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Exhibit R-2, PB 2010 Chemical and Biological Defense Program RDT&E Budget Item Justification **DATE:** April 2009

APPROPRIATION/BUDGET ACTIVITY 0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)
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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
Total Program Element	269.580	239.297	209.072						Continuing	Continuing
CB2: CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)	93.629	110.615	111.420						Continuing	Continuing
CI2: CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)	38.911	43.200	0.000						Continuing	Continuing
TB2: MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)	98.878	47.591	54.156						Continuing	Continuing
TC2: MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH)	36.154	35.922	40.587						Continuing	Continuing
TR2: MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)	2.008	1.969	2.909						Continuing	Continuing

A. Mission Description and Budget Item Justification

The use of chemical, biological, and radiological weapon systems in future conflicts is a steadily increasing threat. Funding under this program element (PE) sustains a robust defense program, which both reduces the danger of a chemical, biological, or radiological (CBR) attack and enables U.S. forces to survive, and continue operations in a CBR environment. The medical program focuses on development of antidotes, drug treatments, casualty diagnosis, patient decontamination and medical technologies management. In the physical sciences area, the emphasis is on continuing improvements in CB defense materiel, including contamination avoidance, decontamination, and protection technologies. Research efforts are planned to be initiated for CB defense technologies that will result from a strategic approach of converging nanotechnology, biotechnology, information technology and cognitive science. This PE also provides for applied research in the areas of real-time sensing and immediate biological countermeasures. The work in this PE is consistent with the Chemical Biological Defense Program Research Development and Acquisition (RDA) Plan. Efforts under this PE transition to or provide risk reduction for Advanced Technology Development (PE: 0603384BP), Advanced Component

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APPROPRIATION/BUDGET ACTIVITY	R-1 ITEM NOMENCLATURE
0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research	PE 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)

Development and Prototypes (PE: 0603884BP) and System Development and Demonstration (PE: 0604384BP). This project is placed in BA2, because it includes non-system specific development, directed toward military needs.

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	266.999	203.731	187.744	
Current BES/President's Budget	269.580	239.297	209.072	
Total Adjustments	2.581	35.566	21.328	
Congressional Program Reductions	0.000	-7.634		
Congressional Rescissions				
Total Congressional Increases	0.000	43.200		
Total Reprogrammings	5.880	0.000		
SBIR/STTR Transfer	-3.299	0.000		
Other Adjustments	0.000	0.000	21.328	

Congressional Increase Details (\$ in Millions)

Project: CI2, CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)

FY 2008	FY 2009
0.000	43.200

Change Summary Explanation

Funding: FY09 - Congressional increases to enhance projects within the science and technology base (+\$43,200K CI2). Congressional general reductions and other adjustments (-\$369K CB2; -\$7,147K TB2; -\$112K TC2; -\$6K TR2).

FY10 - Program realignments and other adjustments (-\$4,594K CB2; +\$3,772K TB2; -\$400K TC2; +\$1,000K TR2), Inflation adjustments (-\$1,617K CB2; -\$730K TB2; -\$739K TC2; -64K TR2). NTA adjustments (+\$17,700K CB2; +\$7,000K TC2).

Schedule: N/A

Technical: N/A

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APPROPRIATION/BUDGET ACTIVITY 0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)					PROJECT NUMBER CB2	
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
CB2: CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)	93.629	110.615	111.420						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (CB2) provides physical applied research to develop future, multi-disciplinary, multi-functional capabilities in Life Sciences, Physical Sciences, Environmental Sciences, Mathematics, Cognitive Sciences, and Engineering. Efforts in this project support the seamless addition of state-of-the-art-technologies into an integrated collection of systems across the spectrum of capabilities requisite to support chemical and biological defense missions. To achieve this, the activities are organized into four capability areas: detection; information systems technology; protection/hazard mitigation (formerly decontamination and protection); and threat agent science. Detection focuses on developing technologies for standoff and point detection and identification of chemical and biological agents. Information systems technology focuses on advanced warning and reporting, hazard prediction and assessment, simulation analysis and planning, and systems performance modeling. Starting in FY10, Decontamination and Protection capability areas will be merged into a new capability area called Protection and Hazard Mitigation. Protection and Hazard Mitigation focuses on providing technologies that protect and reduce the chemical/biological threat or hazard to the warfighter, weapons platforms, and structures. Threat agent science is devoted to characterizing threat agents and the hazards they present in terms of agent fate in the environment, toxicology, pathogenicity and the development of simulants, especially with regard to Non-Traditional Agents (NTA's). This project focuses on horizontal integration of CB defensive technologies in support of the Joint Services.

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

	FY 2008	FY 2009	FY 2010	FY 2011
Solution Chemistry: Development and improvement of chemical and biological decontamination formulations that are compatible with the current family of decontamination systems.	2.020	0.000	0.000	
FY08 - Completed research and published technology readiness assessment on technologies that generate chlorine dioxide at point-of-use. Coordinated findings with advance development programs such as the Joint Portable Decon System (JPDS).				
FY09 - Efforts will be re-aligned under Protection.				
Sensor Data Fusion: Emphasis on developing scientific techniques for fusing disparate information from multiple sources for insertion into the Joint Effects Model (JEM), Joint Warning and Reporting Network (JWARN), and Joint Operational Effects Federation (JOEF), and other identified acquisition programs.	5.241	4.980	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>FY08 - Processed high-resolution field trial data and provided, via data server, support to test first-generation outdoor Source Term Estimation (STE), Hazard Refinement (HR) and Sensor Placement Tool (SPT) algorithms. Completed validation and verification (V&V) of first-generation SPT algorithm. Began development of second-generation SPT algorithm to include optimal hazard prediction capability. Completed prototype algorithm for building interior STE and began development of building interior HR algorithms. Continued biological background model development to reduce sensor false alarms and produced a first generation prototype.</p> <p>FY09 - Complete testing and V&V of first-generation outdoor STE/HR and second-generation SPT algorithms. Complete development, testing and V&V of building interior STE and HR algorithms. Initiate development of advanced STE, HR and SPT tools for use in complex environments (e.g., variable terrain, urban, water.) Complete biological background model development to reduce sensor false alarms and incorporate a first generation model into virtual environment software. Initiate development of a tool that continuously refines and updates the contamination footprint through rapid assimilation of limited and disparate information into meteorological, transport and dispersion, and virtual environment models.</p> <p>FY10 - Sensor Data Fusion efforts will be re-aligned to Advanced Warning and Reporting.</p>				
<p>Integrated Protective Fabric: Development of lightweight chemical and biological protective textiles that can be used as an integrated combat duty uniform.</p> <p>FY08 - Completed work on identifying and assessing nanocatalytic and nano-particle reactive materials with detoxifying and anti-microbial properties and down-selecting candidate materials. Continued development of test methodologies. Continued the development of elastic, conformable chemical and biological (CB) protective fabrics with selectively permeable properties. Continued development of interpenetrating polymer networks whose permeability properties can be electrically controlled. Initiated work on fabric residual life indicators. Initiated selection and development of novel sorbents leap-ahead improvements over activated carbon technologies. Initiated development and selection of ultralight and tactile barrier materials for gloves and boots. Continued fabrication and testing of prototype integrated fabrics to determine protection, mechanical properties, and heat transfer characteristics. Continued use of computational methods for</p>	4.100	5.723	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>assessment and refinement of prototypes. Initiated ensemble design conceptual work based on lessons gathered in the human performance project.</p> <p>FY09 - Complete development of test methodologies. Complete assessment of elastic, conformable CB protective fabrics with selectively permeable properties. Continue development of interpenetrating polymer networks whose permeability properties can be electrically controlled. Continue work on fabric residual life indicators that can be automatically integrated. Continue development of novel sorbents leap-ahead improvements over activated carbon technologies. Continue development work on ultra light and tactile barrier materials for gloves and boots. Continue fabrication and testing of prototype integrated fabrics to determine protection, mechanical properties, and heat transfer characteristics. Continue use of computational methods for assessment and refinement of prototypes. Continue ensemble design conceptual work based on lessons gathered in the human performance project. Initiate fabrication of prototype ensembles for evaluation and demonstration. Resulting technologies/knowledge will transition to an integrated fabric development project in support of advanced development programs such as the Future Force Warrior Demonstration of the Soldier-as-a-System Ground Program and Uniform Integrated Protective Ensemble (UIPE).</p> <p>FY10 - This effort will be re-aligned to Protection and Hazard Mitigation.</p>				
<p>Point Detection, Chemical: Research and development efforts that focused on chemical detection and discrimination.</p> <p>FY08 - Micro Gas Analyzer (MGA) technology from the Defense Advanced Research Projects Agency (DARPA) was demonstrated to be immature. Terminated development of MGA technology for integration into a possible next generation chemical warfare agent detector. Initiated transition of an alternative DARPA Micro Cryogenic Cooler technology to enhance detection sensitivity for MEMS IR sensor system.</p> <p>FY09 - Efforts will be re-aligned to Chemical and Biological Point Technology.</p>	2.719	0.000	0.000	
SBIR - FY09 - Small Business Innovative Research.	0.000	1.250	0.000	
Physiological Response: Delivers the scientific understanding and relevant standards for hazards posed to humans from a chemical or biological agent exposure.	7.851	6.637	14.718	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>FY08 - Initiated development of technically demanding exposure and analytic methods for selected very low volatile chemical threat agents, such as Non-Traditional Agents (NTAs). Expanded and targeted studies that directly lead to a human health risk assessment exposure standard for medical applications. For non-medical applications, studies supported efforts to establish detection and decontamination limits for technology development. Initiated development of empirically based mathematical models to characterize population dynamics of bacterial germination and migration within the body (toxicokinetics), and addressed infection of targeted tissue under natural and altered physiological states (toxicodynamics).</p> <p>FY09 - Complete development of technically demanding exposure and analytic methods for selected very low volatile chemical threat agents, such as, NTA's. Continue development of technically demanded exposure and analytic methods for selected very low volatile chemical agents, such as, NTA's. Continue studies on human health risk assessment exposure standard for medical applications associated with contact hazards of low volatility Chemical Warfare Agents (CWAs). Complete development of toxicokinetic and toxicodynamic models initiated in FY08.</p> <p>FY10 - Refine and standardize exposure and analytical methods for evaluation of percutaneous exposure to selected low volatility CWAs and high priority NTA's. Assess established contact and inhalation hazard methodologies for applicability to next-generation chemical warfare agents and refine as evaluation indicates. Set milestones and begin research on hazard assessment for more chemical agents. Complete development of exposure and analytic methods for selected very low volatile chemical threat agents, such as NTA's. Complete studies and publish report on human health risk assessment exposure standard for medical applications associated with contact hazards of low volatility CWAs. Expand previous toxicokinetic and toxicodynamic efforts on a representative spore-forming Biological Weapons Agents (BWA) to include other BWAs, both spore-forming and non-spore-forming. Assess the validity of expanding the viral agents model. Investigate human toxicity operational contact hazard assessment, and the effects of alternate toxicological pathways on the overall physiological impacts of high priority NTAs.</p>				
Innovative Systems Concepts and Analysis: Development and systems analysis of novel system concepts for chemical and biological protection of occupants of buildings and platforms that integrates emerging technologies.	0.000	0.000	1.152	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY10 - Investigate alternate system solutions and technologies for Collective Protection (COLPRO). Technologies include micro fine detoxifying aerosol fogs to facilitate entry and mitigate cross contamination into the COLPRO system, internal self-detoxifying surfaces for walls and ductwork, expedient retrofit kits, self-detoxifying and expedient strippable coatings, rapid isolation and purge schemes, and novel and innovative air flow and re-circulation schemes.				
Lightweight Integrated Fabric: Development of lightweight chemical and biological protective textiles that can be used as an integrated combat duty uniform. FY10 - Support assessment of integrated fabric concurrent with the Individual Protection Advanced Technology Demonstration (IP Demo - see Budget Activity 3, Project TT3, Experiment and Technology Demonstrations), which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of integrated fabric. Continue work on fabric residual life indicators and agent indicators that can be network enabled. Continue development of polymer membranes with permeability properties electrically controlled. Continue development of novel sorbents leap-ahead improvements over activated carbon technologies. Continue development work on ultra light and tactile barrier materials for gloves and boots. Continue development and scaling of nanofiber/textile production technologies. Continue fabrication and testing of prototype integrated fabrics to determine protection, mechanical properties, and heat transfer characteristics. Continue use of computational methods for assessment and refinement of prototypes. Continue ensemble design conceptual work based on lessons gathered in the human performance project. Continue support of fabrication of prototype ensembles for evaluation and demonstration.	0.000	0.000	6.735	
Agent Fate: Characterizes fate of chemical and biological material on operationally relevant surfaces; information obtained from the study of particular agents will be used in core programs to assist detection, information systems, and protection and hazard mitigation activities. FY08 - Implemented protocols for laboratory wind tunnels. Continued kinetic studies of the fate of thickened CWA's on operationally relevant surfaces to investigate newly identified phenomena and collected additional data on thickened CWA's evaporation and low volatility chemicals. Completed the development of evaporation models of thickened CWA's on operationally relevant materials based data from lab-scale wind tunnel data and field trials. Continued the transition of data to the advanced developer for use in the Joint Effects Model (JEM).	8.265	5.990	8.999	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Researched and developed data sets of persistence and residual concentration of Non-Traditional Agents (NTAs) on operationally relevant surfaces (concrete, asphalt, painted surfaces, sand, soil, etc.). Initiated characterization of reactivity of the NTA's with surfaces, as well as, surface penetration and the fate of NTA's over time.</p> <p>FY09 - Complete data collection for evaporation studies on thickened CWA's and low volatility chemicals for relevant substrates and nanotechnology developments. Continue kinetic studies of the fate of thickened CWA's on operationally relevant surfaces. Integrate and complete characterization of new phenomena into models that will be transitioned to advanced development programs, such as, the JEM. Continue research to develop data sets of persistence and residual NTA concentration on operationally relevant surfaces (concrete, asphalt, painted surfaces, sand, soil, etc.) and expand studies to include newly prioritized agents. Continue characterization of reactivity of the NTAs with surfaces, as well as, surface penetration and the fate of NTAs over time.</p> <p>FY10 - Leverage prior agent fate studies to better bound substrate characteristics, and begin to relate to agent-substrate interactions for highly variable substrates, such as, concrete, sand/soil, and asphalt, and transfer data to predictive models. Characterize effects of substrate composition and structure on persistence and degradation of high priority CWA's and NTA's. Accelerate Agent Fate work on operationally relevant surfaces for highest priority NTAs. Relate CWA and NTA adsorption/absorption to chemical properties of both agent and substrate. Characterize vapor and liquid phase transport of high priority CWA's and NTA's through porous and non-porous operationally relevant substrates. Continue studies to determine effects of environmental factors (such as wind, humidity, substrate hydration and temperature) on transport through and off of substrates. Transfer data to predictive models. Refine Droplet Reaction and Evaporation of Agents Model (DREAM), which helps predict evaporation rates of agents from various surfaces, to address variation in program output. Transition DREAM modules to defense acquisition programs. Develop NTA hazard models and estimate hazard with extended skin-surface contact. Transition the data to the JEM.</p>				
Solid Phase: Development and improvement of chemical and biological decontamination formulations that are compatible with the current family of decontamination systems.	1.202	0.000	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY08 - Completed efforts to develop reactive sorbent nano-active suspensions and sprayable powders for advanced development programs such as the Joint Service Transportable Decontamination System (JSTDS). FY09 - Efforts will be re-aligned under Protection.				
Point Detection, Biological: Research and development efforts that focused on biological detection and discrimination. FY08 - Continued development of technology to completely sequence entire pathogen genomes based upon the sequencing through synthesis concept. FY09 - Efforts will be re-aligned to Chemical and Biological Point Technology.	4.200	0.000	0.000	
Battle Space Management: Emphasis on development of collaborative information management technologies for insertion into the Joint Warning and Reporting Network (JWARN) and Joint Operational Effects Federation (JOEF) acquisition programs. FY08 - Continued Sensor Data Fusion (SDF) and source term location technologies for eventual integration with advanced development programs such as the Joint Effects Model (JEM), Joint Warning and Reporting Network (JWARN), and the Joint Operational Effects Federation (JOEF) (see Budget Activity 4, Project IS4; Budget Activity 5, Project IS5). Demonstrated the exchange and multi-level fusion of actionable information with real world Command and Control (C2) systems in the Department of Defense, and Coalition and Homeland Security/Homeland Defense (HLS/HLD) domains. Completed modified thin server for chemical sensors to JWARN's Component Interface Device (JCID). FY09 - Integrate SDF and source term location technologies into JEM and JOEF programs. Investigate and begin development of next generation technologies and net-centric enterprise integration capabilities. Explore Nano, Bio, Information Technology and Cognitive Science (NBIC) solutions in support of the Information Systems Technology Capability Area. FY10 - Battle Space Management efforts will be re-aligned to Advanced Warning and Reporting.	2.624	2.990	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Human Performance: Analysis and modeling of human performance in chemical and biological protective ensembles in order to determine design priorities and trade-offs.</p> <p>FY08 - Continued the comprehensive study to reduce physiological burden on the human performance parameters for various warfighter subgroups in the performance of their mission when CB protective systems are employed. Continued to identify trade space between physiological and psychological comfort with regards to warfighter effectiveness. Initiated work to develop an overall comfort and performance model for CB protective equipment. Continued human subject studies on effects of breathing rates and resistance during high work rates and develop a human response model.</p> <p>FY09 - Complete first segment of the comprehensive study to reduce physiological burden on the human performance parameters for various warfighter subgroups in the performance of their mission when CB protective systems are employed. Publish findings on trade space between physiological and psychological comfort with regards to warfighter effectiveness. Continue work to develop an overall comfort and performance model for CB protective equipment. Complete human subject studies on the effects of breathing rates and resistance during high work rates. Transition results into the comfort and performance model. Additionally, use results to develop a draft standard for Air Purifying Respirator (APR) qualification.</p> <p>FY10 - This effort will be re-aligned to Protection and Hazard Mitigation.</p>	2.802	2.851	0.000	
<p>Self-Decontaminating Processes: Development and analysis of self-decontaminating coatings and surfaces.</p> <p>FY09 - Continue efforts from FY08 Decontamination Alternative Processes and Solid Phase to develop general purpose formulations and self decontaminating processes using sense and react (smart) systems, gas, kinetic, energetic, and/or novel approaches, and support concept development for decontamination systems of systems strategies and technologies. Decontamination process fundamental efforts continue, including the integration of innovative surface chemistry apparatus focusing on surface, decontaminant, and contaminant interactions using live chemical agents.</p> <p>FY10 - This effort will be re-aligned to Protection and Hazard Mitigation.</p>	0.000	6.100	0.000	
	3.300	0.000	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Detection of CB Contamination on Surfaces: Research and development efforts which focused on detecting contaminated surfaces.</p> <p>FY08 - Developed technology to meet the needs to detect contamination on surfaces in a post-decontamination application to reassess and improve understanding of using enhanced modeling. Completed efforts using off-gassing techniques and Raman based LISA. Completed feasibility studies on post-decontamination verification using standoff detection methodology.</p> <p>FY09 - Efforts will be re-aligned to Chemical and Biological Stand-off Technology.</p>				
<p>Alternative Process: Development and analysis of non-traditional decontamination technologies and approaches which gain significantly improved effectiveness by complementary application.</p> <p>FY08 - Continued to investigate novel approaches to develop new decontamination processes.</p> <p>FY09 - Efforts will be re-aligned under Protection.</p>	1.743	0.000	0.000	
<p>Advanced Warning and Reporting: Emphasis on developing science and technologies for collaborative information management, fusion of disparate information from multiple sources, environmental databases and modeling, fusion of syndromic/diseases surveillance data, and synthetic environments for model performance evaluation and acquisition decisions.</p> <p>FY10 - Utilize newly released field test data to conduct validation and verification (V&V) of outdoor Source Term Estimation (STE) algorithms. Initiate development of a networked chemical and biological (CB) detector false alarm reduction capability for an advanced development program (JWARN - see BA4 Project IS4 or BA5 Project IS5). Initiate development of rapid STE tool for JWARN. Expand virtual test environment model to include fielded sensors and enhanced geospatial information. Expand and improve data assimilation techniques for linking chemical, environmental and medical surveillance sensor data with computer based applications. Continue development of advanced STE, Hazard Refinement (HR) and Sensor Placement Tool (SPT) algorithms for use in complex environments (e.g., variable terrain, urban, water). Extend coupling between environmental parameters and advanced development programs. Continue development of a tool</p>	0.000	0.000	6.200	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
that continuously refines and updates the contamination footprint through rapid assimilation of limited and disparate information into meteorological, transport and dispersion, and virtual environment models.				
<p>Accelerating Agent Sciences: Accelerates CB defense research and development by coupling computational methods and experimental approaches.</p> <p>FY08 - Continued to identify and refine applicable Quantitative Structure Activity Relationship (QSAR) developed by academia and industry in pesticide studies, to describe interactions between conventional Chemical Weapon Agents (CWAs) and surfaces/materials of operational interest. Completed QSAR identification and final report. Continued Quantum-Chemical Modeling (QCM) effort to compute the interaction of CWA simulants and real agents on surfaces/materials of operational interest. Benchmarked and validated the capabilities to predict specific interactions of operational interest. Continued development of QCM dataset to capture QSAR differences between Non-Traditional Agents (NTAs) on surfaces/materials of operational interest.</p> <p>FY09 - Continue CWA QCM simulant design and selection methodology; simulant design and selection methodology efforts will be re-aligned to Agent Characterization and Simulant Development in FY10. Complete QCM dataset implementation to establish QSAR between NTA's and surfaces/materials of operational interest. Utilize expertise and baseline against well-characterized substrates and move toward human toxicology QSAR toolsets. Integrate computational chemistry capabilities into experimental planning and data utilization work.</p> <p>FY10 - Integrate research in computational techniques with existing computational toxicology, such as, shape signatures, and existing molecular dynamics capabilities to enhance agent fate, physiological response, simulant experiments and predictive modeling. Initiate work providing near term benefits, such as, computational toxicology. Complete CWA QCM development and maturation capability baseline for CWA interactions. Apply Quantum Chemical Modeling to develop and accelerate computationally obtained datasets and QSARS derived from the QCM data to highest priority NTA interactions and toxicology.</p>	3.340	5.482	3.927	
Low-Resistance, Low-Profile Filtration: Development and integration of novel filtration media into a lightweight, low-profile, and low-burden individual protective filter, which has enhanced performance against a broader range of challenges that includes toxic industrial chemicals.	0.000	0.000	6.043	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY10 - Support assessment of integrate fabric concurrent with the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of low resistance/profile filtration. Continue project to develop the next generation filter for individual protection from chemical and biological (CB) agents, Toxic Industrial Chemicals (TIC's) and Non Traditional Agents (NTA's). Integrate metal-organic frameworks and other novel adsorbent into breadboard prototypes. Integrate nanofiber High Efficiency Particulate Air (HEPA) filters into breadboard prototypes. Continue reactive hybrid approaches for individual protection filtration. Develop and fabricate initial prototypes and evaluate performance. Initiate prototype work for collective protection filtration in support of advanced development programs such as the Joint Expeditionary Collective Protection (JECF) and support of collective protection in vehicular/ platform systems in Major Defense Acquisition Programs (MDAP).				
Human Performance Prediction and Assessment: Analysis and modeling of human performance in chemical and biological protective ensembles in order to determine design priorities and trade-offs. FY10 - Support assessment of integrate fabric concurrent with the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of human performance prediction and assessment. Continue refining human performance parameters for various warfighter subgroups in the performance of their mission when CB protective systems are employed. Continue work to develop an overall comfort and performance model for CB protective equipment. Initiate anthropometric sizing study to support size tariff development.	0.000	0.000	2.015	
Hazard Prediction and Assessment: Improve battlespace awareness by accurately predicting hazardous material releases, atmospheric transport and dispersion, and resulting human effects. Develop predictive capability for the source term of releases of CB and industrial materials to include counterproliferation, CB weapons, accidents and ground effects from ballistic missiles. FY08 - Continued development of data assimilation techniques to improve forecasts of near-surface characteristics important for hazard prediction. Continued development of models for high altitude, urban, and indoor scenarios to be used by the Joint Effects Model (JEM - see BA4 and BA5). Continued development of variable resolution database containing highly refined terrain, landuse and urban data. Completed validation of wind tunnel with urban field trial data and published FY08 validation report. Delivered initial legacy source	2.336	1.988	5.122	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>models such as Industrial Facilities (IFAC), Industrial Transportation (ITRANS), and Chemical Biological Facilities (CBFAC) to JEM.</p> <p>FY09 - Expand and improve data assimilation techniques to develop a multi-scale, four-dimensional model. Continue development of advanced numerical weather prediction capabilities. Initiate optimization of methods to significantly improve performance of transport and dispersion hazard models for JEM. Develop advanced modeling capability for chemical, biological, and industrial source models (IFAC, ITRANS, and CBFAC).</p> <p>FY10 - Initiate development of a missile intercept module for integration with JEM. Continue optimization of methods to significantly improve performance of transport and dispersion hazard models for JEM in both open air and urban environments using Second Order Closure Puff Atmospheric Transport and Dispersion (SCIPUFF AT&D) and Micro-Stationary Wind Fit with Turbulence (Micro-SWIFT). Continue advancing modeling techniques for chemical, biological, and industrial source models IFAC, ITRANS, and CBFAC. Continue experimental verification of models by way of small scale tests initiated in FY09.</p>				
<p>Respiratory Protection (Non Traditional Agent (NTA)/Toxic Industrial Chemical (TIC) Protection): Development and integration of novel filtration media into a lightweight, low-profile, and low-burden individual protective filter, which has enhanced performance against a broader range of challenges that includes toxic industrial chemicals.</p> <p>FY08 - Initiated the integration of the protective mask designs with developmental helmet systems to provide seamless compatibility of CB protection with ballistic protection and integration of communication and optical systems and incorporate into designs under advanced technology development (BA3) efforts. Continued the investigation of intelligent seal enhancement materials and technologies that will provide improvements in the field protection factor performance and comfort of a respirator. Continued to define the key development parameters associated with respiratory protective systems and incorporate data and lessons from the human performance project. Continued to develop a dual-cavity respirator with increased levels of respiratory protection that provide a real-time indication of mask fit. Continued project to develop the next generation filter for individual protection. Continued to develop metal-organic frameworks as tuneable sorbents for advanced air purification technologies in protective masks. Initiated development of nanofiber-based filters with high efficiency, reduced pressure drop and reduction in weight and cube. Continued development of a process to</p>	4.301	5.750	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>grow alumina nanofiber on a silica matrix to optimize size and density of nanofibers. Initiated effort to develop a sorptive and reactive capacity residual life indicator for mask filters. Initiated reactive hybrid approaches for individual protection filtration.</p> <p>FY09 - Complete integration of the protective mask designs with developmental helmet systems to provide seamless compatibility of CB protection with ballistic protection and integration of communication and optical systems and incorporate into designs under BA3 efforts. Complete the investigation of intelligent seal enhancement materials and technologies that will provide improvements in the field protection factor performance and comfort of a respirator. Continue to define the key development parameters associated with respiratory protective systems and incorporate data and lessons from the human performance project. Continue work on the dual-cavity respirator with increased levels of respiratory protection that provide a real-time indication of mask fit and integrate concept into the final design. Continue project to develop the next generation filter for individual protection. Complete initial phase of development of metal-organic frameworks as tuneable sorbents for advance air purification technologies in protective masks. Complete the down-selection of ceramic and polymer nanofiber-based filters. Continue reactive hybrid approaches for individual protection filtration. Develop and fabricate initial prototypes and evaluate performance.</p> <p>FY10 - This effort will be re-aligned to Protection and Hazard Mitigation.</p>				
<p>Agent Characterization and Simulant Development: Characterizes chemical and biological agents based on structure, physiochemical properties, and molecular interactions. Simulants and selection processes are developed to support test and evaluation applications.</p> <p>FY08 - Continued research into Non Traditional Agent (NTA) chemistry, characterizing synthetic pathways and NTA products, and developing NTA simulants. Characterized novel and emerging Biological Warfare Agents (BWA's) and Chemical Warfare Agents (CWA's) based on structure, physiochemical properties, and interactions. Designed and demonstrated simulant and methodology development for testing protective equipment for the Test & Evaluation (T&E) community. Continued simulant correlation studies to define operational envelopes so that simulants may be used for Developmental Testing and Operational Testing (DT/OT). Characterized simulant use and application. Established analytical approaches and criteria for simulant</p>	4.503	5.652	6.130	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>selection, verification and validation, and correlation to agent performance. Initiated development of NTA simulants for limited set of physicochemical properties. Examined BWA & CWA masking technologies.</p> <p>FY09 - Continue research into NTA chemistry, characterizing synthetic pathways and NTA products, and developing NTA simulants. Incorporate newly prioritized agents as identified by the intelligence community and operational users. Complete simulant and methodology development for protective equipment testing in collaboration with the T&E community. Continue simulant correlation studies to define operational envelopes in which simulants may be used for DT/OT. Incorporate computational chemistry research into simulant design, selection, and methodologies for use in DT/OT. Continue development of NTA simulants matching material interaction properties and simulants for novel applications of traditional agents. Characterize masked agents.</p> <p>FY10 - Capitalize on previous research to characterize highest priority CWA and NTA chemistry based on structure, physiochemical properties, and molecular interactions. Leverage prior work to better understand BWA genomic variation as related to preparation methodologies and environmental stresses. Improve sampling methods and agent simulant correlation studies by leveraging established BWA standard characterization and preparation techniques. Continue development and transition CWA, BWA and NTA simulant selection process and test protocols to support T&E applications and work to define the operational envelopes of simulants through the acquisition life cycle. Expand the scope of simulant development to accelerate delivery of characteristics and simulants fo highest priority NTAs. Address critical characterization work on highest priority NTAs.</p>				
<p>Process Fundamentals: Early analysis of decontamination chemistries and test methodologies.</p> <p>FY08 - Completed research efforts to develop an aerosol-based decontamination application and determine the efficacy effects using aerosolized activated hydrogen peroxide. Completed research to determine the effect of droplet-sized decontaminant on the efficacy of aerosolized peroxy-based decontaminants.</p> <p>FY09 - Efforts will be re-aligned under Protection.</p>	1.160	0.000	0.000	
<p>Chemical and Biological Point Technology: Emphasis on the detection and identification of chemical and biological threats to include Non-Traditional Agents (NTAs). Objectives include the development of nanoscale detector for sensing of chemical and biological agents, design for prototype whole pathogen genome</p>	5.100	14.349	11.232	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>sequencing system, and development of a portable point detector for chemical warfare (CW) detection in potable water.</p> <p>FY08 - Completed feasibility assessment of first generation breadboard prototype based on millimeter wave spectroscopy for biological detection. Continued microelectronic machine-sized (MEMS) solid Fourier Transform Infrared (FTIR) point sensor system. Continued feasibility studies on assays for biological materials based on multiphoton, multi-wavelength processes. Continued development of novel use of laser technology to separate biological materials for enhanced detection of biological warfare agents in water. Continued development of novel laser sources and evaluation of discrimination capability and optical design aspects for biological warfare (BW) aerosol detection with these sources. Continued feasibility studies on the use of novel nanowire-array sensors for enhanced sensitivity and selectivity in the detection of biological warfare materials. Initiated feasibility study of nanoscale detection systems. Continued studies to increase understanding of critical biological antigen variability.</p> <p>FY09 - Complete feasibility studies on assays for biological materials based on multiphoton, multi-wavelength processes. Complete breadboard and demonstrate MEMS sized solid state FTIR point sensor system. Complete development of novel use of laser technology to separate biological materials for enhanced detection of biological warfare agents in water. Complete development of novel laser sources and evaluation of discrimination capability and optical design aspects for BW aerosol detection with these sources. Complete feasibility studies on the use of novel nanowire-array sensors for enhanced sensitivity and selectivity in the detection of biological warfare materials. Continue feasibility study of nanoscale detection systems. Continue development of technology to sequence entire pathogen genomes. Initiate expansion of sample preparation concepts to address genomic sequencing of biological pathogens. Initiate new concepts based on nano-scale biological agent identification and sensing technologies. Begin transition of Defense Advanced Research Projects Agency (DARPA) Micro Cryogenic Cooler (MCC) technology to enhance detection sensitivity for MEMS FTIR infrared sensor system. Continue studies to increase understanding of critical biological antigen variability.</p> <p>FY10 - Continue concept development of nano-scale biological agent identification and sensing technologies. Continue development of technology to completely sequence entire pathogen genomes with automated sample preparation. Continue feasibility studies of nanoscale detection systems. Complete transition of MCC</p>				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>technology from DARPA and demonstrate integration into a MEMS FTIR sensor system as next generation chemical warfare agent detector. Continue studies to increase understanding of critical biological antigen variability. Conduct a scientific analysis of alternatives on the technical impacts of the presence of agents (aerosol and surface) and on operational scenarios due to the presense of NTAs. Develop new surface detection technologies, and the ability to detect agents in potable water.</p> <p>Chemical and Biological Stand-off Technology: Emphasis on the detection and identification of chemical and biological threats to include NTAs in near real time at a distance from the detector. Future programs focus on the improvement of algorithms, excitation sources, and detector elements to increase range, reduce false positives, increase sensitivity, and reduce cost.</p> <p>FY08 - Completed models to predict passive standoff technology responses to aerosols. Continued the study on the detection modalities to detect sentinel species (production and weaponization process by-products) from biological warfare materials and processes. Completed studies to investigate the optimal performance parameters for hyperspectral technology to detect biological materials. Completed studies to optimize/convert detection algorithms to imaging technology. Completed validation and modeling studies on the level of discrimination of biological materials in the infrared electromagnetic spectral regions based upon adsorption, scattering, and polarization spectra techniques.</p> <p>FY09 - Initiate improved algorithms development for increase range capabilities and reduce false positives. Complete the study on the detection modalities to detect sentinel species from biological warfare materials and processes. Initiate first generation active infrared standoff biological classification capabilities. Initiate design of first generation chemical standoff detection and identification capabilities. Complete models and continue development of technology to meet the needs to detect contamination on surfaces in a post decontamination application. Evaluate and assess technology for scattering optical techniques, non-scattering optical standoff techniques, and off-gassing (trace vapor production) techniques for down-selection of brassboard design.</p> <p>FY10 - Continue algorithm development to increase range capabilities and reduce false positives. Continue first generation active infrared standoff biological classification capabilities development. Continue development of first generation chemical standoff detection and identification capabilities. Continue development of technology to meet the needs to detect contamination on surfaces in a post decontamination</p>	12.201	17.231	15.942	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
application. Continue to evaluate and assess technology for scattering optical techniques, non-scattering optical standoff techniques, and off-gassing techniques for down-selection of brassboard design.				
<p>Novel Air Purification Technologies: Development of chemical and biological air-purification alternative technologies that minimize or eliminate the need for expendable media within acceptable size, weight and power constraints.</p> <p>FY08 - Initiated a project to develop energetic, reactive, media-less, air purification technologies that reduce size, weight, and lifecycle costs of removing chemical and biological agents and Toxic Industrial Chemicals (TICs) from both make-up and recirculation air in buildings, shelters or platforms. Initiated development of an acoustic fractionator that removes particulates down to the submicron level using standing sound waves. Initiated development of a hybrid plasma filter that provides both vapor particulate removal and destruction capabilities. Initiated development of a new air purification technology based on selective ionization and contaminant extraction. Initiated development of a novel, low pressure drop, High Efficiency Particulate Arrestance (HEPA) filter, which provides increased dust capacity and extended filter life through the use of irregularly shaped high surface area submicron fibers. Continued development of a highly efficient particulate filter that uses charged sub-micron water droplets from efforts under Improved Single-Pass Filters.</p> <p>FY09 - Continue to develop energetic, reactive, media-less, air purification technologies that reduce size, weight, and lifecycle costs of removing chemical and biological agents and TICs from both make-up and recirculation air in buildings, shelters, or platforms. Continue development of an acoustic fractionator that removes particulates down to the submicron level using standing sound waves. Complete investigation of a hybrid plasma filter that provides both vapor particulate removal and destruction capabilities. Continue development of a new air purification technology based on selective ionization and contaminant extraction. Continue development of a novel, low pressure drop, HEPA filter, which provides increased dust capacity and extended filter life through the use of irregularly shaped high surface area submicron fibers. Complete demonstration of a highly efficient media-less particulate filter that uses charged sub-micron water droplets and down-select among technological approaches for further development.</p> <p>FY10 - This effort will be re-aligned to Protection and Hazard Mitigation.</p>	3.100	3.800	0.000	
	5.000	12.316	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Chemical Biological Defense Program Decision Capability: Develop tools for decision making for consequence management, human knowledge management, and health/human effects modeling including casualty estimation.</p> <p>FY08 - Completed user-driven requirements analysis and developed prototype Chemical, Biological Radiological, and Nuclear Investment Planning and Analysis Tool. Continued validation and verification of NBC Casualty Resource Estimation Support Tool (NBC CREST) casualty estimation module for CBRN agent exposure, based on NATO's Allied Medical Publication 8 (AMedP-8). Selected and linked human respiratory tract models with algorithms to model particle size distribution (PSD) of atmospheric aerosol hazards to predict the rate and location of agent deposition in the body as a function of particle size. Initiated development of secondary infection models for disease spread based on small-world networks and an extension of the Susceptible-Exposed-Infectious-Removed (SEIR) epidemiological model to account for heterogeneous mixing among sub-populations in order to provide a well-founded model for casualty estimates in the Joint Effects Model (JEM) involving infectious/contagious diseases, both bioagent-induced and naturally occurring. Continued building the analytical framework and identified gaps in capability to conduct rapid program analysis and conduct feasibility assessments for tools development. Continued development of representative prototype models for each of the capability areas. Continued decision support data inscription technology and initiated distributed modeling research.</p> <p>FY09 - Complete validation and verification and transition NBC CREST to the Joint Operational Effects Federation (JOEF). Complete the implementation of the respiratory tract model and development of the prototype PSD health effects model. Continue development of secondary infection models for disease spread based on small-world networks and an extension of the SEIR epidemiological model to account for heterogeneous mixing among sub-populations in order to provide a well-founded model for casualty estimates in the JEM involving infectious/contagious diseases, both bioagent-induced and naturally occurring. Continue building the analytical framework and identifying gaps in capability to conduct rapid program analysis and conduct feasibility assessments for tools development and realign efforts to the Systems Performance Modeling area in FY10. Continue development of representative prototype models for each of the capability areas and realign efforts to the Systems Performance Modeling area in FY10. Initiate development of a web-based system for storage and access of CB Modeling & Simulation (M&S) and Information Technology (IT) development data and knowledge and realign efforts to the Systems Performance Modeling area in FY10.</p>				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Closeout decision support data inscription technology to support change in advanced development program office priority. Continue distributed modeling research. FY10 - CBDP Decision Capability efforts will be re-aligned to Simulation Analysis and Planning.				
Low-Burden Air Purifying Respirator: Development and analysis of design alternatives for chemical and biological air-purifying respirators to provide enhanced protection with lower physiological burden and improved interface with mission equipment. FY10 - Support assessment of integrate fabric concurrent with the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of a low-burden air purifying respirator. Continue to define the key development parameters associated with respiratory protective systems and incorporate data and lessons from the human performance project. Continue integration analysis with ground warfighter helmet systems. Complete integration work on the dual-cavity respirator into concepts into the final design. Continue to refine and fabricate prototypes and evaluate performance.	0.000	0.000	2.012	
Chemical and Biological Warfare Effects on Operations: Develop the science behind the modeling and simulation of operations at the strategic, operational and tactical level in a CBRN environment for mobile forces, tactical aircraft, naval operations and fixed sites. FY08 - Integrated methodologies for CB effects on theater level models at the U.S. Transportation Command (USTRANSCOM). Continued development of building interior modeling to transition to the Joint Operational Effects Federation (JOEF). Continued development of Agent Fate model and initiated transition to the Joint Effects Model (JEM). Initiated studies on CB effects for mobile and shipboard forces to be transitioned to JOEF in FY09 or FY10 timeframe. Initiated studies on consequence management (CM) information system tools, including foreign CM and domestic CM and delivered a prototype CM system for JOEF. Delivered initial optimized sensor employment tool to JOEF. Initiated studies and identified methodology development for chemical, biological, radiological, and nuclear (CBRN) decision support tools. FY09 - Deliver methodology for CB effects on mobile and shipboard forces models to JOEF. Refine design and expand prototype system for CM and continue development of Incident Management/CM inclusions in consequence systems. Refine and expand methodology for CBRN decision support tools.	3.381	3.986	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY10 - Chemical and Biological Warfare Effects on Operations efforts will be re-aligned to Simulation Analysis and Planning.				
Logistically Sustainable Air Purification for Collective Protection: Development of chemical and biological air-purification alternative technologies that minimize or eliminate the need for expendable media within acceptable size, weight and power constraints. FY10 - Complete development and analysis of prototypes of energetic, reactive, media-less, air purification technologies that reduce size, weight, and lifecycle costs of removing chemical and biological agents and toxic industrial chemicals (TICs) from both make-up and re-circulation air in buildings, shelters, or platforms. Complete development of an acoustic fractionator that removes particulates down to the submicron level using standing sound waves. Continue development of a new air purification technology based on selective ionization and contaminant extraction. Complete development of a novel, low pressure drop, HEPA filter, which provides increased dust capacity and extended filter life through the use of irregularly shaped high surface area submicron fibers.	0.000	0.000	2.300	
Collective Protection (COLPRO) System Integration: Development and systems analysis of novel system concepts for chemical and biological protection of occupants of buildings and platforms that integrates emerging technologies. FY08 - This effort transitions technologies from previous efforts of Regenerative and Reactive Air Purification, Shelter Systems (to include contamination control areas, airlocks, and toxic free areas), and Shelter Materials, Coatings and Materials Treatments, Reactive or Self-Decontaminating. Continued project to investigate alternate system solutions and technologies for COLPRO. Technologies included micro fine detoxifying aerosol fogs to facilitate entry and mitigate cross contamination into the COLPRO system, internal self-detoxifying surfaces for walls and ductwork, expedient retrofit kits, self-detoxifying and expedient strippable coatings, rapid isolation and purge schemes, and novel and innovative air flow and re-circulation schemes. Expanded study of system and alternatives and initiate efforts addressing specific technological gaps for COLPRO development.	3.140	3.540	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY09 - Continue project to investigate alternate system solutions and technologies for COLPRO. Technologies include micro fine detoxifying aerosol fogs to facilitate entry and mitigate cross contamination into the COLPRO system, internal self-detoxifying surfaces for walls and ductwork, expedient retrofit kits, self-detoxifying and expedient strippable coatings, rapid isolation and purge schemes, and novel and innovative air flow and re-circulation schemes. Complete the study of system alternatives and initiate efforts addressing specific technological gaps for COLPRO development.				
FY10 - This effort will be re-aligned to Protection and Hazard Mitigation.				
General Purpose Formulations for Decontamination: Development and improvement of chemical and biological decontamination formulations that are compatible with the current family of decontamination systems.	0.000	0.000	1.900	
FY10 - Continue solid oxidant and green surfactant efforts resulting from alternative process research that emphasize dual-use technologies. Initiate focused enzymatic decontamination approaches.				
Simulation Analysis and Planning: Develop decision support tools and information management capabilities for planning and real-time analysis to determine and assess operational effects, risks, and impacts of CBRN incidents on decision making.	0.000	0.000	6.300	
FY10 - Refine and update secondary infection models and NBC Casualty Resource Estimation Support Tool (NBC CREST) human effects models to reflect revision of NATO's Allied Medical Publication 8 (AMedP-8). Initiate development of casualty estimation methodology for CBRN agents not in AMedP-8 including Non-Traditional Agents. Develop methodologies to improve the calculation of medical countermeasures effects in casualty estimation models. Improve CBRN medical resource planning tools. Continue development of contagious and infectious disease models. Continue development of particle size distribution health effects based on basic and applied threat agent science research efforts. Continue development and improvement of methodologies to apply CB operational effects in tactical, operational and strategic level models for mobile forces, shipboard modeling, fixed sites and tactical aircraft. Continue development of Incident Management/Consequence Management (IM/CM) tools and capabilities. Initiate studies to identify and investigate existing syndromic/disease surveillance systems and early detection capabilities. Continue validation and verification (V&V) effort for medical modeling efforts aimed at transitioning to advanced development efforts. Continue				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
refinement and expansion of decision support tools for advanced development efforts. Complete distributed modeling research.				
Decontamination System-of-Systems: Development and analysis of non-traditional decontamination technologies and approaches which gain significantly improved effectiveness by complementary application. FY10 - Complete development of self-detoxifying coatings, agent disclosure spray efforts, and strippable coating efforts and transition products in advanced development programs such as the Hazard Mitigation for Material and Equipment Restoration (HaMMER) Advanced Technology Demonstration. Continue investigation of microwave interaction with coating embedded particles and functionalities for directed energy decontamination. Complete work on functionalized photocatalytic materials. Initiate formulation development of a Dial-a-Decon system that allows optimized formulation adjustment at point-of-use.	0.000	0.000	2.600	
Systems Performance Modeling: Develop Chemical, Biological, Radiological and Nuclear (CBRN) data sharing capabilities. FY10 - Develop data collection and exchange methodologies for implementation in the Chemical, Biological, Radiological and Nuclear (CBRN) Data Backbone. Design CB Warfare Effects Manual.	0.000	0.000	3.073	
Smart Hazard Mitigation: Development of decontamination technologies that sense, respond (decontaminate) and signal in the presence of chemical and biological contamination. FY10 - Complete feasibility studies on the use of surface-modified nanoporous beads as encapsulation delivery devices for decontaminants. Continue development of molecular switches that respond and react to the presence of CB agents and signal results.	0.000	0.000	1.820	
Novel Threat Agent (NTA) Assessment and Methods: FY10 - Initiate methodology development for assessment and quantification of percutaneous hazards from permeation of liquid NTAs. Initiate methodology development for assessment and quantification of decontamination contact hazard residuals of NTAs. Baseline methodologies for current filtration, barrier materials, and textile effectiveness against NTAs. Continue efforts to assess and predict NTA performance on military CWA adsorbents.	0.000	0.000	3.200	

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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
CB3/CHEMICAL BIOLOGICAL DEFENSE (ATD)	18.839	19.183	25.403						Continuing	Continuing
TT3/TECHBASE TECHNOLOGY TRANSITION	9.239	8.214	7.388						Continuing	Continuing
D. Acquisition Strategy										
N/A										
E. Performance Metrics										
N/A										

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APPROPRIATION/BUDGET ACTIVITY				R-1 ITEM NOMENCLATURE					PROJECT NUMBER	
0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research				PE 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)					C12	
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
CI2: CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)	38.911	43.200	0.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

The efforts listed in Section B of this justification include congressional interest programs for FY08 and FY09.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>CBDP Initiative Fund Applied Research: The CBDIF goal is to fund new and innovative chemical and biological science and technology projects across a wide range of military operations. Established in FY 2003, it is congressionally directed with the intent to provide funds via a competitive acquisition to non-Government entities.</p> <p>FY08 - Solicited proposals from degree-granting universities, nonprofit organizations, or commercial concerns to include small businesses, in support of the CBDP to fund chemical and biological defense science and technology projects across a wide-range of military operations. Upon technical evaluation and selection of proposals, provide a report detailing the number of projects funded and areas of research.</p>	7.885	0.000	0.000	
<p>SBIR - FY09 - Small Business Innovative Research.</p>	0.000	0.486	0.000	
<p>Rapid Forensic Evaluation of Microbes in Biodefense -</p> <p>FY08 - Developed a rapid screening and detection system for multiple Bio-Threat agents, to include bioengineered and genetically modified biohazards.</p> <p>FY09 - Continuation of research program to develop an ultra-sensitive single application detection method that can be used for a range of Bioterrorism agents.</p>	0.986	0.989	0.000	
<p>Chem/Bio IR Detection System -</p>	1.577	1.186	0.000	

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Exhibit R-2a, PB 2010 Chemical and Biological Defense Program RDT&E Project Justification			DATE: April 2009	
APPROPRIATION/BUDGET ACTIVITY 0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)		PROJECT NUMBER CI2	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY08 - Developed the sampling sub-systems for biological (aerosolized) warfare agents that will be interfaced with optical identification approaches. The proposed identification approach utilizes Fourier Transform Infrared Spectroscopy (FTIR) as the agent identifier.				
FY09 - Continue research to investigate an electric-field focusing approach, combined with optically transparent filters, to be used for spore capture and identification.				
Rapid Detection of Bacterial Pathogens -	1.577	0.000	0.000	
FY08 - Continued research to development of a prototype clinical point of care detector that is inexpensive, specific, and capable of low detection levels for human pathogens. This effort continued work begun in FY06/ FY07 on the phages associated with Bacillus anthracis, Yersinia pestis, and focus new energies on Francisella tularensis, Burkholderia mallei, and Burkholderia pseudomallei.				
Zumwalt National Program for Countermeasures to Bio Chem Threats -	0.985	1.187	0.000	
FY08 - Improved model development related to atmospheric sciences and environmental modeling.				
FY09 - Continue research to improve model development related to atmospheric sciences and environmental modeling.				
Point-of-Care Diagnostic System -	0.986	0.000	0.000	
FY08 - Developed a gel-drop, microarray device as a biological agent identification and diagnostic system. This system provided an enhanced capability to rapidly detect, locate, identify, and confirm the presence or absence of any standard or non-standard NBC hazard.				
Virus Mutation and Virus Transfer from Humans to Animals -	2.957	0.000	0.000	
FY08 - Identified virus-host protein-protein interactions (PPIs) and associated virus mutations important for change in host species or enhanced virulence within emerging viruses. A knowledge database will be created to predict similar essential PPIs in other potential WMD viruses.				
HyperAcute Vaccine Development -	1.459	2.373	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY08 - Conducted research in how the application of the broad-spectrum immuno-stimulatory alphaGal Adjuvant Technology will enhance the potency and thus the efficacy of viral vaccine platforms. FY09 - Continue research by testing vaccine efficacy in a mouse model for correlates of immunity and protection from live virus challenge.				
Antibody-based Therapeutic against Smallpox - FY08 - Conducted tests to observe the protective efficacy of full length specific human mAbs derived from a phage FAb combinatorial library in a series of relevant in vitro and in vivo studies. FY09 - Continue testing with the goal of generating a combinational therapeutic of human mAbs to several neutralizing VACV proteins, that confer the highest degree of protection against vaccinia, smallpox, monkeypox, and other orthopoxvirus infections.	0.986	0.791	0.000	
Novel Viral Biowarfare Agent Identification and Treatment (NOVBAIT) - FY08 - Continued effort to find small molecules that inhibit the assembly of capsids by viruses of high biowarfare potential, thereby inhibiting their replication and neutralizing infection. FY09 - Continuation of the research from FY06/FY07/FY08.	3.154	3.955	0.000	
Mixed Oxidants for Chemical and Biological Decontamination - FY08 - Developed a rapidly effective, mild oxidants for military applications. FY09 - Continuation of research begun in FY08.	3.942	2.769	0.000	
Self-Decontaminating Polymer System for Chem and Bio Warfare Agents (CBWA) - FY08 - Developed self-decontaminating fabric materials containing polymer-based coating systems impregnated with reactive materials for CBWA destruction, which can be activated on demand.	5.519	0.000	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Multifunctional Particles for Defeating Chem and Bio Warfare Agents (CBWA) - FY08 - Conducted research to improve the absorbent materials used in clothing designed to protect against chemical and biological agents.	0.986	0.000	0.000	
Research on a Molecular Approach to Hazardous Materials Decontamination - FY08 - Conducted research on molecular approach to decontamination in collaboration with NSWC begun in FY06.	1.182	0.000	0.000	
Bio Surety Development and Management Program - FY08 - Investigated, researched, analyzed, benchmarked and applied system assets and processed engineering techniques to meet biosurety personnel reliability program (BPRP) requirements for laboratories utilizing and storing biological select agents and toxins. FY09 - Continuation of the research and analysis from FY08.	0.788	1.186	0.000	
Countermeasures to Chemical/Biological Control-Rapid Response - FY08 - Researched support of biodefense and emerging infectious disease. FY09 - Continuation of research from FY08.	3.942	2.372	0.000	
Multiple Applications for Light Activated, Reactive Materiels for Protection of Warfighter, First Responder, and Public Health - FY09 - TBD.	0.000	1.582	0.000	
Chemical Biological Preparedness Center for Advanced Development of Mobile Rapid Response Prototype - FY09 - Develop a mobile, forward deployable, medical capacity that would respond to bio-terrorist incidents and other mass casualty incidents resulting from WMD, natural and technological disasters.	0.000	3.955	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Novel System for Developing Therapeutics against Botulism - FY09 - Conduct research to discover new therapeutics against Botulism.	0.000	3.955	0.000	
Ultra-Rapid Next Generation Pathogen Identification - FY09 - TBD.	0.000	1.978	0.000	
Preventing Long-Term Brain and Lung Damage Caused by Battlefield Trauma Project - FY09 - Conduct research to determine new techniques to prevent brain and lung damage.	0.000	2.868	0.000	
Chemical Agent Fate Appropriate Response Tool - FY09 - Conduct research to create a systematic approach for to the development of a comprehensive operational agent fate model/tool that provides recommendations on the appropriate response to contamination events.	0.000	1.582	0.000	
Multivalent Marbug/Ebola Vaccine - FY09 - Conduct research in the development of a multivalent Marburg/Ebola vaccine.	0.000	3.461	0.000	
Botulinum Neurotoxin Research - FY09 - Conduct research in the development of a new assay which is designed to detect Botulinum (A-G) in the environment and on exposed animals, humans, and culture cells.	0.000	1.582	0.000	
Miniaturized Chemical Detector for Chemical Warfare Protection (ChemPen) - FY09 - Develop a ready for production MEMs FTIR absorption spectrometer to detect in seconds a wide range of nerve agents/TICs.	0.000	1.581	0.000	
Continued Expansion of Prototypes for Destruction of Airborne Pathogen - FY09 - Continue development of methodologies for the destruction of aerosolized agents.	0.000	0.791	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
Mismatch Repair Derived Antibody to Treat Staph Derived Bioweapon - FY09 - Continue research begun in FY07 to develop fully human anti-Staphylococcus enterotoxin B (SEB) monoclonal antibodies (mAbs) that can neutralize >1000 times the human LD50 of the toxin.			0.000	1.582	0.000
Nano Porous Hollow Fiber Regeneratie Chemical Filter - FY09 - Conduct research in the application of nanotechnology to chemical filter design.			0.000	0.989	0.000
C. Other Program Funding Summary (\$ in Millions) N/A					
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
TB2: MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)	98.878	47.591	54.156						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (TB2) funds applied research of vaccines, therapeutic drugs, and diagnostic capabilities to provide effective medical defense against validated biological threat agents including: bacteria; toxins; and viruses. Innovative biotechnology approaches will be incorporated to advance medical systems designed to rapidly identify, diagnose, prevent, and treat disease due to exposure to biological threat agents will be advanced. Categories of this project include core science efforts in biological based research and technology programs areas in biological defense capability areas, such as, Pretreatments, Diagnostics, and Therapeutics. Medical S&T efforts in this Budget Activity refine promising medical initiatives identified in Budget Activity 1, resulting in the development of pretreatment (prophylaxis) modalities against the effects of Chemical, Biological, and Radiological (CBR) agents as an effective countermeasure to CBR exposure. These efforts also focus on, and act as, methods for the timely diagnosis of specific exposures and post-exposure treatments that sustain individual health and force strength in the event of attack.

This project also includes efforts such as the Transformational Medical Technologies Initiative (TMTI). The Transformational Medical Technologies Initiative (TMTI) was launched in FY 2006 as a key Quadrennial Defense Review initiative to respond to the threat of emerging or intentionally bioengineered biological threats. TMTI's mission is to protect the warfighter from genetically engineered biological threats by providing a rapid response capability from identification of pathogens to the delivery of medical countermeasures. This mission is accomplished through two main efforts: 1) developing broad spectrum (multi-agent) therapeutics against biological warfare (BW) agents (e.g, one drug that treats multiple agents); and 2) developing platform technologies to assist in the rapid development of medical countermeasures (MCMs) in response to BW agents (e.g, developing new and innovative ways to mass produce drugs in the event of a biological incident).

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

	FY 2008	FY 2009	FY 2010	FY 2011
Vaccine Constructs for a Combined Equine Encephalitis Vaccine (Former DTO CB58): Develop a single vaccine that protects against the three alphaviruses: Venezuelan Equine Encephalitis (VEE), Eastern Equine Encephalitis (EEE), and Western Equine Encephalitis (WEE). Strategies include development of deoxyribonucleic acid (DNA) vaccines, live virus strains with reduced infectivity, and non-replicating viral vector delivery systems.	0.500	0.000	0.000	
FY08 - Completed the evaluation of viral vaccines containing gene-specific changes resulting in reduced infectivity. Performed dose-determining studies in animals for effectiveness of multiagent viral vaccine				

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>candidates. Optimized a combined Venezuelan, Eastern, and Western Equine Encephalitis (VEE, EEE, and WEE) vaccine. Concluded immune interference studies for the combined VEE/EEE/WEE vaccine in the definitive animal model. Performed down-selection of vaccine candidate platforms. Complete DTO CB58.</p> <p>SBIR - FY09 - Small Business Innovative Research.</p> <p>Therapy for Ebola and Marburg Virus Infections: Identify, optimize and evaluate lead candidate therapeutics for efficacy against Filovirus infections, specifically Ebola and Marburg Viruses.</p> <p>FY08 - Optimized dose and regimen for therapeutic technologies in relevant animal models of Ebola virus and Marburg virus. Evaluated lead candidates for specific viral therapeutic requirements including the drug's effects on the body and the body's effects on the drug.</p> <p>FY09 - Complete proof-of-concept studies for lead candidate technologies.</p>	0.000	0.535	0.000	
<p>Diagnostic Technologies: Development and verification of rapid, sensitive, and specific tests for the identification of Biological Warfare Agents (BWAs) and their expressed toxins in biological fluids of warfighters for the diagnosis of exposure/infection. Discovery of biomarkers of response to exposure. Evaluation of next generation diagnostic technologies including portable instrument platforms, highly parallel and informative testing formats, and nanotechnology applications.</p> <p>FY08 - Conducted testing on next generation diagnostic devices with an emphasis on technologies capable of integrating sample preparation, nucleic acid and antibody-based diagnostic testing. Initiated a study of laboratory-based research targeting the diagnostic implications of toxins in the body and their relevant analytical parameters. For additional agents, used animal models exposed to biological warfare agents to identify the optimal matrices/tissues for biological pathogen identification and determined test windows of diagnostic opportunity. Incorporated multiple-agent, antibody-based detection assays on to existing platforms. Tested biosynthetic protein (recombinant) reagents on existing antibody-based diagnostic platforms. Completed a study directed at increasing sample concentration and extending sample viability prior to testing. Completed initial build/validation of a database transitioned from Defense Advanced Research Projects Agency (DARPA) on a broad range pathogen detection system capable of potentially identifying genetically engineered strains. Adapted existing Polymerase Chain Reaction (PCR) assays to a rapid sequencing</p>	8.292	7.497	7.334	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>platform. Continued to develop real time PCR assays to identify genes responsible for antibiotic resistance in bio-threat agents. Validated antibody based assays designed from protein interaction analysis data.</p> <p>FY09 - Continue to apply previously established evaluation protocols and acceptance criteria to testing on next generation diagnostic devices with emphasis on technologies capable of integrating sample processing, nucleic acid and antibody-based diagnostic testing. Based on results from FY08 effort, assess/expand studies using animal models exposed to bio-threat agents in order to identify the optimal matrices/tissues for biological pathogen identification and test windows of diagnostic opportunity using service developed assays. Promote use of biosynthetic protein reagent production and incorporate into existing systems. Develop improved test assays utilizing new technologies and approaches that enhance diagnosis of early exposure to BWAs. Complete a study of laboratory-based research targeting the diagnostic implications of biological toxins in the body.</p> <p>FY10 - Extend the decision matrix for developmental testing on next generation diagnostic devices with the capability to fully automate and integrate on-board sample preparation, multi-directional analysis and identification, and reporting. Continue to develop pre-symptomatic diagnostic signatures as early indicators of exposure/infection. Develop and characterize reagents that recognize and bind with specific regions or closely related forms of BWAs and apply these characteristics to assay development and platform optimization studies. Develop prototype assays that bind with specific regions and amplify the signal for application to the current nucleic acid amplification based system. This will enable integration of multiple modes of detection/analysis of BWA tests on a single instrument platform. Apply nano-diagnostic technology to demonstrate BWA viability and analytic identification. Develop target enrichment methods for rapid diagnostic initial sequencing of BWA directly from clinical matrices. Develop a gene expression library screening method and study its diagnostic utility.</p>				
Multiagent (Broad Spectrum) Medical Countermeasures: This effort will build on existing basic research performed by existing performers and will support the efforts of new performers who are in the mid-drug discovery phase of drug development. Applied research efforts also include the investigation of existing drugs to explore their efficacy against BW agents. Tests will look for toxicity and efficacy demonstration in accordance with the product's intended use. Initiation of experiments to identify markers, correlates of protection, assays, and endpoints for further non-clinical and clinical studies. Develop a scalable and	49.440	10.282	4.186	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>reproducible manufacturing process amenable to Food and Drug Administration (FDA) good manufacturing processes.</p> <p>FY08 - Continued the discovery and evaluation of novel therapeutics to treat Hemorrhagic Fever Viruses (HFV's) and Intracellular Bacteria (ICB's). Continued studies of antisense ribonucleic acid (RNA) therapeutic candidate drugs against HFV pathogens. Continued evaluation of novel drugs for anti-bacterial effects. Initiated new projects and continued to work on existing projects to evaluate and develop genetic methods for identifying broad spectrum host pathway therapeutic targets. Continued evaluation of drug compounds targeting key pathogen and/or host target molecules.</p> <p>FY09 - Continue efforts to evaluate novel drugs to treat against HFVs and ICB pathogen infections. Complete validation studies of antisense RNA therapeutic candidate drugs against HFV pathogens to prepare for Investigational New Drug (IND) studies. Continue to evaluate novel drugs for anti-bacterial effects. Continue to evaluate and develop genetic methods for identifying broad spectrum host pathway therapeutic target. Evaluate promising therapeutics in combination with lead therapeutic candidates. Continue to expand the evaluation of drug compounds targeting key pathogen and/or host molecules. Conduct a validation of the computer model and a bioinformatics structure for the examination of protein interactions.</p> <p>FY10 - Continue efforts to evaluate novel drugs to treat against HFVs and ICB pathogen infections. Mature promising compounds in combination with lead therapeutic candidates.</p>				
<p>Development of Platform Technologies: Applied research efforts in platform technologies will continue to mature the components necessary to develop an integrated capability from pathogen identification and characterization to countermeasure delivery. Off-the-shelf technologies will be identified, evaluated, and where applicable, refined to demonstrate the ability to provide drug development capabilities. Drug evaluation needs will continue to advance the maturity of animal models specific for each BW agent therapeutic.</p> <p>FY10 - Identify enabling and critical technologies, formulate appropriate technology plans and acquisition strategies, and determine their performance objectives. Initiate development of an information network to serve as the backbone for a rapid drug discovery and development capability. Support development of platform technologies to higher levels of maturity. Genetic sequencing studies will model the types and quantity of</p>	0.000	0.000	16.783	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
data needed for the identification of unknown pathogen ID, including a genomic survey for countermeasure targets and genetically engineering. Evaluate the information network to serve as the backbone for a rapid drug discovery and development capability. Further pursue informatics to support analytical activities, event response, and science discovery. Initial work on advanced manufacturing will occur to enhance the rapid production of therapeutics.				
Vaccine Technology Development: Novel compounds that stimulate the immune system will be tested for their ability to enhance the immune response to vaccine candidates. FY08 - Optimized gene-based poxvirus vaccines and determined the immune response and efficacy in animal models. Tested the ability of immune cell binding compounds to enhance vaccine efficacy in animal models. Initiated evaluation of specific antigens that may confer immunity against several bio-threat agents. Assessed immune response to antigens of selected bio-threat target antigens. Pursued the use of immune stimulating peptides or immune cell targeting peptides to enhance vaccine efficacy in animal models. FY09 - Efforts will be re-aligned to Vaccine Research Support.	2.607	0.000	0.000	
Detection, Assessment, and Attribution: Rapid detection, threat assessment, and attribution of genetically engineered biothreat organisms using microarray based re-sequencing technologies FY08 - Demonstrated three-fold scale-up of experimental protocols and systems. Re-sequenced 30 Bacillus anthracis and 30 Yersinia pestis bacterial genomes, releasing data to other relevant Department of Defense (DoD) projects. Expanded a strain collection, focused on agents most relevant to Warfighters. Evaluated further microarray feature improvements on two microarray platforms. Developed re-sequencing and genotyping arrays for identification of 15 Bunyaviridae and Togaviridae viruses. Completed this effort and made the data available to the Department of Defense community.	2.300	0.000	0.000	
Viral Therapeutics: Identify, optimize and evaluate lead candidate therapeutics for efficacy against viral pathogens. FY08 - Optimized key dosing, administration, and drug characteristics of leading antivirals in non-human primate models. Utilized computer, laboratory, and animal models to consider novel and currently-available	3.600	0.430	2.101	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>antiviral technologies as therapeutics against conventional viral threat agents. Screened metal-based nanomaterials for their ability to inhibit isolated viral enzymes. Developed immune system modifying and host response interventions as helping agents to antiviral therapeutics. Developed small molecule screening programs for therapeutic candidates against the designated viral pathogens, which include smallpox, viral hemorrhagic fevers (e.g., Ebola, Marburg), arenaviruses (e.g., Lassa, Machupo), and viral encephalitis (e.g., Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis).</p> <p>FY09 - Determine the ability of heavy metal nanoparticle-based therapeutics to inhibit viral infection in a laboratory model system. Conduct proof-of-concept studies aimed at identifying therapeutic candidates for poorly characterized threats. Continue supporting therapeutics effective against well characterized threat agents towards advanced development. Screen multiple compound libraries for small molecule inhibitors of designated viral pathogens.</p> <p>FY10 - Initiate drug discovery for a second novel orthopox drug with a mechanism distinct from ST-246, a low-molecular-weight compound that is active against multiple orthopoxviruses. Expand drug discovery efforts for alphaviruses (VEE, EEE, and WEE). Establish clinical protocols to obtain human clinical samples from filovirus outbreaks in the Democratic Republic of the Congo. Test and evaluate lead candidate therapeutic compounds in relevant animal challenge models. Continue testing of heavy metal nanoparticle-based therapeutics for the ability to prevent viral infection in animal models. Identify lead compounds from small molecule library screening and optimize their action through medicinal chemistry. Test and evaluate small protein fragments to determine if their ability to prevent a virus from binding to cells represents a viable therapeutic interdiction point for designated viral pathogens.</p>				
<p>Bacterial Therapeutics: Identify, optimize and evaluate lead therapeutic candidates effective against designated bacterial threat agents.</p> <p>FY08 - Conducted proof-of-concept evaluation of a new single domain antibody that is smaller than conventional antibodies against plague. Evaluated small molecules that can prevent plague bacteria from injecting virulence factors into cells. Expanded development of antimicrobial protein fragments as anti-bacterial therapeutics with activity against specific threat agents. Focused research on treatment for the symptomatic anthrax patient.</p>	9.168	5.809	4.179	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>FY09 - Complete initial evaluation of a single domain antibody that is smaller than conventional antibodies against plague, and extend the application to other related bacteria if successful. Screen small molecules that can prevent plague bacteria from injecting virulence factors into cells in the laboratory, and extend application of assay to other related bacteria. Balance efforts to evaluate potential single agent bacterial therapeutics with those having broad-spectrum activity. Identify and screen inhibitors of bacterial phosphatases for protective effects in cellular and animal models.</p> <p>FY10 - Complete evaluation of bacterial phosphatase inhibitors in a mouse model of plague infection. Test and evaluate lead candidate small molecules to determine their antimicrobial activity. Screen commercially available antimicrobial in advanced clinical development for their activity in the laboratory against bacterial threat agents.</p>				
<p>Multi-agent DNA Vaccines for Bio-Warfare Agents (Former DTO CB65): Molecular (i.e., naked DNA) vaccine platforms will be developed so that a single vaccine formulation provides protection against multiple bacterial and viral biothreat agents.</p> <p>FY08 - Assessed immune response and efficacy of multivalent DNA vaccines that included anthrax and plague elements. Defined protective responses and evaluated possible interference between vaccine components and the immune response in multiagent DNA vaccine formulations. Continued to explore alternative DNA vaccine delivery strategies and vaccine formulations for the development of immunity against intracellular bacterial pathogens. Conducted efficacy testing of native vaccine candidates, as well as, vaccine candidates genetically modified to express additional target proteins (antigens). Optimized DNA vaccine constructs that express multiple biothreat agent antigens. Further evaluated a multiple target spore display vaccine platform.</p> <p>FY09 - Optimize DNA multiagent vaccines that include anthrax and plague components in animal models. Characterize the underlying protective response and evaluate for possible interference between vaccine components and the immune response. Optimize alternative genetic vaccine delivery strategies and unique immune stimulation formulations for the development of vaccines against intracellular bacterial pathogens. Finalize efficacy testing of native and genetically modified vaccine candidates. Complete testing of native and</p>	3.687	3.809	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
genetically modified vaccine candidates, particularly single formulation DNA vaccine constructs expressing multiple biothreat antigens. Test spore-based vaccines in animal models. Complete DTO CB65 in FY09. FY10 - This effort will be re-aligned to Vaccine Platforms and Research Tools.				
Multiagent Vaccine Platforms: Multi-agent vaccine platforms and formulations will be constructed capable of expressing multiple protein antigens from multiple pathogens, and evaluated in animal models. FY08 - Conducted further animal studies for development of candidate anthrax/plague/toxin and anthrax/plague/melioidosis multi-agent vaccine. Performed studies to determine laboratory based measures of immunity (or correlates of immunity) for select candidate vaccine projects. Pursued optimization studies of new vaccine formulations considering alternative immune stimulating compounds, routes of administration, and dosage schedules. Reviewed candidate vaccines for down-selection to primary candidates. FY09 - Further assess candidate multi-agent vaccines in animal models, and consider the inclusion of alternative agents. Explore novel platforms and vaccine formulations. Evaluate effectiveness in animal models. FY10 - Effort will be realigned to Vaccine Platforms and Research Tools.	1.731	1.342	0.000	
Toxin Therapeutics: Identify, optimize and evaluate therapeutic candidates that are effective against biological toxin agents. FY08 - Designed and developed specific antibodies with improved binding activity utilizing data generated from structural analysis of the Botulinum Neurotoxin (BoNT) receptor site. Identified potential inhibitors from compound repositories and protein fragment libraries using computer modeling and structural analysis with inhibitor bound to the toxin. Evaluated small molecule, specific antibody and single chain antibodies against Staphylococcal Enterotoxin B (SEB). FY09 - Evaluate next generation monoclonal antibodies for laboratory and animal effectiveness against BoNT. Characterize lead compounds for potency and specificity in laboratory models and animal models. Initiate development of inactive versions of BoNT substrates as therapeutics with the potential to restore nerve activity	13.737	10.528	9.217	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>following neuromuscular paralysis. Develop a cell-based high-throughput screening system for BoNT therapeutics derived from mouse cells and embryonic stem cells. Evaluate immune-modifying compounds for pre- and post-exposure therapy for SEB intoxication in laboratory and animal models.</p> <p>FY10 - Screen compound libraries utilizing a high-throughput screening system for BoNT therapeutics derived from mouse cells and embryonic stem cells. Test and evaluate lead candidate inhibitors in relevant laboratory and animal model systems of BoNT intoxication. Perform experimental analysis to clarify the contribution of protein modification of BoNT to its structure and biochemical activity as it relates to drug development. Conduct high-throughput screening of drug libraries to identify inhibitors of ricin toxicity.</p>				
<p>Vaccine Research Support: Identify the elements of a vaccine formulation that are necessary for an effective host immune response that confers protection against biothreat agents. Laboratory tests will be developed that are predictive of an effective vaccine. These predictive tests (correlates of immunity) will be used as the basis for rational vaccine design.</p> <p>FY08 - Validated additional intracellular bacterial pathogen (Burkholderia) target antigens in mice. Tested the immune response and efficacy of botulinum neurotoxin (BoNT) components as vaccines. Evaluated the immune response to and efficacy of non-protective, antigen-based vaccines against anthrax to combat genetically engineered or emerging strains. Tested the efficacy of disease inactivated, but metabolically active vaccines against brucellosis. Further defined and evaluated correlates of immunity for specific threat agents (e.g., tularemia, plague, and anthrax). Pursued development of filovirus antibody based assays and examined contributions of the cellular immune response. Evaluated the immune response in animals to filovirus vaccine formulations consisting of virus-like particles.</p> <p>FY09 - Further characterize immune correlates of protection elicited by alphavirus (WEE/VEE/EEE) and filovirus vaccines in animal models. Optimize alphavirus and filovirus antibody-based assays and evaluate their ability to predict protection. Explore additional intracellular pathogen antigens using animal model systems including the use of alternative vaccine delivery platforms for protection. Further evaluate the protective efficacy of BoNT components in small animal models. Extend the characterization of non-protective antigen vaccine candidates to additional small animal models. Pursue the use of immune stimulating protein fragments (peptides) or immune cell targeting peptides to enhance vaccine efficacy in animal models.</p>	2.444	6.548	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY10 - Efforts will be re-aligned to Viral Vaccines and Bacterial/Toxin Vaccines.				
Bacterial/Toxins Vaccines: Develop novel or improved anti-toxin vaccines and vaccines against bacterial biothreat agents for which no vaccines are currently available. FY10 - Test the efficacy of Burkholderia vaccine candidates against aerosol challenge in small animal models. Begin to determine the therapeutic regimen needed in conjunction with a vaccine to eliminate residual Burkholderia organisms and begin evaluation of the immune response elicited by the vaccine. Use comparative animal studies to test the efficacy of disease inactivated, but metabolically active vaccine candidates against Brucella species. Begin to compare the ability of the disease inactivated, but metabolically active vaccine candidates to protect mice against aerosol challenge with distinct strains of Brucella following oral immunization. Continue to test the immune stimulation and effectiveness of novel anthrax vaccines (e.g., multi-component genetically altered vaccines composed of spore antigens, etc.) to combat emerging and genetically engineered strains. Initiate studies aimed at generating a second-generation vaccine that protects against aerosolized Type A Francisella tularensis.	0.000	0.000	3.000	
Viral Vaccines: Design and test vaccines against the Filoviruses (Ebola and Marburg strains) and Alphaviruses (VEE, EEE, WEE) using distinct vaccine platforms. Determine correlates of immunity for alphaviruses and filoviruses and use this knowledge to direct rational design of vaccines and vaccine platforms, as well as, validation of vaccine formulations. FY10 - Identify correlates of immunity for alphavirus (VEE, EEE, WEE) vaccine candidates. Define immune correlates of protection for mature Marburg and Ebola virus vaccine candidates. Develop vaccine candidates for emerging filovirus strains (e.g. Ebola Uganda strain).	0.000	0.000	3.000	
Vaccine Platforms and Research Tools: Develop novel multiagent vaccine platforms, investigate potential immune interference between mature vaccine candidates, and determine the ability of different compounds to stimulate the immune response and enhance vaccine efficacy. Investigate alternative delivery (needle-free) mechanisms for vaccines, develop novel vaccine stabilization methodologies, characterize the human immune response to mature vaccine candidates to identify correlates of protection, and aid in down selection of distinct vaccine formulations.	0.000	0.000	4.356	

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B. Accomplishments/Planned Program (\$ in Millions)							FY 2008	FY 2009	FY 2010	FY 2011		
<p>FY10 - Research multiagent vaccines, immune interference, immune stimulation formulations, vaccine delivery/stabilization, and efforts to predict the human immune response to vaccine candidates. Develop and test new platform technologies that support the expression of multiple antigens. Explore new multi-agent vaccine formulations for immune stimulation in animal models. Further examine devices for efficient administration of DNA vaccines. Begin evaluating alternate, needle-free immunization strategies (i.e., intranasal, oral, and transdermal administration) with current vaccine candidates (non-DNA) against biological threats. Conduct studies to advance the laboratory based artificial human immune system to optimize antibody production. If available, obtain samples from individuals in the Former Soviet Union that have either been vaccinated against or infected with endemic pathogens considered to be threat organisms in order to evaluate the human immunologic response to these agents and/or vaccines. Evaluate new immune stimulating formulations for their ability to enhance vaccine effectiveness in animal models by examining the antibody and cell-based immune responses.</p>												
C. Other Program Funding Summary (\$ in Millions)												
	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost		
TB3/MEDICAL BIOLOGICAL DEFENSE (ATD)	95.996	188.748	204.576						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
TC2: MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH)	36.154	35.922	40.587						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (TC2) funds applied research for the investigation of new medical countermeasures to include prophylaxes, pretreatments, antidotes, skin decontaminants and therapeutic drugs against identified and emerging chemical warfare threat agents (to include a class of agents called, "Non Traditional Agents" (NTA's)). Research and development efforts in this project focus on formulation and scale-up of candidate compounds using current Good Laboratory Practices (cGLP).

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>Diagnostic Technologies: Focuses on developing state-of-the-art laboratory/fieldable methods that detect exposure to chemical warfare agents (CWA) (e.g., nerve agents and vesicants) in clinical samples. It also targets identifying biomolecular targets that can be leveraged as analytical methodologies, as well as, laboratory and animal studies characterizing time-course and longevity of a particular analyte/biomarker.</p> <p>FY08 - Continued development of alternative sample collection/extraction technologies, such as, solvent free extraction as part of a rapid screening method to verify exposure to Chemical Warfare Agents (CWA's). Completed reproducibility studies for water reactive compounds and optimized fibers for select agents. Initiated development of a urine byproduct assay to detect chemical agent exposure. Developed a sample extraction technique and test methodology to detect the presence of chemical warfare analytes in hair samples. Assessed the feasibility of transitioning nerve agent detection capabilities from the laboratory to field portable technology.</p> <p>FY09 - Complete alternative sample collection/extraction technologies, such as, solvent free extraction as part of a rapid screening method to verify exposure to CWAs. Evaluate the combined sample extraction and analysis procedure for pre- and post-CWA exposure to assess the feasibility of detecting chemical warfare analytes in hair samples from animals. Incorporate promising antibody diagnostics and molecular technologies for hand-held CWA diagnostic platforms developed under the Small Business Innovative Research (SBIR) program into the core program for further development.</p>	1.248	1.381	1.229	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
FY10 - Continue development of definitive diagnostic biomarkers for early detection of CWA exposure using several different analytical approaches. Develop pre-symptomatic diagnostic technologies for eventual incorporation into handheld devices in order to detect CWA exposures.				
Respiratory and Systemic: Supports investigation of the systemic host response to chemical warfare agent (CWA) injury via all routes of exposure, with emphasis on the respiratory system and chronic effects of exposure. This involves the development of effective practical field and clinic management strategies and physical and pharmacological interventions to treat the injury processes. This work is designed to support eventual Food and Drug Administration (FDA) licensure of new compounds or new indications for licensed products for use in the treatment of chemical warfare casualties. FY08 - Completed protocol and animal model optimization. Utilized human tissue model of inhalational exposure to screen therapeutics to protect against lung injury. Evaluated and down-selected candidate compounds focusing on countermeasures effective against exposure to multiple agents. FY09 - Continue research on broad-based therapeutics effective against multiple agents and routes of exposures. FY10 - Evaluate safety, efficacy, dosing and relevant effects on the body and the body's effects on the drug of candidate countermeasures against lung injury. Investigation of down-selected potential candidate countermeasures based on molecular biology approaches to CWA lung injury. Continue studies of long-term health effects due to CWA exposure.	4.039	3.160	3.045	
Nerve Agent, Bioscavengers: Develop pretreatments that provide protection against all organophosphorous nerve agents. Bioscavengers should have the ability to rapidly bind and detoxify nerve agents, and have broad binding specificity and high catalytic efficiency for the destruction of agents. One molecule of catalytic bioscavenger should be capable of detoxifying numerous molecules nerve agents resulting in the need for a small quantity of catalytic bioscavenger to protect against large doses of nerve agents. FY08 - Evaluated gene-splicing methods and expression systems for large scale production and purification of genetically altered and catalytic bioscavenger proteins. Conducted studies in animals with specific genes	8.468	10.602	10.051	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>turned off to determine the effect of catalytic bioscavengers in those animals. Continued to develop short amino acid-based drugs as potential catalytic bioscavengers in animal models for safety and efficacy. Explored novel native/genetically altered catalytic bioscavengers. Utilized novel methods to improve/modify the destruction efficiency of selected catalytic bioscavengers. Assessed new, more efficient delivery formulations.</p> <p>FY09 - Refine gene-splicing methods and expression systems for large scale production and purification of genetically altered and catalytic bioscavengers. Continue investigating catalytic bioscavengers in mice that have various genes turned off. Optimize dose and route of administration of short amino acid based drugs as potential catalytic bioscavengers. Assess efficacy of novel catalytic bioscavengers. Evaluate catalytic bioscavengers with increased destruction efficiency. Test new, more efficient delivery formulations in animal models.</p> <p>FY10 - Develop formulations for improved PBPK and reduced immune system stimulation of catalytic/stoichiometric bioscavengers, with a particular focus on providing protection against Non-Traditional Agents (NTAs). Investigate improved drug-delivery systems for 1st generation catalytic/stoichiometric bioscavengers. Conduct supportive studies toward licensure of catalytic stoichiometric bioscavengers.</p>				
SBIR - FY09 - Small Business Innovative Research.	0.000	0.404	0.000	
<p>Cutaneous and Ocular: Therapeutic strategies to effectively minimize injuries to dermal and ocular tissues resulting from exposure to CWAs involves the development of effective practical field and clinic management strategies and physical and pharmacological interventions to treat the injury processes. This work is designed to support eventual FDA licensure of new non-licensed compounds or new indications for licensed products for use in the treatment of chemical warfare casualties.</p> <p>FY08 - Maintained screening efforts to evaluate new and Federal Drug Administration (FDA) approved compounds, and down-selected those shown to be effective using laboratory and animal techniques. Determined the best candidate technologies for preventing and reversing damage to the eye following blister agent exposure.</p> <p>FY09 - Evaluate safety, efficacy, dosing and relevant effects on the body and the body's effects on the drug of candidate countermeasures against sulphur mustard injury. Evaluate cell-based therapeutic technologies.</p>	1.905	1.540	1.284	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Test the protective effects of an FDA approved antibiotic against acute sulphur mustard injury. Evaluate the efficacy of drug modifiers of stem cells for blister injury. Assess effectiveness of anti-inflammatory drugs in the laboratory against sulphur mustard damage to the eye.</p> <p>FY10 - Continue to determine the efficacy of bioengineering and molecular biology approaches to treat blister agent ocular injury. Continue testing of cell-based approaches to facilitate blister agent wound healing. Continue development of a decontaminant for penetrating wounds containing CWAs. Maintain effort to determine the chronic consequences of blister agent exposure. Begin novel efforts to increase drug delivery of candidate countermeasures. Enhance current anti-inflammatory approaches to treating blister agent injury. Evaluate the commonality in mechanisms of blister-induced injury across tissues and routes of exposure.</p>				
<p>Neurologic: Therapeutic strategies to effectively minimize neurologic injuries resulting from exposure to CWAs. This involves the development of neuroprotectants, anticonvulsants, and improved neurotransmitter restorers. Supports eventual FDA licensure of new compounds or new indications for licensed products for use in the treatment of chemical warfare casualties.</p> <p>FY08 - Expanded the search for improved neurotransmitter restorers to reduce the effects of exposure to nerve agents. Evaluated agent-binding proteins as post-exposure therapeutics against nerve agents. Further evaluated FDA approved products demonstrating neuroprotective activity for efficacy in animals against nerve agent exposure.</p> <p>FY09 - Identify and develop broad-spectrum improved reactivators based on the mechanism of action of reactivation. Initiate testing of centrally acting neurotransmitter degrading enzyme restorers for efficacy using laboratory and animal models. Down-select novel and FDA approved anticonvulsants, neuroprotectants, anti-epileptics, and receptor competitors and neutralizing agents for neuroprotective activity against nerve agents. Define and optimize the utility of therapeutic agent-binding proteins.</p> <p>FY10 - Identify and develop drug-delivery systems to improve the restoration of nerve transmitters following exposure to chemical agents. Utilize structure-activity relationships to identify nerve impulse blocking drugs with reduced side effects and novel neuroprotectants and anti-epileptics to protect against nerve agents.</p>	8.441	8.132	8.798	
	2.235	1.800	2.802	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>Medical Toxicology (Non Traditional Agents (NTAs) and Other Agents): Investigate common mechanisms of agent injury. Determine the toxic effects of agents by probable routes of field exposure, as well as, standard experimental routes. Physiological parameters and pathological assessment will be used to establish the general mode and mechanism(s) of toxicity.</p> <p>FY08 - Extended the fidelity of predictive and computational tools by expanding the scope of validation studies to include multiple classes of NTAs.</p> <p>FY09 - Quantify the nature, scope, and time course of exposure/effects using biochemical, toxicological, physiological, and modeling methods as required for therapeutic and clinical strategy design.</p> <p>FY10 - Investigate and study receptor effects of common and agent-specific mechanisms of NTA injury for therapeutic intervention.</p>				
<p>Therapeutics for Non Traditional Agents (NTAs): Develop, assess, evaluate, and validate therapeutics for treatment as result from exposure to NTA's.</p> <p>FY08 - Evaluated the efficacy of currently available therapeutics for treatment resulting from exposure to NTAs and selected chemical warfare agents. Focused on therapies for respiratory injury following inhalational exposure and non-cholinergic mediated neurological injury, using animal models. Investigated the efficacy of the agent-binding proteins as post-exposure therapy.</p> <p>FY09 - Evaluate pre-existing and new commercially-available compounds for respiratory and neurological injury in small animal models and begin transition to large animal models (e.g. non-human primate). Initiate testing of novel compounds as therapies in small animal models. Define and optimize the utility of therapeutic agent-binding proteins against NTAs.</p> <p>FY10 - Further development and validation of animal models for testing clinical efficacy of therapeutics against NTAs. Identify binding characteristics of NTAs, as well as mitigate NTA toxicity by researching and developing novel therapeutics.</p>	9.818	8.903	13.378	

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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
TC3/MEDICAL CHEMICAL DEFENSE (ATD)	24.183	26.482	29.092						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
TR2: MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)	2.008	1.969	2.909						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (TR2) funds applied research to develop medical countermeasures to protect the warfighter against radiological exposure. Specifically, innovative technical approaches will be used to develop products to mitigate health consequences resulting from Acute Radiation Exposure (ARS) and Delayed Effects of Acute Radiation Exposure (DEARE). The research and development of medical countermeasures for radiation exposure will ultimately enhance the survivability of warfighters and will serve to significantly minimize the development of acute radiation syndromes and subsequent health problems. Efforts funded under this project are collaboratively shared with other government agencies, with an emphasis on the development of pretreatments to protect first responders in the event of a radiological incident.

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

	FY 2008	FY 2009	FY 2010	FY 2011
SBIR - FY09 - Small Business Innovative Research.	0.000	0.022	0.000	
Radiation Medical Countermeasures: Develop medical countermeasures to protect the warfighter against radiological/nuclear exposure. DoD's mission is to develop both pretreatments (prophylaxis) and post-irradiation therapeutics against radiological/nuclear exposure. DoD is the only governmental agency currently developing medical prophylaxis to protect warfighters and/or first responders in the event of a radiological incident. FY08 - Evaluated efficacy of four drug candidates as pretreatment (prophylaxis) and/or post-irradiation therapeutic agents. Using promising drug candidates, initiated preliminary studies for preclinical efficacy of combined agents, which confer protection or supportive medical care against lethal radiation with minimal toxic side effects. FY09 - Down-select at least one promising drug candidate that has the ability to provide protection from the harmful effects of radiation exposure. Determine the pre-clinical efficacy of combined agents that confer protection or supportive medical care against the harmful effects of radiation exposure with minimal toxic side	2.008	1.947	2.909	

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B. Accomplishments/Planned Program (\$ in Millions)							FY 2008	FY 2009	FY 2010	FY 2011
<p>effects. Explore current Good Laboratory Practice (cGLP) test capability for selected candidate drugs against acute radiation syndrome (ARS) based on Food and Drug Administration's (FDA) animal testing requirements.</p> <p>FY10 - Evaluate mature and promising drug candidates for respiratory and gastrointestinal damage and repair, demonstrating efficacy, safety, and animal (rodents) survival exposed to lethal radiation for a future non-human primate (NHP) efficacy study. Identify common biochemical/physiological mechanisms for hematological, respiratory and gastrointestinal damage and repair, as well as, biology of cellular damage.</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>	<u>Cost To Complete</u>	<u>Total Cost</u>
TR3/MEDICAL RADIOLOGICAL DEFENSE (ATD)	2.152	4.863	2.413						Continuing	Continuing
D. Acquisition Strategy										
N/A										
E. Performance Metrics										
N/A										

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