Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Chemical and Biological Defense Program											Date: February 2016	
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*							
COST ($ in Millions)	**Prior Years**	**FY 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
Total Program Element	-	212.538	202.611	188.715	-	188.715	206.855	202.085	203.616	207.504	Continuing	Continuing
CB2: *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	-	52.364	51.131	56.191	-	56.191	60.366	53.979	54.415	54.427	Continuing	Continuing
NT2: *TECHBASE NON-TRADITIONAL AGENTS DEFENSE (APPLIED RESEARCH)*	-	69.647	67.047	64.476	-	64.476	73.088	71.295	71.876	71.891	Continuing	Continuing
TM2: *TECHBASE MED DEFENSE (APPLIED RESEARCH)*	-	90.527	84.433	68.048	-	68.048	73.401	76.811	77.325	81.186	Continuing	Continuing

A. Mission Description and Budget Item Justification

Applies research in the areas of physical technologies (CB protective materials, textiles, and filtration, sensors and sensing algorithms, effects modeling, chemical formulations, processes and methods for hazard mitigation), medical technologies (drug discovery and platform technology development, biomarkers and assay development useful in drug development and diagnostics, human mimicking devices and regulatory science), and non-traditional agent medical and physical defense technologies, including characterization of emerging threats. Major efforts support development of vaccines, therapeutics, next generation diagnostics systems, next generation chemical detectors, nerve agent pretreatments, and individual protection advances.

In the physical sciences area, Project CB2, focuses on continuing improvements in CB defense materiel, including contamination avoidance, decontamination, and protection technologies, as well as biological weapon/agent surveillance.

For Non-Traditional Agents (NTAs), Project NT2 consolidates all NTA efforts (both medical and non-medical) including pretreatments, therapeutics, detection, threat agent science, modeling, and protection and hazard mitigation.

The medical program, Project TM2, focuses on the development of antidotes, drug treatments, disease surveillance and point-of-need diagnostic devices, patient decontamination and medical technologies management.

Efforts under this PE will transition to or will provide risk reduction for Advanced Technology Development (PE: 0603384BP), Advanced Component Development and Prototypes (PE: 0603884BP), and System Development and Demonstration (PE: 0604384BP).

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Chemical and Biological Defense Program	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	226.317	208.111	204.941	-	204.941
Current President's Budget	212.538	202.611	188.715	-	188.715
Total Adjustments	-13.779	-5.500	-16.226	-	-16.226
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	0.000	-5.500			
• Congressional Rescissions	-	-			
• Congressional Adds	0.000	-			
• Congressional Directed Transfers	0.000	-			
• Reprogrammings	-10.651	-			
• SBIR/STTR Transfer	-3.128	-			
• Other Adjustments	0.000	-	-16.226	-	-16.226

Change Summary Explanation

Funding: N/A

Schedule: N/A

Technical: N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	Project (Number/Name) CB2 / *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
CB2: *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	-	52.364	51.131	56.191	-	56.191	60.366	53.979	54.415	54.427	Continuing	Continuing

A. Mission Description and Budget Item Justification

Project CB2 provides physical science 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 integration of state-of-the-art-technologies into a collection of systems across the spectrum of capabilities required to support chemical and biological defense missions. Capability areas in this project include: protection/hazard mitigation; detection; information systems technology; and threat agent science. Protection and hazard mitigation focuses on providing technologies that protect from and reduce the impact of chemical/biological threat or hazard to the Warfighter, weapons platforms, and structures. Detection focuses on developing technologies for standoff and point detection and identification of chemical and biological agents. Information systems technology focuses on advanced hazard prediction, operational effects and risk assessment, and systems performance modeling. Threat agent science is devoted to characterizing threat agents and the hazards they present in terms of agent fate in the environment, toxicology, and pathogenicity, and focuses on the horizontal integration of CB defensive technologies in support of the Joint Services.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: 1) Expeditionary Collective Protection	0.873	0.923	1.233
Description: Develop new technologies for soldiers to determine the remaining chemical vapor service life of their chemical warfare agent (CWA) filters. ***FY 2015 Accomplishments:*** Designed and evaluated prototype satellite filter cartridge to serve as Residual Life Indicator (RLI) for collective protection systems. RLI simulates the carbon bed in a Chemical, Biological, Radiological and Nuclear (CBRN) collective protection filter. ***FY 2016 Plans:*** Finalize component design and begin verification testing of a satellite filter cartridge system that will be investigated into a field application for long term exposure in an operationally relevant environment. ***FY 2017 Plans:*** Analyze and characterize the performance of RLI satellite filter cartridge. Optimize the RLI performance to ensure correlation to that of the carbon bed in a CBRN collective protection filter. Collect data to establish the filter bed performance of the RLI is effectively correlated with Guard Bed (a low profile pre-filter) and the RLI creates an extended filter bed life with Guard Bed.			
Title: 2) Material Contamination Mitigation	5.835	3.232	2.975

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** CB2 / *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017

Description: Development and analysis of non-traditional or novel decontamination technologies and approaches which gain significantly improved effectiveness by complementary application.

FY 2015 Accomplishments:

Focused efforts on the consolidating formulation component of Dial-a-Decon and enzyme decon projects and provided data package for transition into the Decon Family of Systems (DFoS) General Purpose Decontaminant (DFoS GPD) program. Continued Wide Area Decon project focusing on Bacillus anthracis spore decontamination for seaports, airports, and wide-area operations and validated 3-log kill of candidate technologies on representative surfaces. Initiated non-aqueous sorbent decontaminant formulation effort for immediate decontamination to leverage emerging technologies and data that demonstrates significantly greater efficacy if decontamination process is initiated within the first hour. Continued responsive coatings effort to enhance material hardening. Transitioned new acceptance criteria for chemical agent resistant coating (CARC) acceptance to CARC commodity manager after inter-laboratory validation. Initiated technology enhancement effort for Contamination Indicator/ Decontamination Assurance Spray (CIDAS). Completed technology assessment and data transition on blister (HD) CIDAS formulation. Initiated the radiological/nuclear decontamination/hazard mitigation effort to define scope of challenges and outline concept of operations. Transitioned Joint Biological Agent Decontamination System (JBADS) hazard mitigation technology data related to complex spores to the JBADS program of record, also initiated a focus on developing viral (Ebola and surrogates) kill curves to expand application of technology.

FY 2016 Plans:

Continue Dial-a-Decon, Wide Area Decon of Bacillus anthracis, and sensitive equipment decontamination (enzyme) projects. Continue non-aqueous formulation investigations and incorporate data gathered from surface science investigations to inform design to initiate development of the next generation of hazard mitigation technologies that include integration of multiple systems to achieve efficacy goals. Continue responsive coatings project to enhance decontaminability as part of the systems approach to achieving efficacy goals. Continue the decontamination/hazard mitigation effort.

FY 2017 Plans:

Transition sorbent decontaminant formulation effort to advanced development for immediate decontamination to leverage emerging technologies and data that demonstrates significantly greater efficacy if decontamination process is initiated within the first hour. Initiate room temperature ionic liquid decontaminant effort to address sensitive equipment decontaminant need (enzyme and catalytic) projects. Continue application of data gathered from surface science investigations to inform design to initiate development of the next generation of hazard mitigation technologies that include integration of multiple systems to achieve efficacy goals. Continue enhanced CB survivability and responsive coatings projects to enhance decontaminability as

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
part of the systems approach to achieving efficacy goals. Demonstrate the wide-area decontamination hazard mitigation effort, which focuses on biological spore decontamination in a representative outdoor environment.			
Title: 3) Percutaneous Protection ***Description:*** Study and assessment of percutaneous protective technologies. ***FY 2015 Accomplishments:*** Transitioned data on low burden fabrics and ensemble designs to the Uniform Integrated Protective Ensemble (UIPE) program of record. Completed development areas that include: evaluation of materials with high resistance to organic compounds, refinement of "man in simulant test" sensors, aerosol system testing, advanced adsorbent nanofiber/textile production technology, and smart materials. Transitioned materials that integrate functionality and durability to improve CB protection by increasing protection factors and reducing physical burden. Conducted a demonstration of new fabric technologies. Continued to engineer polymer membranes with increased moisture permeability and reactive components to selectively and sensitively interact with chemical agents. Continued designing reactive metal-organic/ metal-oxide materials to destroy chemical agents and engineer substrates into forms amenable to protective applications. ***FY 2016 Plans:*** Enhance both force protection and situational awareness through the improvement of multi-functional materials that exhibit broad-reaching, cross-cutting capabilities in chemical/biological sensing and detoxification. Validate response mechanisms of dynamic materials that conform to the challenge amount. ***FY 2017 Plans:*** Engineer mixed matrix membranes with increased moisture permeability and selectivity against CB threats. Incorporate metal-organic/metal oxide constructs into these membranes to destroy chemical agents. Continue to test reactive metal-organic/ metal-oxide materials with chemical agents and develop deposition strategies to form composite materials. Continue to develop and scale production technologies for novel materials.	5.975	5.076	4.931
Title: 4) Personnel Contamination Mitigation ***Description:*** Develop new technologies to alleviate the risk associated with contaminated human remains and personal effects (materials) exposed to and contaminated by chemical agents by neutralizing and/or physically removing the residual chemical agents. ***FY 2015 Accomplishments:*** Initiated personnel decontamination assessment and formulation effort examining commercial off-the-shelf (COTS) items and initiated development of zirconium hydroxide technology set. Initiated human remains storage testing to determine how the hazards associated with contaminated human remains are altered by the normal and extended storage conditions. Initiated	1.039	-	0.673

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** CB2 / *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Personnel Decontamination hazard mitigation projects to develop an alternative to RSDL (Reactive Skin Decontamination Lotion). Initiated mass casualty personnel decontamination projects to develop technology to manage the specific issues (throughput and efficacy) associated with mass casualty decontamination to support warfighter operations, including homeland defense mission. ***FY 2017 Plans:*** Continue Personnel Decontamination hazard mitigation projects to develop an alternative to RSDL. Continue mass casualty personnel decontamination projects to develop technology to manage the specific issues (throughput and efficacy) associated with mass casualty decontamination to support warfighter operations, including homeland defense mission.			
Title: 5) Respiratory and Ocular Protection ***Description:*** 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 (TICs). ***FY 2015 Accomplishments:*** Transitioned to the JSGPM program (M-50 mask) a synthetic nano-structured material focused on the removal of toxic industrial chemicals to include ammonia resulting in improved respirator efficiency and breakthroughs in filtration media that meets the Capability Production Document (CPD) objective. ***FY 2016 Plans:*** Demonstration 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. Develop components of a hybrid respirator that can scale between different challenge environments. Components include nanotechnologies, anti-fogging materials, dynamic response breathing, oxygen storage and CO2 scrubbing. ***FY 2017 Plans:*** Continue to develop components of a hybrid respirator that can scale between different challenge environments. Components include nanotechnologies, anti-fogging materials, dynamic response breathing, oxygen storage and CO2 scrubbing.	2.785	3.348	3.698
Title: 6) Biosurveillance (BSV) ***Description:*** Integrate existing disparate military and civilian datasets, investigate methodologies to appropriately integrate open source data into advanced warning systems, and leverage and enhance advanced epidemiological models and algorithms for disease prediction, forecasting, impact, and biological threat assessment. Contribute to the development of global, near real-time, disease monitoring and surveillance systems that address secondary infection, fuse medical syndromic, environmental, and clinical data, and feed into disease modeling, medical resource estimation and decision support tools.	1.643	2.926	8.380

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
FY 2015 Accomplishments: Completed efforts using social media to infer individual and collective health behavior for digital threat surveillance, epidemic planning and response which delivered an analytic capability for the Biosurveillance Ecosystem. Completed efforts to refine technology and implement standards to enable diagnostic device-to-cloud communications in order to fully leverage biosurveillance and point of need diagnostic efforts which is in the process of being transitioned for advanced development. Continued the development of the Biosurveillance Ecosystem to include analyst collaboration tools, advanced analytics, and analyst workbench. Continued effort to develop a trust filter for next generation data sources to be included in biosurveillance analytic capabilities. ***FY 2016 Plans:*** Complete effort to develop a trust filter for next generation data sources to be included in biosurveillance analytic capabilities of the Biosurveillance Ecosystem. Initiate effort to explore next generation device-to-cloud capabilities and possible applications for biosurveillance. ***FY 2017 Plans:*** Develop technologies (e.g., event-based surveillance and historical baselines; predictive models of plant and/or animal disease; uncertainty quantification) to intelligently fuse ubiquitous sensing capabilities (wearables, field deployed diagnostics and autonomous environmental sensing vehicles). Data fusion technologies were developed in FY16 under BA2 TM2/Diagnostics; readjustment in FY17 more appropriately aligns these activities as biosurveillance efforts. Continue device-to-cloud capabilities effort to reliably transmit sensed data to a secure repository and appropriately feed into disease modeling, medical resource estimation, and decision support tools.			
Title: 7) Detection	15.413	15.864	13.831
Description: Emphasis on the detection and identification of chemical and biological threats. Objectives include the development of miniaturized detector for sensing of chemical and biological agents, design for prototype whole pathogen genome sequencing system. ***FY 2015 Accomplishments:*** Continued integration studies for Next Generation Chemical Detector (NGCD) based on Micro Electro-Mechanical Systems components for Gas Chromatography and Mass Spectrometry. The integration studies for NGCD move to BA3 NT3/Detection in FY16. Continued algorithm development to increase range capabilities, reduce false positives, and provide decision capabilities for large data sets. Initiated concept and technology development for biological threat early warning. ***FY 2016 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Continue algorithm development to increase range capabilities, reduce false positives, and provide decision capabilities for large data sets. Continue concept and technology development for biological threat early warning detection. Initiate high sensitivity immunoassay detection platforms for environmental samples. ***FY 2017 Plans:*** Continue concept and technology development for the biological threat early warning detection. Initiate development of sample preparation techniques to enhance environmental detection platforms. Continue high sensitivity immunoassay detection platforms for environmental samples.			
Title: 8) Hazard Prediction ***Description:*** Improve battlespace awareness by accurately predicting hazardous material releases, atmospheric transport and dispersion, and resulting human effects. Develop capability for predicting the source term of releases of chemical, biological, and industrial materials. ***FY 2015 Accomplishments:*** Continued development of next-generation waterborne transport models in conjunction with related validation and verification efforts. Continued interior building transport and dispersion modeling effort to improve modeling of outdoor dispersion from indoor release and modeling of indoor dispersion in multiple buildings from an outdoor release, simulating wide-area effects of a release in an urban environment. Delivered Common CBRN Modeling Interface (CCMI) compliant Internal Building Hazard (IBH) model for inclusion in the Joint Effects Model (JEM). Completed initial verification and validation of interior building transport and dispersion models, which informed planning of the urban component of the Jack Rabbit II Field Trial by identifying data needs. Continued development of a generalized capability for virtual test and evaluation for evaluating/stressing source characterization and hazard refinement techniques. Focused on bridging the gap between meso- and micro-scale turbulence simulations. Delivered missile intercept/functioning missile effects model. Initiated next-generation development of missile intercept/functioning missile effects model. Continued advancing the urban modeling capability and optimizing the urban sub-system for interfacing transport models of varying fidelity and speed. ***FY 2016 Plans:*** Complete development of waterborne transport and dispersion models, including advancements to the Incident Command Tool for Drinking Water Protection (ICWater), System for Hazard Assessment of Released Chemicals (SHARC), and associated documentation. Continue related field studies to validate waterborne transport and dispersion model outputs. Continue interior building transport and dispersion modeling effort to improve modeling of outdoor dispersion from indoor release and modeling of indoor dispersion in multiple buildings from an outdoor release, simulating wide-area effects of a release in an urban environment. Continue high-resolution and probabilistic meteorology research, incremental numerical weather prediction system upgrades, and provide operational support for the Environmental Data Enterprise (EDE). Initiate work to optimize the urban subsystem modeling	3.703	4.811	3.867

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
capability and increase the fidelity of source term estimation in urban environments. Continue development of MicroSWIFT/ SPRAY (MSS) to improve hazard prediction in urban environments in Hazard Prediction and Assessment Capability (HPAC). Continue advancing the urban modeling capability and optimizing the urban sub-system for interfacing transport models of varying fidelity and speed. Continue research and development to enhance the fidelity of the missile intercept modeling capability within the HPAC. ***FY 2017 Plans:*** Continue development of waterborne transport and dispersion models, including advancements to the ICWater and SHARC. Leverage new data sources for higher resolution land-use, bathymetric and oceanographic data. Continue related field studies to validate waterborne transport and dispersion model outputs. Continue interior building transport and dispersion modeling effort to improve modeling of outdoor dispersion from indoor release and modeling of indoor dispersion in multiple buildings from an outdoor release, simulating wide-area effects of a release in an urban environment. Continue work to optimize the urban subsystem modeling capability and develop capability to perform linked Bayesian probability analysis and increase the fidelity of source term estimation for urban environments. Continue development of MSS to improve hazard prediction for urban environments in HPAC. Continue research and development to enhance the fidelity of the missile intercept modeling capability within the HPAC. Continue development of a virtual test and evaluation simulation environment for evaluating/stressing source characterization and hazard refinement techniques.			
Title: 9) Data Analysis ***Description:*** Develop CBRN data sharing capabilities and simulation tools. Develop chapters of the Chemical and Biological Agent Effects Manual Number 1 (CB-1), an authoritative source capturing analytical methods for evaluating the effects of CB agents on equipment, personnel, and operations. ***FY 2015 Accomplishments:*** Initiated development of chapters for the CB-1 manual. Began providing access to field trial data sources. ***FY 2016 Plans:*** Continue providing access of field trial data sources to transport and dispersion community. Continue to develop additional chapters of the Chemical and Biological Agent Effects Manual Number 1 (CB-1). Draft chapters to be completed include Chapter 12 - Human Factors, Chapter 8 - Structures/Site Characteristics. Continue work drafting Chapter 13 - Consequence Assessment and Chapter 15 - Battlespace Management. Begin work on Chapter 18 - Material Effects, Chapter 19 - Mission Effects, and Chapter 20 - Risk Assessment. Much of the efforts to become more mature and transition to CB3. ***FY 2017 Plans:***	3.720	1.327	3.797

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** CB2 / *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Improve modeling of subsurface chemical concentrations of contaminants. Complete several CB-1 chapters, currently planned to include "Meteorological/Environmental Data", "Geographic Data", "Battlespace Management" and "Reconnaissance". Initiate several CB-1 chapters, currently planned to include "Test and Evaluation" and "Consequence Management".			
Title: 10) Operational Effects & Planning ***Description:*** Increase effort to 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. Focus areas include consequence management, population modeling, and human knowledge management. ***FY 2015 Accomplishments:*** Continued system performance model integration and applied research development for program-wide exploitation for collective and individual protection and contamination avoidance. Continued operational effects risk management framework development to inform service-specific analyses and decision-makers. Initiated Decision Support Tool to address Joint Operations Effects requirements and risk-based planning and decision making. ***FY 2016 Plans:*** Continue system performance model integration and advanced development for program-wide exploitation for collective and individual protection and contamination avoidance. Initiate health and human effects modeling capability for expanded threat list. Continued operational effects research and analysis efforts, previously referred to as Decision Support Tool, to provide objective, quantitative analysis in support of science and technology initiatives, material developments, operational guidance, and requirements setting. ***FY 2017 Plans:*** Continue system performance model integration and advanced development for program-wide exploitation for collective and individual protection and contamination avoidance. Continue to develop health and human effects modeling capability. Increase effort on operational effects research and analysis efforts, to provide objective, quantitative analysis in support of science and technology initiatives, material developments, operational guidance, and requirements setting.	5.257	8.850	8.395
Title: 11) Threat Agent Sciences ***Description:*** Supports defensive countermeasure development against chemical and biological (CB) threats by delivering the scientific understanding and relevant estimates of the hazards posed to humans by exposure to CB agents. Toxicological and/or infectious-dose information and environmental response supports development and/or enhancing both operational risk and exposure guidelines; limits for detection and protection; goals for decontamination; and medical	6.121	3.770	4.411

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
countermeasures. The knowledge generated from this program is used to inform hazards and hazard prediction models as well informing countermeasure development. ***FY 2015 Accomplishments:*** Continued to define particle properties and predict aerosolization behavior to inform hazard assessment. Moved towards methods for rapid prediction of agent-substrate interactions, including correlation of agent physical properties. Developed a barcoded spore for use in Developmental Testing and other RDT&E needs; a subset of this library was delivered to West Desert Test Center, DPG. Completed studies on Ebola virus viability in biological fluids on operationally relevant materials. ***FY 2016 Plans:*** Continue to define particle and agent properties and predict aerosolization behavior to inform hazard assessment. Continue developing methods to facilitate rapid prediction of agent-substrate interactions, including correlation of physical agent properties. Continue assessing the impact of environmental factors on threat agent activity (pyrotechnic dissemination, persistence, transport, degradation, resuspension, etc). Continue developing Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADMET) models of physiological response to agent and predictive toxicology capabilities. Characterize priority emerging chemical and biological threats to provide critical agent parameters to decision makers and technology developers. ***FY 2017 Plans:*** Continue to develop methods for biological agent characterization including genomic fingerprinting and tracing initiated with Ebola virus efforts. Provide environmental persistence and decontamination estimates on high priority biological threat agents, including genomic finger printing and/or tracing. Continue to define particle properties to predict aerosolization behavior to inform hazard assessment. Continue efforts to characterize the effects growth media have on the environmental fate of biological aerosols for understanding hazards. Continue developing methods to predict agent-substrate interactions.			
Title: 12) SBIR/STTR ***FY 2016 Plans:*** SBIR/STTR - FY16 - Small Business Innovative Research.	-	1.004	-
Accomplishments/Planned Programs Subtotals	52.364	51.131	56.191

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• CB3: *CHEMICAL BIOLOGICAL DEFENSE (ATD)*	17.362	16.062	19.109	-	19.109	18.343	17.899	18.035	18.038	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program			Date: February 2016
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COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
NT2: *TECHBASE NON-TRADITIONAL AGENTS DEFENSE (APPLIED RESEARCH)*	-	69.647	67.047	64.476	-	64.476	73.088	71.295	71.876	71.891	Continuing	Continuing

A. Mission Description and Budget Item Justification

Project NT2 provides early applied research to enhance and develop defensive capabilities against Non-Traditional Agents (NTAs). This project focuses on expanding scientific knowledge required to develop defensive capabilities and to demonstrate fast and agile scientific responses to enhance or develop capabilities that address emerging threats. Efforts in this project support an integrated approach to counter emerging threats through innovative science and technology (S&T) solutions for detection, protection, decontamination, information systems and modeling and simulation, and medical countermeasures. This project is a comprehensive and focused effort for developing NTA defense capabilities, coordinated with specific interagency partners for doctrine, equipment, and training for the Warfighter and civilian population for defense against NTAs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: 1) Expeditionary Collective Protection ***Description:*** Develop new technologies for soldiers to determine the remaining chemical vapor service life of their chemical warfare agent (CWA) filters. ***FY 2015 Accomplishments:*** Completed testing of a brass board photoluminescent Residual Life Indicator (RLI), which was tested to determine if it can be used to evaluate both adsorptive and reactive changes in chemical capacity.	0.163	-	-
Title: 2) Material Contamination Mitigation ***Description:*** Study and assessment of decontamination technologies. ***FY 2015 Accomplishments:*** Continued to assess performance and unique aspects of full spectrum of NTAs and developed technologies to optimize performance against NTAs, focusing on dial-a-decon NTA formulation components. This included initiating the investigation and analysis of additional categories of emerging threats. ***FY 2016 Plans:***	1.070	1.577	3.142

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** NT2 / *TECHBASE NON-TRADITIONAL AGENTS DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Integrate NTAs, including newly identified emerging threats into the continuing Dial-a-Decon, sensitive equipment decontamination (enzyme) projects, responsive coatings, multiple system integration, and the full hazard mitigation technology development portfolio. ***FY 2017 Plans:*** Continue integrating NTAs, including newly identified emerging threats into the continuing Government owned decontaminant formulation, sensitive equipment decontamination (enzyme and catalytic) projects, responsive coatings, multiple system integration, and the full hazard mitigation technology development portfolio. Initiate focus on hazard mitigation of other emerging threats and classes of NTAs, including data sharing with international partners. Incorporate data gathered from surface science effort to inform design of new approach on Government owned formulation.			
Title: 3) Personnel Contamination Mitigation ***Description:*** Develop new technologies to alleviate the risk associated with contaminated human remains and personal effects (materials) exposed to and contaminated by chemical agents by neutralizing and/or physically removing the residual chemical agents. ***FY 2015 Accomplishments:*** Initiated human remains storage testing to determine how the hazards associated with contaminated human remains are altered by the normal and extended storage conditions, including storage effects on NTAs. ***FY 2016 Plans:*** Transition Human Remains storage data to the human remains related programs and the Joint Mortuary Affairs Center (JMAC), Fort Lee, Virginia. Initiate Personnel Decontamination hazard mitigation projects to develop an alternative to RSDL (Reactive Skin Decontamination Lotion). Initiate mass casualty Personnel Decontamination projects to develop technology to manage the specific issues (throughput and efficacy) associated with mass casualty decontamination. ***FY 2017 Plans:*** Continue mass casualty personnel decontamination projects to develop technology to manage the specific issues (throughput and efficacy) associated with mass casualty decontamination that include efficacy against NTAs and emerging threats decontamination to support warfighter operations, including homeland defense mission.	0.133	0.519	1.669
Title: 4) Respiratory and Ocular Protection ***Description:*** 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.	0.163	-	0.358

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
FY 2015 Accomplishments: Continued to investigate performance limitations current and developmental of respiratory protection technologies against NTA challenges. ***FY 2017 Plans:*** Continue to investigate performance limitations current and developmental of respiratory protection technologies against NTA challenges and investigate counter-measures to these specific limitations.			
Title: 5) Chemical Diagnostics - Medical ***Description:*** Focuses on developing state-of-the-art laboratory/fieldable methods to detect exposure to non-traditional agents in clinical samples. Identifies 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. Supports the analytics for traditional agent diagnostics and hand-held diagnostic technologies that might be applied to NTA diagnostics. ***FY 2015 Accomplishments:*** Expanded NTA biomarker discovery efforts for additional compounds. Continued development of systems biology-based pipeline for the identification and validation of NTAs in clinical and animal samples for compounds of interest. ***FY 2016 Plans:*** Continue to expand NTA biomarkers for additional compounds. Optimize method development for identification and validation of NTAs in clinical samples for additional compounds of interest.	2.384	2.248	-
Title: 6) Chemical Pretreatments - Medical ***Description:*** Develops pretreatments and prophylactics that provide protection against NTAs and emerging chemical threats. Prophylactic medical countermeasures (MCMs) include catalytic and stoichiometric bioscavengers that rapidly bind and detoxify a broad spectrum of NTAs. ***FY 2015 Accomplishments:*** Continued studies to develop prophylactic bioscavengers for NTA exposure. These studies included investigations of FDA approved drugs, designer enzymes and novel assays to support countermeasure development. ***FY 2016 Plans:***	14.341	13.242	11.755

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Continue focused studies to identify lead catalytic bioscavenger candidates against NTA exposure in validated animal models. Support development of a catalytic bioscavenger cocktail effective against multiple NTAs. ***FY 2017 Plans:*** Explore bioscavengers administered as post-exposure, pre-symptomatic prophylaxis against NTAs in validated animal models. Evaluate Food and Drug Administration (FDA) licensed MCMs for potential pretreatment/prophylaxis against NTAs and emerging chemical threats.			
Title: 7) Chemical Therapeutics - Medical ***Description:*** Investigates common mechanisms of agent injury. Determines the toxic effects of agents by probable routes of field exposure, as well as standard experimental routes. Physiological parameters and pathological assessments will be used to establish the general mode and mechanism(s) of toxicity. Develops, assesses, evaluates, and validates therapeutics for treatment resulting from exposure to NTAs and emerging chemical threats. ***FY 2015 Accomplishments:*** Continued to develop novel therapeutic compounds for NTAs that cross the blood brain barrier and can be used to treat symptoms of exposure and prevent damage. Continued to screen currently licensed FDA approved countermeasures to determine potential efficacy against NTAs. Utilized assays at the ADMET Center of Excellence (CoE) to improve understanding of medical countermeasure cellular and mechanistic effects to facilitate NTA therapeutic discovery, development, transition, and licensure. ***FY 2016 Plans:*** Continue optimizing centrally acting novel therapeutic compounds that cross the blood brain barrier. Investigate identified licensed FDA approved countermeasures for potential efficacy against other classes of NTAs for potential Emergency Use Authorization (EUA). Continue research projects at the ADMET CoE that improves Medical Countermeasure (MCM) profile understanding that will facilitate development. ***FY 2017 Plans:*** Continue to optimize novel therapeutic compounds that cross the blood brain barrier and can be used as treatments for NTA exposures. Continue to evaluate licensed FDA therapeutics against NTAs for potential EUA. Continue to utilize the ADMET CoE to support evaluation and development of new NTA therapeutics.	14.703	13.241	15.575
Title: 8) Detection ***Description:*** Primary focus is to assess the potential of multiple technologies to meet the needs to detect the presence of NTAs. ***FY 2015 Accomplishments:***	12.267	12.376	10.333

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Continued development from technology concepts and models to meet the needs to detect contamination on surfaces in pre and post decontamination application. Completed integration studies for chemical aerosol detection into the Next Generation Chemical Detector (NGCD) MS B, and transitioned to BA3 NT3/Detection in FY16. Initiated concept and technology development for chemical threat early warning detection. ***FY 2016 Plans:*** Continue development from technology concepts and models to meet the needs to detect contamination on surfaces in pre and post decontamination application. Continue concept and technology development for chemical threat early warning detection. ***FY 2017 Plans:*** Continue development from technology concepts and models to meet the needs to detect contamination on surfaces in pre and post decontamination applications. Continue concept and technology development for chemical threat early warning detection.			
Title: 9) Modeling & Simulation ***Description:*** Provide modeling of NTA materials for hazard prediction. Develop NTA source term algorithms for predicting chemical hazards from intentionally functioning weapons, counter-proliferation scenarios (bomb on target), and missile intercept. Investigate NTA agent fate for secondary effects, environmental/atmospheric chemistry, atmospheric and waterborne transport and dispersion, human effects, model Validation and Verification (V&V), scaled testing, casualty estimation, and supporting data management. ***FY 2015 Accomplishments:*** Continued analysis of data resulting from experimentation phase of small-scale testing for NTA simulants for use in creating and verifying NTA source terms, for defense against CBRN hazards. Continued to develop new NTA source term models and flexible NTA scenario models. ***FY 2016 Plans:*** Continue analysis of data resulting from small-scale testing of NTA simulants and continue test execution. Continue sensitivity and validation studies on NTA source term models and update and expand NTA databases. Continue development of agent fate modeling for NTAs. ***FY 2017 Plans:*** Continue sensitivity and validation studies on NTA source term models and update and expand NTA databases. Continue development of agent fate modeling for NTAs.	2.082	1.814	1.738
Title: 10) Percutaneous Protection	0.640	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Description: Study and assessment of percutaneous protective technologies. ***FY 2015 Accomplishments:*** Assessed and optimized technologies to improve whole system performance against NTAs. The whole system performance included the integration of the percutaneous protection with the respiratory protection, as well as effectiveness of the closures between the components of protective equipment. The final report and data was transitioned to UIPE 1 and UIPE 2 programs.			
Title: 11) Threat Agent Sciences	21.701	20.745	19.906
Description: Provide critical agent characterization (physical and physiological/toxicological) on current and emerging threat agents to prepare for surprise which enables and informs development and testing of NTA defense technology such as detection, decontamination, protection, hazard assessment, and more. This preliminary assessment of new threats informs decision makers, Concept of Operations (CONOPs) and Tactics, Techniques and Procedures (TTP) Development as well as provides the basis for all countermeasure development and assessment. ***FY 2015 Accomplishments:*** Continued to characterize the synthesis and physico-chemical properties of priority NTAs (informed by intelligence assessments and program requirements). Refined and delivered human toxicity estimates for selected priority threat agents; continued work to develop human toxicity estimates for other selected classified, priority threat agents. Provided characterization of priority threat agents to enable countermeasure development and testing as well as inform CONOPs, policies, doctrines and procedures. Developed in vitro, in vivo and in silico models for ADMET for understanding operationally relevant exposure effects and use in building predictive toxicology capabilities. ***FY 2016 Plans:*** Provide supportable data to enable countermeasure development and testing as well as inform CONOPs, policies, doctrines and procedures. Continue to characterize the synthesis and physico-chemical properties of priority NTAs (informed by intelligence assessments and program requirements). Continue preparing laboratory and operational toxicity estimates for next priority NTAs. Refine and deliver human toxicity estimates for next priority NTAs. Continue to develop in-silico platforms for predicting human ADMET of threat agents. Characterize priority emerging threats, including those areas where the threats converge, to provide critical agent parameters to decision makers and technology developers. ***FY 2017 Plans:*** Continue to characterize priority emerging threats to provide critical agent parameters to decision makers and technology developers to support countermeasure development and testing, informs concept CONOPs, policies, doctrines and procedures. Build linkages between emerging threat characterization and advanced development capability assessments to better define			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
current capability gaps. Continue the evaluation of synthesis pathways, physico-chemical properties and environmental fate properties for priority threats. Continue assessing the impact of environmental factors and substrate properties on threat agent activity (pyrotechnic dissemination, persistence, transport, degradation, resuspension, etc). Continue preparing laboratory and operational toxicity estimates for next priority NTAs. Refine and deliver human toxicity estimates for next priority NTAs. Continue to develop in-silico platforms for predicting human ADMET of threat agents.			
Title: 12) SBIR/STTR ***FY 2016 Plans:*** SBIR/STTR - FY16 - Small Business Innovative Research.	-	1.285	-
Accomplishments/Planned Programs Subtotals	69.647	67.047	64.476

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• NT3: *TECHBASE NON-TRADITIONAL AGENTS DEFENSE (ATD)*	21.534	22.948	17.173	-	17.173	19.885	19.378	19.541	19.544	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program			Date: February 2016
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COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
TM2: *TECHBASE MED DEFENSE (APPLIED RESEARCH)*	-	90.527	84.433	68.048	-	68.048	73.401	76.811	77.325	81.186	Continuing	Continuing

A. Mission Description and Budget Item Justification

Project TM2 provides for applied research for innovative technology approaches to advance medical systems designed to rapidly identify, diagnose, prevent, and treat disease due to exposure to all three of radiological, chemical and biological threat agents. Categories for this project include core science efforts in Medical Chemical, Medical Biological, Diagnostics, and the Medical Countermeasures Initiative (MCMI). Against radiological threats, this project provides investment for the development of pretreatments (prophylaxis) and post-irradiation therapeutics against radiological/nuclear exposure. Against chemical and biological agents, this project supports applied research for the investigation of new medical countermeasures to include prophylaxes, pretreatments, antidotes, skin decontaminants, and therapeutic drugs against identified and emerging biological and chemical warfare agents. Medical Science and Technology (S&T) efforts in this Budget Activity refine promising medical initiatives identified in Budget Activity 1, resulting in the development of countermeasures to protect against and treat the effects of exposure to chemical and biological (CB) agents. Diagnostic research focuses on providing high quality data closer to the point-of-need comprising device innovation, panels of biomarkers driven by bioinformatics, and epidemiological modeling tools.

The Medical Countermeasures Initiative (MCMI) was established to coordinate inter-related advanced development and flexible manufacturing capabilities, providing a dedicated, cost-effective, reliable, and sustainable MCM process that meets the Warfighter and national security needs. MCMI efforts within science and technology (S&T) are concentrated in advancing two areas: 1) regulatory science and 2) flexible manufacturing technologies and processes for MCMs. Efforts conducted in these areas are enablers supporting the DoD Medical Countermeasures Advanced Development and Manufacturing (MCM-ADM) capability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: 1) Biosurveillance	3.603	3.920	4.182
Description: Biosurveillance/Disease Surveillance: Integrate existing disparate military and civilian datasets, investigate methodologies to appropriately integrate open source data into advanced warning systems, and leverage and enhance advanced epidemiological models and algorithms for disease prediction, forecasting, impact and biological threat assessment. Contribute to the development of global, near real-time, disease monitoring and surveillance systems that address secondary infection, fuse medical syndromic, environmental, and clinical data, and feed into disease modeling, medical resource estimation and decision support tools. The Chemical Biological Defense Program partners with civil agencies and DoD agencies to provide near real-time information and provide situational awareness, yielding analytical and predictive capabilities for DoD decision makers including Combatant Commanders.			
FY 2015 Accomplishments:			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Completed effort to develop a flexible set of data driven models that dynamically assesses the socio-economic response to the spread of disease and, in turn, the effect of that response on disease spread which delivered an analytic capability for the Biosurveillance Ecosystem. Initiated various biosurveillance analytic capabilities, including real-time influence forecasting, agricultural animal population database for zoonotic disease analysis, an online crowdsourcing game for bacterial genome assembly to enhance rapid pathogen discovery and identification, biosurveillance analysis using clinical diagnoses and social media indicators in military populations, capability to assess the risk of disease spread to the United States, a data-driven framework for zoonotic disease prediction, biosurveillance visualization capabilities, a Global Rapid Identification Tool for diagnosing infectious disease bioevents, and a biosurveillance analytics verification and validation capability. ***FY 2016 Plans:*** Continue the development of the Biosurveillance Ecosystem to include analyst collaboration tools, advanced analytics, and analyst workbench. Continue various biosurveillance analytic capabilities, including real-time disease forecasting, agricultural animal population database for zoonotic disease analysis, an online crowdsourcing game for bacterial genome assembly to enhance rapid pathogen discovery and identification, biosurveillance analysis using clinical diagnoses and social media indicators in military populations, capability to assess the risk of disease spread to the United States, a data-driven framework for zoonotic disease prediction, biosurveillance visualization capabilities, and a Global Rapid Identification Tool for diagnosing infectious disease bioevents. ***FY 2017 Plans:*** Development of Biosurveillance Ecosystem is shifted to Biosurveillance. Complete the next iteration of analytic capabilities, specifically an agricultural animal population database for zoonotic disease analysis, an online crowdsourcing game for bacterial genome assembly to enhance rapid pathogen discovery and identification, a capability to assess the risk of disease spread to the United States, a data-driven framework for zoonotic disease prediction, and tools for diagnosing infectious disease bioevents. Continue development of biosurveillance analytic capabilities, including real-time disease forecasting capabilities, novel visualization capabilities, mobile applications, an ecological analytics capability to monitor and map global, near-real-time areas at risk of emerging infectious diseases, an ability to link sequencing at remote locations with the Biosurveillance Ecosystem. Develop next generation of technologies with focus on synthesizing large volumes of data to enable analysts and decision makers to make informed decisions in real-time. Initiate new efforts to explore utilizing ensemble approaches to disease forecasting.			
Title: 2) Chemical Diagnostics ***Description:*** Focuses on developing state-of-the-art laboratory/fieldable methods that detect exposure to chemical warfare agents (CWA) (e.g., nerve agents and vesicants) or radiological agents in clinical samples. Identifies 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.	0.845	0.882	0.149

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
FY 2015 Accomplishments: Continued development of assays for enhancing the ability to identify sublethal exposure to emerging chemical agent threats using newly-identified biomolecular targets for second series of compounds. Completed final stability tests and transitioned Forensic Liquid Analysis Kit (FLAK) to partners. Expanded the discovery for generic long-term ion-based markers of nerve agent exposure and developed confirmatory assays using previously discovered markers. ***FY 2016 Plans:*** Continue development of assays for enhancing the ability to identify sublethal exposure to emerging chemical agent threats using newly-identified biomolecular targets for third series of compounds. Continue developing confirmatory assays for discovered markers and initiate assay verification studies. ***FY 2017 Plans:*** Complete development of assays for enhancing the ability to identify sublethal exposure to emerging chemical agent threats using newly-identified biomolecular targets for third series of compounds. Complete the development of confirmatory assays for discovered markers and continue assay verification studies.			
Title: 3) Diagnostic Assays ***Description:*** Focuses on in-vitro assay development for viral vaccines. ***FY 2016 Plans:*** Develop in-vitro assays for Western, Eastern, and Venezuelan Equine Encephalitis (VEE) virus vaccines. Develop in-vitro assays for VEE virus protease activity and structure based discovery of viral protease inhibitors. These efforts transition to TM2/TBMDB BIO CM in FY17.	-	1.177	-
Title: 4) Diagnostic Assays ***Description:*** Development and verification of rapid, sensitive, and specific tests for the identification of BWAs and their expressed pathogens and toxins in clinical specimens from Warfighters for the diagnosis of exposure/infection. Discovery of host biomarkers generated in response to exposure to biological threat agents, whether known or emerging. ***FY 2015 Accomplishments:*** Continued to optimize processes and platform technologies employed in laboratory characterization of host and pathogen biomarker signatures of exposure and disease processes. Continued to develop nanomaterial structure designs to enable companion diagnostics. Completed the development of a prototype for transport of biothreat agents in clinical and environmental	10.572	9.177	4.268

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
samples from field to laboratory. Initiated efforts for Rapid Automated Diagnostics for Antimicrobial Resistance (RADAR) and investigations into the feasibility of integrating identification of antimicrobial resistance into future diagnostic systems. ***FY 2016 Plans:*** Continue to optimize processes and platform technologies employed in laboratory characterization of host and pathogen biomarker signatures of exposure and disease processes. Continue to develop nanomaterial structure designs to enable companion diagnostics. ***FY 2017 Plans:*** Continue to optimize processes and platform technologies employed in laboratory characterization of host and pathogen biomarker signatures of exposure and disease. Continue discovery and identification of host response biomarkers. Continue efforts and initiate verification studies for RADAR and feasibility of integrating identification of antimicrobial resistance into future diagnostic systems. Initiate the investigation for designing biomarker validation methods and activities.			
Title: 5) Next Generation Diagnostics ***Description:*** Diagnostic device development to include systems able to harness next generation technologies to revolutionize clinical diagnostics in care facilities and in hospital laboratories. This investment will incorporate capabilities such as next generation sequencing and advanced biomolecular methods to harness both host and pathogen biomarkers in a threat agnostic approach that will serve all echelons of military medical care. ***FY 2015 Accomplishments:*** Expanded multiplexed point of need diagnostic platform technologies into syndromic-based panels. Began transition of candidate diagnostic technologies to Next Generation Diagnostic Systems (NGDS), Increment 2. Developed and evaluated candidate host biomarker diagnostic targets in analytical test environments. ***FY 2016 Plans:*** Continue development of multiplexed point of need diagnostic platform technologies into syndromic-based panels. Continue transition of candidate diagnostic technologies to NGDS, Increment 2. ***FY 2017 Plans:*** Complete development of multiplexed point of need diagnostic platform technologies into syndromic-based panels. Initiate development of sample preparation techniques to enhance clinical diagnostic platforms.	11.864	9.849	3.685
Title: 6) Medical Countermeasures Initiative ***Description:*** Integrate the regulatory science and manufacturing technologies and processes developed into the DoD MCM-ADM as enablers of the advanced development and flexible manufacturing.	8.905	6.000	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
The MCMI budget line will transition to TM2/Bacterial Therapeutics in FY17. ***FY 2015 Accomplishments:*** Continued project that investigated organotypic platforms for MCM evaluation (ex-vivo heart, liver, kidney, lung, or blood-brain barrier) with the goal of accelerating and enhancing the FDA-regulated medicinal product development process. Constructed one next generation high-yield protein-expression platform for biotechnology-based MCMs. ***FY 2016 Plans:*** Evaluate novel conjugation approaches for polysaccharide based vaccines. Technology transfer process development and manufacturing activities to long-term partner for Advanced Development Manufacturing capability.			
Title: 7) Viral/Bacterial/Toxins Vaccines ***Description:*** Generate novel or improved vaccines against viral, bacterial and toxin biothreat agents, and demonstrate preliminary efficacy in small animal models. Develop assays that identify correlates of protective immunity in animal models. ***FY 2015 Accomplishments:*** Continued the most promising in-progress animal model development projects, refined with regulatory guidance, including animal models for aerosolized Burkholderia mallei (glanders), and B. pseudomallei (melioidosis). Animal models for Type A Francisella tularensis (Tularemia) were established. Initiated correlates of immunity elicited by Burkholderia (glanders and melioidosis) and Coxiella (Q-fever) species. Novel subunit, polysaccharide, and OMV (outer membrane vesicle) based Burkholderia (glanders and melioidosis) vaccine candidates were evaluated in small or large animal models with and without adjuvants. Activities, including in vitro analysis through computational biology and serological surveys, were initiated to identify Coxiella (Q-fever) protective antigens. Developed and evaluated promising vaccine candidates designed to protect against genetically engineered Bacillus anthracis (anthrax) strains and successfully tested for safety and efficacy in pilot animal model studies. Initiated testing of lead vaccine candidates for protection against aerosolized Type A Francisella tularensis (Tularemia) infection in established small animal models [moved to TM3/Viral Vaccines in FY16]. Initiated development of additional promising but immature vaccine candidates for protection against aerosolized Type A Francisella tularensis (Tularemia) infection. Initiated development of a monoclonal antibody-based pretreatment against multiple serotypes of botulinum neurotoxin. Initiated early development of prototypic three-component vaccines to protect against WEVEE. ***FY 2016 Plans:*** Animal model development projects will be refined with regulatory guidance, including animal models for aerosolized Burkholderia mallei and B. pseudomallei. Evaluate candidate Burkholderia vaccines in small and large animal models. Assess correlates of immunity elicited by Burkholderia and Coxiella species. Test promising vaccine candidates designed to protect against genetically engineered Anthrax strains for safety and efficacy in non-human primates. Continue testing of vaccine candidates for protection	10.236	10.479	15.026

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
against aerosolized Type A Francisella tularensis infection and initiate alternative candidate vaccine. Expand to two approaches for Q Fever vaccines. Develop and evaluate bridging strategies for interim fielding capability readiness. ***FY 2017 Plans:*** Execute down-selection of FDA Animal Rule compliant non-human primate model for aerosolized Burkholderia pseudomallei (melioidosis), which adequately mimics progression of human disease. Continue correlates of immunity studies: Characterize specific antibody responses during human Burkholderia pseudomallei (melioidosis) and Coxiella (Q-fever) infections. Complete data analysis for studies involving novel subunit, polysaccharide, and OMV-based candidate Burkholderia (glanders and melioidosis) vaccines in small and large animal models. Continue to evaluate and define in composition type A Francisella tularensis (Tularemia) vaccine prototypes in established small animal and NHP models for safety and efficacy. Develop a non-reactogenic Coxiella (Q-fever) vaccine and a humanized mouse model for aerosolized Q-fever [moved from TM2/MCMI]. Evaluate prototypic three-component vaccines against WEVEE viruses in small animal models with down-selected adjuvants. Initiate immune correlate studies with a three-component vaccine against WEVEE viruses in small animal models. Evaluate immunogenicity and efficacy of nanoparticle adjuvants with the VEEV DNA vaccine and the trivalent (WEVEE) vaccine in mice. Continue to assess the ability of novel adjuvants to enhance the protective efficacy of viral vaccines. Initiate research to assess MCM capabilities and strategies to defend against emerging and genetically engineered bioweapon (BW) threat agents.			
Title: 8) Vaccine Platforms and Research Tools	15.505	8.575	6.928
Description: Use novel technology and methods to support development of vaccine candidates. Conduct studies to determine potential immune interference between lead vaccine candidates, the effect of alternative vaccine delivery methods, and thermo-stabilization technologies on the efficacy of lead vaccine candidates. Identify correlates of protection in humans, and predict the success of lead vaccine candidates in humans. ***FY 2015 Accomplishments:*** Collected clinical samples from Filovirus outbreaks in multiple international locations to help define clinically relevant correlates of immunity. Relevant small animal models were evaluated in terms of immune response, in novel multi-antigen platforms. Evaluated the efficacy of mosaic glycoproteins in protecting against multiple filoviruses in mice [moved to TM3/Vaccine Platforms and Research Tools in FY16]. Continued to identify improved technologies to enhance viral vectors and DNA vaccine platform technologies. Further refined the capabilities of the surrogate human immune system, modular immune in vitro construct (MIMIC), which provides an in vitro assessment of the human immune response. Assessed capabilities for production of novel synthetic molecules with potential applications as pretreatments against relevant targets. ***FY 2016 Plans:***			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Maintain studies that utilize clinical samples from Filovirus outbreaks in multiple international locations to refine definition of clinically relevant correlates of immunity. Initiate novel adjuvants as platforms for utilization in biodefense vaccines. Develop and evaluate bridging strategies for interim fielding capability readiness. ***FY 2017 Plans:*** Complete evaluation of hybrid antigenic proteins for use in broad spectrum vaccines for Staphylococcus Enterotoxins in relevant small animal models [moved from TM2/MCMI]. Downselect to most promising Toll-Like Receptors against adjuvants for testing in vivo with relevant vaccines [moved from TM2/MCMI]. Exploration of novel formulation and targeting systems for enhanced vaccine potency.			
Title: 9) Viral Therapeutics ***Description:*** Identify, optimize and evaluate lead candidate therapeutics for efficacy against viral pathogens. ***FY 2015 Accomplishments:*** Evaluated FDA-approved drugs for potential repurposing as effective antivirals. Evaluated novel antibody-based therapeutics for Filovirus infections. Identified and evaluated novel pathogen-directed therapeutics for Alphaviruses. ***FY 2016 Plans:*** Evaluate FDA-approved drugs for potential repurposing as effective antivirals. Continue to evaluate novel antibody-based therapeutics for Filovirus infections. Continue identification and evaluation of novel pathogen-directed therapeutics for Filoviruses and Alphaviruses. ***FY 2017 Plans:*** Screen and evaluate novel small molecule inhibitors of alphaviral infections in vitro and in vivo. Evaluate novel formulations to deliver antivirals to target sites and/or to enable new dosing methods. Evaluate modified nucleoside analogues as inhibitors of alphaviral infections in animal models for their access to the central nervous system and ability to inhibit encephalitic complications. Identify novel nuclear import and export inhibitors for modulation of capsid localization against alphaviruses. Initial studies target Venezuelan equine encephalitis (VEE), but there is potential for broad spectrum activity against WEE and EEE, as well.	8.975	6.867	9.284
Title: 10) Bacterial Therapeutics ***Description:*** Identify, optimize and evaluate lead therapeutic candidates effective against designated bacterial threat agents. ***FY 2015 Accomplishments:***	4.630	9.243	8.484

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** TM2 / *TECHBASE MED DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Maintained FDA approved drug screening programs for Burkholderia, Francisella tularensis and determined in vitro susceptibilities. Refocused program on later stage optimization and testing of novel inhibitors of bacterial biological warfare agents, reducing efforts in discovery and addressing a limited number of priority pathogens. ***FY 2016 Plans:*** Augment FDA approved and late stage development drug screening programs for BWA and determine in vitro susceptibilities. Evaluate reformulation and/or targeted delivery approaches to enhance efficacy of poorly performing or failed drug candidates. Evaluate efficacy of bioactive peptides for the ability to stimulate host protective pathways in mouse models. Identify and validate novel targets and initiate small molecule screening for inhibitors. Develop alternative animal models to evaluate efficacy of candidates against otherwise nonpathogenic Multi-Drug Resistant (MDR) BW surrogate strains. ***FY 2017 Plans:*** Evaluate FDA approved or late stage therapeutics for activity against Burkholderia, Francisella tularensis, Bacillus anthracis, and Yersinia pestis. Continue to evaluate reformulation and/or targeted delivery approaches to enhance efficacy of poorly performing or failed drug candidates. Continue the discovery and advancement of non-traditional strategies to diversify approaches to identify lead therapeutic candidates against bacterial infection. Continue generation of MDR surrogate panels to bridge the gap between antimicrobial resistant biowarfare agents and multi-drug resistant clinical pathogens. Organotypic platform-related work previously funded under TM2/MCMI will be continued here.			
Title: 11) Toxin Therapeutics ***Description:*** Identify, optimize and evaluate therapeutic candidates that are effective against biological toxin agents. ***FY 2015 Accomplishments:*** Continued to characterize Botulinum neurotoxin (BoNT) small molecule inhibitors in vitro. Continued co-crystallization studies of BoNT-inhibitor complexes. ***FY 2016 Plans:*** Continue to characterize BoNT small molecule inhibitors in vitro. Continue co-crystallization studies of BoNT-inhibitor complexes. Initiate evaluation of late development and FDA approved drugs for treatment of staphylococcal enterotoxin B intoxication. ***FY 2017 Plans:*** Further evaluate most potent small molecule BoNT/A inhibitors in neuronal assays and ex vivo model systems.	2.974	2.943	2.015
Title: 12) Pretreatments, Nerve Agents	6.826	9.825	6.312

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** TM2 / *TECHBASE MED DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Description: Develop pretreatments and prophylactics that provide protection against all organophosphorous (OP) nerve agents. Pretreatments/prophylactics include both stoichiometric and catalytic bioscavengers that rapidly bind and detoxify a broad spectrum of OP nerve agents. ***FY 2015 Accomplishments:*** Continued efforts to develop effective bioscavengers (stoichiometric and catalytic). Continued development of a broad spectrum regimen of catalytic bioscavengers effective against multiple types of OP nerve agents. ***FY 2016 Plans:*** Realign efforts to emphasize catalytic bioscavengers. Select promising G-type nerve agent catalytic bioscavengers candidates to humanize. Continue developing V-type nerve agent catalytic bioscavenger, and a regimen of catalytic bioscavengers effective against multiple nerve agents. ***FY 2017 Plans:*** Continue to optimize catalytic bioscavengers for acceptable in vivo toxicity profile, pharmacokinetic (PK) and efficacy activity against G-type and V-type OP nerve agents in appropriate animal models.			
Title: 13) Chemical Therapeutics ***Description:*** Focuses on therapeutic strategies to effectively minimize neurologic injuries resulting from exposure to chemical warfare agents (CWAs). This effort involves the development of neuroprotectants, anticonvulsants, and improved therapies for brain enzyme reactivation. This work is designed to develop potential candidates that will ultimately be submitted for FDA licensure or to identify previously licensed products for new uses in the treatment of chemical warfare casualties. ***FY 2015 Accomplishments:*** Continued to investigate technology to facilitate delivery of therapeutics to the brain (crossing the blood brain barrier). Explored molecular, nanomaterial-based drug delivery platforms. Continued to investigate the potential for broad spectrum cholinesterase enzyme reactivators that work in the brain. Continued development of animal models for operationally relevant threat agent exposure and medical countermeasure (MCM) development. ***FY 2016 Plans:*** Continue focus on refined technology that facilitates delivery of therapeutic regimen to the central nervous system (crossing the blood brain barrier). Select promising molecular, nanomaterial-based drug delivery platforms for further development. Continue supporting the development and screening for new potential leads as broad spectrum/centrally acting cholinesterase reactivators. ***FY 2017 Plans:***	5.592	3.838	7.715

Exhibit R-2A, RDT&E Project Justification: PB 2017 Chemical and Biological Defense Program		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602384BP / *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**Project (Number/Name)** TM2 / *TECHBASE MED DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Support in vivo validation and characterization of therapeutics for: 1) an improved broad spectrum oxime; 2) compounds effective in the brain for enhanced neuroprotection and 3) compounds effective in the brain for enhanced survival. Continue exploring technologies for delivery of therapeutics to the brain (crossing the blood brain barrier). Continue supporting development and screening for broad spectrum cholinesterase reactivators that work in the brain. Continue development of animal models for realistic operational threat agent exposure and MCM development. Investigate dermal treatments and therapeutics for nerve agent and sulfur mustard exposure.			
Title: 14) SBIR/STTR ***FY 2016 Plans:*** SBIR/STTR - FY16 - Small Business Innovative Research.	-	1.658	-
Accomplishments/Planned Programs Subtotals	90.527	84.433	68.048

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• TM3: *TECHBASE MED DEFENSE (ATD)*	102.610	93.725	83.838	-	83.838	93.720	92.727	94.495	98.357	Continuing	Continuing
• MB4: *MEDICAL BIOLOGICAL DEFENSE (ACD&P)*	114.230	79.516	65.648	-	65.648	61.660	41.306	29.440	50.001	Continuing	Continuing
• MC4: *MEDICAL CHEMICAL DEFENSE (ACD&P)*	0.000	0.000	5.681	-	5.681	0.000	0.000	0.000	0.000	0	5.681
• MB5: *MEDICAL BIOLOGICAL DEFENSE (EMD)*	169.400	107.883	106.223	-	106.223	170.667	190.756	188.537	181.318	Continuing	Continuing
• MC5: *MEDICAL CHEMICAL DEFENSE (EMD)*	25.966	42.911	39.504	-	39.504	44.656	25.358	11.155	4.855	Continuing	Continuing
• MB7: *MEDICAL BIOLOGICAL DEFENSE (OP SYS DEV)*	13.186	11.801	7.145	-	7.145	9.575	16.516	13.931	13.338	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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