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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)								DATE February 1999		
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety						
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	10707	10422	10537	10814	10137	9986	11082	11293	Continuing	Continuing
DF21 North Atlantic Treaty Organization (NATO) Small Arms Evaluation	295	0	493	493	492	492	492	490	Continuing	Continuing
DF24 Conventional Ammunition Demilitarization	9106	6663	4558	4541	4646	4769	4901	5038	Continuing	Continuing
D293 Field Artillery Ammunition (NATO) Engineering Development	78	86	0	0	0	0	0	0	0	1672
D297 Munitions Survivability & Logistics	0	2481	3913	4215	4222	3937	4884	4939	Continuing	Continuing
M296 Pyrotechnic Reliability and Safety	663	650	794	800	0	0	0	0	0	3534
M857 Explosive Safety Standards	565	542	779	765	777	788	805	826	Continuing	Continuing

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 munitions 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.

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B. Program Change Summary	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (FY 1999 PB)	11064	8497	8812	8770
Appropriated Value	11417	10497		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-353	-75		
b. SBIR / STTR	-271			
c. Omnibus or Other Above Threshold Reductions	-91			
d. Below Threshold Reprogramming	+5			
e. Rescissions	0			
Adjustments to Budget Years Since FY 1999 PB			+1725	+2044
Current Budget Submit (FY 2000 /2001 PB)	10707	10422	10537	10814

Change Summary Explanation: FY 2000: Funds realigned from Ammunition Procurement to higher priority ammunition related RDTE programs (+1725).
 FY 2001: Funds realigned from Ammunition Procurement to higher priority ammunition related RDTE programs (+2044).

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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety					PROJECT DF21		
COST (In Thousands)		FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
DF21	North Atlantic Treaty Organization (NATO) Small Arms Evaluation	295	0	493	493	492	492	492	490	Continuing	Continuing
<p>Mission Description and Justification: This program assures complete interchangeability of small caliber and automated cannon-caliber ammunition and weapons among all NATO countries with all of the associated logistic, strategic and tactical advantages. Project involves development, maintenance and testing compliance of NATO STANAGS and staffing of the NARTC.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 70 Continued to staff, equip and maintain the NARTC for 9mm, 5.56mm and 7.62mm • 80 Continued to maintain standardization of previously qualified calibers, including the 25mm • 35 Completed facilitation of NARTC for 12.7mm standardization testing • 35 Continued development of 40mm STANAG/MOPI • 60 Participation in D/14 working group, 25/40mm Panel Of Experts (POE) and 5.7mm Group of Experts • 15 Partnership for Peace <p>Total 295</p> <p>FY 1999 Planned Program: Project not funded in FY 1999</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 90 Continue to staff, equip, and maintain the NARTC for 9mm, 5.56mm, and 7.62mm. Add the 12.7mm to current program • 105 Continue to maintain standardization of previously qualified calibers, including the 25mm • 145 Initiate facilitation of NARTC for 40mm standardization testing • 50 Complete development of 40mm STANAG and MOPI • 48 Participate in D/14 working group, 25/40mm POE and 5.7mm Group of Experts • 55 Initiate activities associated with standardization of Advanced Soldier Systems <p>Total 493</p>											
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<p>BUDGET ACTIVITY 6 - Management and Support</p>	<p>PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety</p> <p align="right">PROJECT DF21</p>	
<p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 90 Continue to staff, equip and maintain the NARTC for 9mm, 5.56mm, 7.62mm and 12.7mm • 105 Continue to maintain standardization of previously qualified calibers, including the 25mm • 133 Continue facilitation of NARTC for 40mm standardization testing • 65 Complete 12.7mm qualification testing • 35 Participate in D/14 working group, 25/40mm Panel of Experts and 5.7mm Group of Experts • 65 Continue activities associated with standardization of Advanced Soldier Systems <p>Total 493</p>		
<p>Project DF21</p>	<p align="center"><i>Page 4 of 13 Pages</i></p>	<p align="right">Exhibit R-2A (PE 0605805A)</p>

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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety					PROJECT DF24	
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
DF24 Conventional Ammunition Demilitarization	9106	6663	4558	4541	4646	4769	4901	5038	Continuing	Continuing
<p>Mission Description and 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) for recovery/recycle/reclamation equipment and processes to reduce the extremely large stockpile of munitions in the resource recovery disposition account and recovered munitions from FUDS.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 1251 Completed installation and pre start-up testing of prototype Supercritical Water Oxidation (SCWO) system for demilitarization of colored smokes and dyes • 984 Continued development of explosives rework process for cast loaded munitions • 1268 Continued cryofracture development for demilitarization of anti-personnel landmines (APL) and other munitions • 503 Completed fabrication and continued installation of pilot scale plasma arc technology • 1038 Completed construction of Explosive Waste Incinerator • 4062 Initiated demonstration program using commercially available blast chamber technology <p>Total 9106</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 2294 Continue cryofracture development for demilitarization of APL and other munitions • 2000 Continue demonstration program for blast chamber technology • 900 Complete test and evaluation of prototype SCWO system for the demilitarization of colored smokes and dyes • 250 Complete development of explosive rework process for cast loaded munitions • 1062 Continue testing of pilot scale plasma arc technology • 157 Small Business Innovative Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 6663</p>										
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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605805A Munitions Standardization Effectiveness and Safety	February 1999 DF24
FY 2000 Planned Program:		
•	2400 Complete testing, evaluation, and prove-out of pilot scale plasma arc technology	
•	900 Complete cryofracture development for demilitarization of APL and other munitions	
•	504 Initiate development of recycle/reuse technology for magnesium/aluminum	
•	402 Initiate development of multibase propellant recovery technology	
•	352 Initiate development of recovery/reuse technology for nitramine explosives	
Total	4558	
FY 2001 Planned Program:		
•	583 Continue development of recycle/reuse technology for magnesium/aluminum	
•	1152 Continue development of multibase propellant recovery technology	
•	851 Continue development of recovery/reuse technology for nitramine explosives	
•	586 Initiate development of nitrocellulose technology	
•	600 Explore advanced cutting technology	
•	769 Initiate development of electrochemical oxidation process	
Total	4541	

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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety					PROJECT D297	
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D297 Munitions Survivability & Logistics	0	2481	3913	4215	4222	3937	4884	4939	Continuing	Continuing
<p>Mission Description and Justification: This project makes Army units more survivable by investigating, testing and demonstrating munitions logistics system solutions that prevent or minimize catastrophic explosive events and accelerate ammunition resupply. Key thrusts are munitions storage area survivability, insensitive munitions technology integration, weapon system rearm, explosive incompatibilities in strategic configured loads 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, and 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, effective fighting force.</p> <p>FY 1998 Accomplishments: Project not funded in FY 1998</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 873 Complete design architecture of prototype munitions storage area planning software tool that allows soldiers to quickly design survivable and efficient ammunition storage sites • 100 Complete study of the explosive safety hazards in storage and transport caused by incompatible munitions in proposed Strategic Configured Loads (SCL) and develop concepts for mitigating these hazards • 250 Populate database of Army munitions compliance status with DoD 5000.2-R requirement that all munitions be designed to withstand unplanned stimuli • 210 Complete concept and fabrication of a barrier system for tank ammunition packaging that makes the tank munition less sensitive to unplanned stimuli • 170 Evaluate less heat sensitive propellants and design a projectile venting system that relieves gas pressure for M915 and XM916 Dual Purpose Improved Conventional Munition (DPICM) cartridges to reduce reaction to unplanned stimuli • 210 Develop and evaluate low melting point ballistic protection material inserts for missile packaging (PAC-3, THAAD, MLRS, etc.) that will either contain the cycloid projectiles within the canister or, lower their exit velocity. The inserts will also protect the munition from bullet and fragment impacts • 50 Conduct testing of THAAD missile propellant to determine tensile strength and burning characteristics and prepare report to baseline future insensitive munitions (IM) propellant development 										
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety	PROJECT D297
<p>FY 1999 Planned Program: (continued)</p> <ul style="list-style-type: none"> • 110 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 meet this requirement • 153 Conduct market survey of corrosion prevention materials suitable for use in munitions packaging and select candidates for evaluation • 145 Select materials and candidate munition item and complete design of a lightweight packaging prototype for large munitions (VOLCANO dispenser system, Javelin, Multipurpose Individual Munition-Short Range Anti-tank Weapon (MPIM-SRAW), Precision Guided Mortar Munition, etc.) that will reduce the manpower and handling required to move heavy/bulky munitions • 65 Determine Special Operations Forces ammunition requirements and develop man-portable mixed ammunition packaging utilizing standard containers • 95 Conduct a study of the planned production levels and consumption rates of all Army munitions used for training to select likely candidates for reduced packaging configurations (to reduce operations and support costs and provide easier disposal of waste packaging) • 50 Small Business Innovative Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 2481</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 1100 Complete development of safety and survivability training information modules for the prototype munitions storage area planning software tool • 835 Conduct compatibility assessment tests and develop conceptual designs of packaging and mitigation solutions for incompatible munitions SCLs • 250 Identify specific IM technologies that can be applied to individual Army munitions, develop database, and identify IM improvement priorities • 250 Complete design modification, fabricate, and test tank ammunition packaging with a barrier system that makes the round less sensitive to unplanned stimuli. Test and evaluate a prototype plastic composite tank munitions container for improved IM performance • 380 Test less heat sensitive propellants and fabricate alternative projectile venting systems that relieve gas pressure for M915 and XM916 DPICM projectiles • 250 Complete testing of low melting point ballistic protection material inserts for missile packaging • 140 Continue reviews of munitions in development and production to determine if they meet DoD 5000.2-R requirement to withstand unplanned stimuli and recommend technical approaches to meet the requirement • 208 Complete concept and design of a venting system for Wide Area Mine (WAM) packaging that makes the WAM less sensitive to unplanned stimuli • 180 Purchase candidate corrosion prevention materials and conduct engineering testing to determine suitability for use in munitions packaging • 320 Complete functional element analysis of design and fabricate lightweight packaging prototype for large munitions. Conduct baseline testing of prototype <p>Total 3913</p>		
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<p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 1000 Complete integration of safety and survivability planning information modules, develop linkage to Standard Army Ammunition System (SAAS), the ammunition management information system, and conduct engineering testing of a prototype munitions storage area planning software tool • 438 Design and fabricate prototype packaging and mitigation solutions for incompatible munitions SCLs and develop test plan • 600 Analyze test results and modify, if necessary, less heat sensitive propellants and projectile venting systems that relieve gas pressure for M915 and XM916 DPICM projectiles. Complete test plan for modified/improved prototypes • 150 Analyze test data and prepare final report on low melting point ballistic protection material inserts for missile packaging • 140 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 • 300 Fabricate and test shipping and storage packaging with a venting system that makes the WAM less sensitive to unplanned stimuli • 262 Evaluate less sensitive high explosives as replacements for TNT in many Army munitions (artillery, mortars, mines, etc.) Replacing highly sensitive TNT will reduce reactions to unplanned stimuli and eliminate the environmental hazards of manufacturing TNT. Develop test plans. • 825 Evaluate less sensitive high explosives and propellants and impact and heat resistant rocket motor case materials for missiles (MLRS, ATACMS-BAT, PAC-3, THAAD, etc.) that will reduce the reaction to unplanned stimuli. Develop test plans • 200 Analyze test results, modify design and conduct instrumented testing of lightweight packaging prototype for large munitions • 110 Develop concepts and design prototype lightweight composite containers for medium and small caliber ammunition that will increase handling efficiency and reduce environmental impact compared to currently fielded containers • 190 Conduct a market survey and purchase candidate coatings and materials that, when applied or inserted into packaging, will reduce the accelerated aging of ammunition energetics, electronics and propellants due to solar heating <p>Total 4215</p>		
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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety				PROJECT M296		
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
M296 Pyrotechnic Reliability and Safety	663	650	794	800	0	0	0	0	0	3534
<p>Mission Description and Justification: This project will support 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, including training realism. Project will result in the development and demonstration of new, safe, reliable and environmentally acceptable munitions.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 149 Successfully completed parametric formulation and formulation characterization to demonstrate the use of atomized aluminum as an effective substitute for magnesium fuel. Environmentally acceptable potassium nitrate/boron ignition mixture was demonstrated to replace environmentally incompatible barium chromate compound • 149 Successfully demonstrated 88% reduction in hydrogen outgassing of magnesium fuel containing countermeasure flare formulations by applying polymeric coating technology. Conventional processing techniques (dissolution, blending, pressing) have been employed • 365 Studied a radio frequency safe design technique relying on ferrite material. Conducted a market survey and an evaluation of industry posture and effectiveness on ferrite cable for the purpose of avoiding complete reliance on existing sole source product. Responses were minimal <p>Total 663</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 120 Develop and investigate merit of substitutes for critical, sole-source and toxic materials. Perform preliminary testing to screen candidate materials • 175 Design safer pyrotechnic munitions/systems for reduced fragmentation effects and tamper resistant configurations • 203 Develop alternative to magnesium. Conduct parametric formulations, performance characterization/evaluations and optimization of selected candidates in white, green, and red illuminants • 135 Complete technology pyrotechnic shelf life study. Conduct environmental tests under various temperature/humidity conditions. Perform function test and evaluation on conditioned items • 17 Small Business Innovative Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 650</p>										
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<p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 236 Complete development of alternative to magnesium. Develop formulations and conduct performance characterization/evaluations. Optimize weapons effects simulator design. • 328 Develop safer pyrotechnic munition/systems specific to light amplification by stimulated emission of radiation techniques • 230 Investigate merit of substitutes for critical, sole-source, and toxic materials. Perform formulation development, parametric studies, and performance characterization <p>Total 794</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 232 Eliminate incompatible and hygroscopic pyrotechnic ingredients in pyrotechnic munitions/system. Initiate improvement of the pyrotechnic reliability and manufacturing process controls • 335 Develop and test safer pyrotechnic munition/systems specific to light amplification by stimulated emission of radiation techniques • 233 Investigate merit of substitutes for critical, sole-source, and toxic materials. Perform formulation development, parametric studies, and performance characterization <p>Total 800</p>		
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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety				PROJECT M857		
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
M857 Explosive Safety Standards	565	542	779	765	777	788	805	826	Continuing	Continuing
<p>Mission Description and Justification: Supports explosive effects research and testing to quantify hazards and to develop techniques to mitigate these hazards in all DOD manufacturing, testing, transportation, maintenance, storage and disposal of ammunition and explosives operations. Results are essential to the development and improvement of quantity-distance standards, hazard classification procedures, cost effective explosion-resistant facility design procedures, and personnel hazard/protection criteria.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 40 Collected and analyzed data for revising DOD and NATO hazard interpretation for Hazard Divisions 1.1 and 1.2 ammunition outside and inside structures • 110 Developed improved tri-service design procedures and improved computer codes for explosion-resistant structures • 47 Developed improved explosives and munitions tests and characterization data • 288 Developed improved DOD and NATO explosives safety guidelines for munitions storage, explosives operating and field operation facilities • 80 Conducted other hazards analyses and expanded/automated explosives safety data bases <p>Total 565</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 54 Continue to collect and analyze airblast/fragment/thermal data for revising DOD, NATO and United Nations hazard classification interpretations for Hazard Divisions 1.1, 1.2, 1.3, 1.4, 1.4S, 1.5 and 1.6 • 150 Continue development of improved explosives and munitions tests and characterization data • 303 Continue to develop improved DOD and NATO explosives safety guidelines for munitions storage, explosives operating and field operation facilities • 20 Continue to conduct other hazards analyses and expand/automate explosives safety data bases • 15 Small Business Innovative Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 542</p>										
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605805A Munitions Standardization Effectiveness and Safety	PROJECT M857
<p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 150 Continue to collect and analyze airblast/fragment/thermal data for revising DOD, NATO and United Nations hazard classification interpretations for Hazard Divisions 1.1, 1.2, 1.3, 1.4, 1.4S, 1.5 and 1.6 • 150 Continue development of improved tri-service design procedures and improved computer codes for explosion-resistant structures • 100 Continue development of improved explosives and munitions tests and characterization data • 229 Continue to develop improved DOD and NATO explosives safety guidelines for munitions storage, explosives operating and field operation facilities • 150 Continue to conduct other hazards analyses and expand/automate explosives safety data bases <p>Total 779</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 150 Continue to collect and analyze airblast/fragment/thermal data for revising DOD, NATO and United Nations hazard classification interpretations for Hazard Divisions 1.1, 1.2, 1.3, 1.4, 1.4S, 1.5 and 1.6 • 150 Continue development of improved tri-service design procedures and improved computer codes for explosion-resistant structures • 100 Continue development of improved explosives and munitions tests and characterization data • 215 Continue to develop improved DOD and NATO explosives safety guidelines for munitions storage, explosives operating and field operation facilities • 150 Continue to conduct other hazards analyses and expand/automate explosives safety data bases <p>Total 765</p>		
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