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Exhibit R-2, PB 2010 Office of Secretary Of Defense RDT&E Budget Item Justification **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY					R-1 ITEM NOMENCLATURE					
0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research					PE 0602000D8Z Joint Munitions Technology					
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	12.152	15.171	22.669						Continuing	Continuing
P000: Insensitive Munitions	12.152	15.171	15.112						Continuing	Continuing
P204: Enabling Fuze Technology	0.000	0.000	7.557						Continuing	Continuing

A. Mission Description and Budget Item Justification

This program addresses applied research associated with improving the lethality, reliability, safety and survivability of munitions and weapon systems. The goal is to develop joint enabling technologies that can be used by the Services as they develop their specific weapon programs. The program invests in technologies from a Joint Service perspective thus ensuring the development of technology with the broadest applicability, while avoiding duplication of efforts.

Under the Joint Insensitive Munitions (IM) Technology Program (JIMTP), investments are focused on specific munition areas that have been identified by the S&T community and validated by the technology needs identified in the IM Strategic Plans submitted by the Program Executive Officers (PEOs). These five munitions areas are: 1) high performance rocket propulsion, 2) minimum smoke rocket propulsion, 3) large caliber gun propulsion, 4) anti-armor warheads, and 5) blast and fragmentation warheads.

Under the Joint Fuze Technology Program (JFTP), investments are focused on specific capability areas that have been identified by Department strategic guidance and current shortfalls in weapon systems and will be validated by the PEOs and Heads of the Service S&T communities. These four capability areas are: 1) Hard Target Survivable Fuzing, 2) Tailorable Effects Weapon Fuzing, 3) High Reliability Fuzing, 4) and Enabling Fuze Technologies and Common Architecture2.

Munition Area Technology Groups (MATGs) and Fuze Area Technology Groups (FATGs) have been established for each munitions and capability area and are tasked with 1) coordinating, establishing, and maintaining five-year technology development plans and roadmaps, 2) coordinating biannual meetings to review technical and programmatic details of each funded and proposed effort, 3) developing and submitting Technology Transition Agreements in coordination with appropriate PEOs for insertion in their IM Strategic Plans / Fuze Technology Development Plan, and 4) interfacing with other MATGs / FATGs and IM / fuze science and technology projects as appropriate. The JIMTP and JFTP will utilize a Technical Advisory Committee (TAC) (consisting of senior DoD and DOE laboratory representatives and senior Munitions PEO representatives) to provide program oversight, policy, direction and priorities during its annual meeting.

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APPROPRIATION/BUDGET ACTIVITY 0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602000D8Z Joint Munitions Technology
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B. Program Change Summary (\$ in Millions)

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>
Previous President's Budget	12.433	15.254	15.371	
Current BES/President's Budget	12.152	15.171	22.669	
Total Adjustments	-0.281	-0.083	7.298	
Congressional Program Reductions				
Congressional Rescissions		-0.083		
Total Congressional Increases				
Total Reprogrammings	-0.200			
SBIR/STTR Transfer	-0.053			
Undistributed Reductions	-0.028			
Program Adjustment			-0.077	
Other			-0.275	
New project initiated			7.650	

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APPROPRIATION/BUDGET ACTIVITY 0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602000D8Z Joint Munitions Technology					PROJECT NUMBER P000	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
P000: Insensitive Munitions	12.152	15.171	15.112						Continuing	Continuing

A. Mission Description and Budget Item Justification

This RDT&E effort is aimed at developing the enabling technologies needed to build weapons in compliance with Insensitive Munitions (IM) requirements established in statute (United States Code, Title 10, Chapter 141, Section 2389) and regulation (DoDI 5000.1 and CJCSI 3170.01F). Using technology available today, the Department has incrementally improved the IM response of our current munitions. New munitions which have fully implemented current IM technology and design practices have been able to achieve IM compliance. However, these have been the most easily solved problems. Without new technology, future variants of current weapon systems will have the same, or worse, response to IM stimuli (i.e., they will not improve with the technology available today). New weapon developments will face similar challenges.

Under the Joint Insensitive Munitions Program (JIMTP), investments are focused on five Munition Areas: High Performance Rocket Propulsion, Minimum Signature Rocket Propulsion, Blast and Fragmentation Warheads, Anti-Armor Warheads, and Large Caliber Gun Propulsion. Munition Area Technology Groups (MATGs), under tri-service leadership, have developed technology roadmaps for each Munition Area which are used to guide investments based on goals consistent with the DoD IM Strategic Plan. The program is structured around these five areas with clear cross-cutting tasks.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Insensitive Munitions (IM) This RDT&E effort is aimed at developing the enabling technologies needed to build weapons in compliance with Insensitive Munitions (IM) requirements established in statute (United States Code, Title 10, Chapter 141, Section 2389) and regulation (DoDI 5000.1 and CJCSI 3170.01F). Using technology available today, the Department has incrementally improved the IM response of our current munitions. New munitions which have fully implemented current IM technology and design practices have been able to achieve IM compliance. However, these have been the most easily solved problems. Without new technology, future variants of current weapon systems will have the same, or worse, response to IM stimuli (i.e., they will not improve with the technology available today). New weapon developments will face similar challenges.	12.152	15.171	15.112	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Under the Joint Insensitive Munitions Program (JIMTP), investments are focused on five Munition Areas: High Performance Rocket Propulsion, Minimum Signature Rocket Propulsion, Blast and Fragmentation Warheads, Anti-Armor Warheads, and Large Caliber Gun Propulsion. Munition Area Technology Groups (MATGs), under tri-service leadership, have developed technology roadmaps for each Munition Area which are used to guide investments based on goals consistent with the DoD IM Strategic Plan. The program is structured around these five areas with clear cross-cutting tasks.</p> <p><i>FY 2008 Accomplishments:</i> In FY 2008, the program remained focused on the five munition areas: (1) High Performance Rocket Propulsion: Demonstrated and transitioned new high-performance composite propellant with improved mechanical properties and sensitivity to 6.3 rocket motor program. Demonstrated in laboratory tests a new binder that may permit high-performance propellants to extinguish in a hazard scenario. Began synthesis of perbromate salts in order to evaluate their effect on composite propellant cook-off behavior. (2) Minimum Signature Rocket Propulsion: Fabricated hardware and demonstrated venting technology concepts in laboratory environment. Laboratory shock sensitivity results conducted and show reduced sensitivity for new minimum signature propellants (3) Blast and Fragmentation Warheads: Demonstrated and transitioned to a 6.3 program reactive liners for improved IM behavior in GP bombs. Developed and conducted successful lab tests for a new cast-cure formulation that shows large improvements in shock sensitivity and has projected performance suitable for large missile warheads. New eutectic-based explosive developed that show improved sensitivity and the performance required for artillery and mortars. New higher performance melt-cast explosive ingredient demonstrated to have less-sensitivity in lab tests and an improved synthesis route discovered. Possible eutectic formulations identified and begun for use of 1-amino-3-methyl-1,2,3-triazolium nitrate (AMTN) ionic liquid to gain reduced sensitivity; improved AMTN synthesis approach demonstrated in sub-scale. (4) Anti-Armor Warheads: Produced sufficient quantity of material for laboratory evaluation of new high-energy explosive using high-density waxes. Formulation and ingredient studies indicating, at lab scale, potential paths for reduced sensitivity explosives. Warhead liner venting transitioned from service tech-</p>				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>base to demonstration project. Evaluated explosive binder effects on laboratory-scale cook-off tests; some new binders appear to show improvement.</p> <p>(5) Large Caliber Gun Propulsion: Multiple gun propellant formulation approaches evaluated in laboratory scale; some ingredients and formulation approaches shown in lab tests to have improved sensitivity. Study of new ingredients and formulation approaches started for new gun propulsion primers for reduced sensitivity propellants.</p> <p>(6) Multi-area: Evaluated multiple approaches to coat sensitive nitramine explosive ingredients with less sensitive materials; down-selected HMX-NTO as promising combination and refined processing parameters for crystallization. Initiation evaluation and design of system for initiating extremely insensitive detonating substances. New synthesis approaches developed for LLM-105, an explosive for use in new booster formulations for use with low sensitivity explosives.</p> <p><i>FY 2009 Plans:</i></p> <p>(1) High Performance Rocket Propulsion: Scale-up and evaluate less extinguishable propellant formulations in lab-scale tests. Complete synthesis of perbromate salts and transition to 6.2 formulation effort. (2) Minimum Signature Rocket Propulsion: Scale-up and assess less sensitive propellants in laboratory tests (aging, performance, sensitivity). Prepare pint mixes of propellant formulations using ANAzF to assess hydrogen bonding affects on sensitivity. Begin study of binding agents to improve properties and reduce sensitivity in minimum signature propellants. (3) Blast and Fragmentation Warheads Scale-up formulation with missile-warhead performance and reduced sensitivity. Complete aging study on first generation of eutectic based-insensitive explosives. Begin development of general purpose bomb main-charge explosive formulations and begin assessment in laboratory environment. (4) Anti-Armor Warheads: Assess additional emerging binder approaches for use in anti-armor IM warheads. Initial formulation development of less-sensitive combined effects explosives. (5) Large Caliber Gun Propulsion: Down-select propellant formulation approach and begin phase II evaluation of sensitivity in laboratory environment. Medium caliber demonstration of concepts for reduced sensitivity primers. For large-caliber gun propulsion cook-off, conduct instrumented ballistic simulator tests and begin modification of required modeling and simulation tools. (6) Multi-area: Transition rocket motor venting concepts to 6.3 demonstration effort. Additional scale-up and synthesis studies of LLM-105. Begin formulation and synthesis work for new booster ingredient, Diaminoazoxy furazan (DAAF).</p>				

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B. Accomplishments/Planned Program (\$ in Millions)							FY 2008	FY 2009	FY 2010	FY 2011		
<p><i>FY 2010 Plans:</i> Scale-up/transition energetic formulations and technologies to BA6.3 activities. Transition additional rocket motor venting concepts. Continue development of extinguishable high performance rocket propellants. Transition initial main-charge bomb fills for use in 6.3 demonstrations. Complete evaluation and transition initial reduced sensitivity minimum signature formulation. Transition down-selected binders to explosive formulation development efforts. Complete evaluation of booster formulations using less sensitive ingredients. Use emerging materials from FY2009 ingredient efforts in new formulations to address long term IM goals. Laboratory evaluation of flight termination technical approaches for use in IM improvements of large rocket motors. Thermal and network analysis for sensor approaches for use in fast cook-off mitigation of rocket motors. Begin development of new formulations using encapsulated materials for reduced sensitivity.</p>												
C. Other Program Funding Summary (\$ in Millions)												
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	Cost To Complete	Total Cost		
0603000D8Z P002/BA3 Insensitive Munitions Advanced Technology	3.941	9.915	20.428						Continuing	Continuing		
D. Acquisition Strategy												
N/A												
E. Performance Metrics												
N/A												

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COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
P204: Enabling Fuze Technology	0.000	0.000	7.557						Continuing	Continuing

A. Mission Description and Budget Item Justification

This RDT&E effort is aimed at developing the enabling technologies needed to provide the survivable and reliable fuzing capabilities based on needs identified in the Guidance for the Development of the Force and the Secretary of Defense Memorandum, DoD Policy on Cluster Munitions and Unintended Harm to Civilians, June 19, 2008. Fuze capability through technology advancements has generally lagged the advancements made in U.S. weapons. Particularly, shortfalls have developed in the areas of: integration with advanced weapons, miniaturization, harsh environment survivability and functionality, and smart electronics and processing. Without new technology future weapon systems, as well as current weapon systems, will fail to meet the survivability and reliability needs of the warfighter.

Under the Joint Fuze Technology Program (JFTP), investments are focused in four capability areas: Hard Target Survivable Fuzing, Tailorable Effects Weapon Fuzing, High Reliability Fuzing, and Enabling Fuze Technologies and Common Architecture. Fuze Area Technology Groups (FATGs) under tri-Service leadership are developing technology roadmaps for each capability area which will be used to guide investments based on goals consistent with the strategic guidance of the Department and shortfalls in existing weapon systems.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Enabling Fuze Technology This RDT&E effort is aimed at developing the enabling technologies needed to provide the survivable and reliable fuzing capabilities based on needs identified in the Guidance for the Development of the Force and the Secretary of Defense Memorandum, DoD Policy on Cluster Munitions and Unintended Harm to Civilians, June 19, 2008. Fuze capability through technology advancements has generally lagged the advancements made in U.S. weapons. Particularly, shortfalls have developed in the areas of: integration with advanced weapons, miniaturization, harsh environment survivability and functionality, and smart electronics and processing. Without new technology future weapon systems, as well as current weapon systems, will fail to meet the survivability and reliability needs of the warfighter. <i>FY 2010 Plans:</i> (Hard Target Fuzing) Develop systems based modeling and simulation tool to determine fuze response to the weapon Dynamics. Develop solid mechanics modeling and simulation technology to provide accurate	0.000	0.000	7.557	

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B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010	FY 2011
<p>material properties. (Tailorable Effects Fuze) Begin development of tailorable initiation technologies including a) multi-point plug-n-play, b) lower energy detonators/initiators and c) miniaturized explosive trains and d) multi-point initiation using energetic tracks, traces or deposition. (High Reliability Fuzing) Begin research, development and demonstration of MEMS device components and fabrication process development for cluster munitions fuze application. (Enabling Fuze Technologies) Begin development for new miniaturized smart fuze sensors and sensing modules for detecting impact, voids, media, and target proximity.</p>						
C. Other Program Funding Summary (\$ in Millions)						
N/A						
D. Acquisition Strategy						
N/A						
E. Performance Metrics						
N/A						

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