push control studies using alternative reactive warhead materials. Continue efforts towards an FY 2006 demonstration of energy coupling enhancement through initiation.

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Munitions Lifecycle Technologies	2.588	2.436	2.806	2.520

(U) FY 2004 Accomplishments:

(U Mid-scale testing of sensors that can detect particle emissions in explosive events commenced. The small and mid-scale sensor test results were used to generate a data base and analysis tools for standoff identification and specification of particles generated in detonation events. Disassembly and handling of ADAM mine projectiles were demonstrated. Adapt the robotics technology to the M77 grenade and demonstrate removal of MLRS M77 grenades from a warhead section. The technology for standoff monitoring of OB/OD events at DoD demilitarization sites was transitioned to a commercial partner. In the predictive materials aging and reliability area, measurements of the electrical response of dormant storage munitions electronic components commenced. Under the aging of propellants task, continued to participate in the service life predictive technology (SLPT) program. This consisted of improved characterization of critical chemical and physical aging processes in composite propellants, and formatting that information into constitutive models for into predictive 3-D reactive-diffusion codes. The particulate emissions identification project moved to actual large-scale open-air detonation events, where soil samples near the event have been characterized to provide a baseline signature.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Complete real time particle size and composition analysis open air testing. Complete isothermal fatigue experiments for solder interconnect reliability studies. Transfer electronic corrosion predictive model to Service demilitarization efforts. Continue identification of critical DoD electronic components susceptible to corrosion failure. Complete studies aimed at determining propellant thermal decomposition kinetics. Continue analysis of DoD aged samples and participation in Predictive Service Life Technology program reviews as requested. Complete MEMS reliability monitor verification tests. Complete testing of stand-off sensor for rocket motor demilitarization. Complete explosive combustion studies for predicting toxic emissions in OB/OD events. Prototype, design, and fabricate M77 grenade handling and safing hardware. Continue identification and analysis of non-plastic encapsulated critical DoD weapon components. Measure age dependent weapon adhesive joint toughness at various temperature levels and high humidity. Apply interfacial fracture mechanics methodology to existing DoD/DOE weapon systems. Continue HX-874 propellant binder aging studies.

C. Other Program Funding Summary: N/A
D. Acquisition Strategy: N/A
E. Major Performers: The work is performed in-house at the three DOE National Laboratories responsible for nuclear weapons RDT&E: Lawrence Livermore, Los Alamos, and Sandia National Laboratories.