Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Threat Reduction Agency											Date: February 2016	
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*							
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	684.895	147.019	152.915	154.857	-	154.857	163.514	165.917	167.419	170.628	Continuing	Continuing
RA: *Information Sciences and Applications*	133.953	26.334	29.432	29.127	-	29.127	33.255	33.513	30.990	31.405	Continuing	Continuing
*RD: *Detection Technologies*	0.000	0.000	25.920	15.936	-	15.936	16.332	16.093	17.586	17.940	Continuing	Continuing
RE: *Counter-Terrorism Technologies*	6.714	0.963	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
*RF: *Forensics Technologies*	165.205	31.403	9.356	10.008	-	10.008	10.274	10.505	10.717	10.933	Continuing	Continuing
RG: *Defeat Technologies*	62.127	12.955	11.769	11.304	-	11.304	11.601	11.864	12.103	12.345	Continuing	Continuing
RI: *Nuclear Survivability*	77.615	20.671	29.383	34.051	-	34.051	34.553	35.261	35.978	36.698	Continuing	Continuing
RL: *Nuclear & Radiological Effects*	98.823	31.666	22.698	28.668	-	28.668	31.146	31.829	32.467	33.120	Continuing	Continuing
RM: *WMD Counterforce Technologies*	67.030	12.750	13.295	12.097	-	12.097	12.375	12.814	13.060	13.323	Continuing	Continuing
**RR: *Countering WMD Test and Evaluation*	52.118	10.277	11.062	13.666	-	13.666	13.978	14.038	14.518	14.864	Continuing	Continuing
***RU: *Basic Research for Countering WMD*	21.310	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.310

Note

*Project RF-Detection and Forensics Technologies subdivided into Projects RD-Detection Technologies and RF-Forensics Technologies in FY 2016.
**Project RR title changes from Combating WMD Test and Evaluation to Countering WMD Test and Evaluation beginning in FY 2017.
***Project RU title changes from Fundamental Research for Combating WMD to Basic Research for Countering WMD beginning in FY 2017.

A. Mission Description and Budget Item Justification

The Defense Threat Reduction Agency (DTRA) WMD Defeat Technologies program element funds the expansion and application of basic scientific knowledge in order to develop novel materials, devices, systems, and methods supporting next generation concepts and technologies that enable advances in weapons of mass destruction (WMD) surveillance, detection, defeat, prevention, nonproliferation, counterproliferation, consequence management, and treaty verification.

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Threat Reduction Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*

This Applied Research portfolio is aligned with strategic planning objectives as well as with science and technology (S&T) investment direction which is established annually by DTRA and the US Strategic Command Center for Combating Weapons of Mass Destruction (SCC-WMD). The objectives directly support policy and planning guidance from the Office of the President, the Department of Defense (DoD), and the broader WMD threat reduction community.

The portfolio advances DTRA's Countering WMD (CWMD) mission by balancing the following imperatives: invest in DTRA's applied research capabilities and increase the CWMD technology base to maximize future pay-off; capitalize on opportunities to deliver innovative, cost-effective solutions to technical challenges that must be resolved prior to system-specific technology investigations and development; and ensure applied research efforts are directly aligned to mission-specific capability requirements of DTRA, the Military Departments, Combatant Commanders, other DoD and federal agencies, and international partners.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	151.443	155.415	160.701	-	160.701
Current President's Budget	147.019	152.915	154.857	-	154.857
Total Adjustments	-4.424	-2.500	-5.844	-	-5.844
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-2.500			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-4.424	-			
• Realignments	-	-	2.674	-	2.674
• Economic Assumptions	-	-	-1.145	-	-1.145
• Other Reductions	-	-	-7.373	-	-7.373

Change Summary Explanation

The decrease in FY 2017 from the previous President's Budget submission is due to the net effect of increased investment in this program element for the revitalization of CWMD test capabilities, targeting support, and threat forecasting, combined with the transition of full effects modeling technology from applied research (6.2) to advanced technology development (6.3), and the balancing of near term operational needs with future technical developments and capabilities. Other reductions were in support of Departmental efficiencies and economic assumptions.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) RA / *Information Sciences and Applications*	

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
RA: *Information Sciences and Applications*	133.953	26.334	29.432	29.127	-	29.127	33.255	33.513	30.990	31.405	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Information Sciences and Applications project develops concepts and technologies in the areas of high-speed information processing, modeling and simulation, signal detection, and data-driven decision analysis in support of the Defense Threat Reduction Agency's (DTRA) technical reachback teams. This project develops and maintains continuously improving collaborative architectures and Chemical, Biological, Radiological, Nuclear and High-yield Explosives (CBRNE) modeling & simulation codes that drive an integrated suite of decision support tools serving the Combatant Commands, other Department of Defense (DoD) agencies, and national and international Countering Weapons of Mass Destruction (CWMD) partners. This effort also provides management and support of the Threat Reduction Advisory Committee. The committee is a senior-level Federal Advisory Committee, which provides independent expert advice on CWMD to the Secretary of Defense through the Under Secretary of Defense for Acquisition, Technology and Logistics, and the Assistant Secretary of Defense4 for Nuclear, Chemical and Biological Defense Matters. This effort also funds the Next Generation Nuclear Professionals (NextGen) activities. This is an outreach effort that encourages collaboration between those currently in the nuclear field and those who are considering entering that field. The effort consists of conferences, working groups, a debate series, publications, international outreach, an online presence, and a Nuclear Scholars effort.

The increase from FY 2015 to FY 2016 is due to increased investment in advanced analytics and modeling and simulation. The decrease from FY 2016 to FY 2017 is due to decreased investment in hazard and effects characterization and technology-driven WMD threat Forecasting.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RA: Information Sciences and Applications	26.334	29.432	29.127
Description: Project RA develops concepts and technologies in the areas of high speed information processing, modeling and simulation, signal detection, and data-driven decision analysis. ***FY 2015 Accomplishments:*** - Initiated image processing, multi-INT data fusion, and machine learning projects in collaboration with National Nuclear Security Administration Labs and Office of the Secretary of Defense-Rapid Reaction Technology Office. - Developed and transferred an integrated CBRNE effects analytics capability in support of United States Strategic Command (USSTRATCOM) Mission Planning Analysis System (MPAS). - Developed automated methods to operate DoD/Department of Homeland Security (DHS)/Department of Energy (DOE) radiation particle transport code suite on the DoD high performance computational network. - Developed enhanced geospatial models and synthetic world-wide population simulations supporting more rapid infectious disease forecasting and predictive modeling for Technical Reachback. - Developed automated input capabilities for a nuclear effects technology transfer project that will introduce nuclear effects codes into an OSD-directed campaign analysis model.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RA / *Information Sciences and Applications*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Demonstrated architecture and systems capable of highly automated fusion and dissemination of comprehensive data required to provide real-time global CWMD situational awareness. - Integrated first principle blast and nuclear fallout codes into the DoD/DHS/DOE radiation particle transport code suite. - Implemented design for a common information science and deployment environment, supporting training, operations, and mission support of CBRNE assessment for primary, secondary, and tertiary effects. - Supported the integration of natural language processing applications and configuration management capabilities into the DTRA Experimental Lab and tested for suitability of advanced features into next generation tactical and CWMD cloud architectures. - Supported two training exercises through the Joint Collaborative Analysis Model (JCAM), providing force-on-force simulation and analysis. - Supported the DTRA exploratory development and initial real-time collaborative CBRNE integrated deployment framework. - Conducted strategic analyses and assessments on emerging WMD threats using various strategic research methodologies. - Continued to manage and support the Threat Reduction Advisory Committee.			
FY 2016 Plans: - Participate in an interagency, large-scale testing series of dense gas release. Analyze data and develop models to improve atmospheric hazard predictions to enhance Consequence Management decision support. - Develop environmental degradation parameters of airborne chemical agents to better characterize collateral effects after a strike on a WMD facility. - In support of the USSTRATCOM, develop capabilities to support analysis of higher order effects, such as infrastructure and economic impacts, from nuclear targeting. - Develop high fidelity Force-on-Force (phenomenology and effects) computational modeling and simulation capabilities integrated with real and virtual sensor responses. - Leverage commercial graphical processor technologies to enable near real-time high fidelity radiation transport calculations. - Integrate new first principle high fidelity blast and nuclear fallout codes into the DoD/DHS/DOE radiation particle transport code suite. - Continue to develop and deploy automated methods to consolidate multiple geospatial terrain types into a single virtual globe capable of supporting multiple modeling and simulation platforms. - Build a CWMD sensor framework with the Night Vision Laboratory to enable real-time data fusion of deployed sensors with modeling and simulation tools. - Continue to develop and deploy mobile device-based situational awareness, mission planning, and training tools for the warfighter featuring up-to-date capabilities for route planning, force tracking, and geo-tagging items of interest. - Continue to develop, deploy, and support implementation of faster than real-time analysis code with large scale exercises in support of nuclear physical security threat and vulnerability assessments. - Develop high fidelity radiation detection trainer technologies utilizing mobile devices and augmented reality displays to enable training with virtual radiation source surrogates.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RA / *Information Sciences and Applications*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Sponsor and co-lead CBRNE topics as part of the Defense Advanced Research Projects Agency's XDATA and similar cloud computing challenges supporting the development of new data awareness and large scale anomaly detection capabilities. - Develop CWMD-Situational Awareness and data analysis/anomaly detection technology as part of a DoD Distributed Common Ground/Surface System and Intelligence Community Information Technology Enterprise compliant architectures. - Support advanced research topics including CWMD object-based intelligence, computational reasoning, and knowledge management tool development and testing. - Support research on integration of unclassified and open source data into tools and capabilities supporting "long view" shaping of the CBRNE environment prior to direct integration done in collaboration with the Department of State and Combating Terrorism Technical Support Office. - Support the rapid development of secure software and toolsets through code vulnerability analysis. - Continue activities in support of leveraging evolving Department and commercial cloud capabilities and services. - Continue to develop and mature IT capabilities in support of achieving highly automated fusion and dissemination of comprehensive data necessary for providing global CWMD situational awareness. - Continue to conduct strategic analyses and assessments on emerging WMD threats using various strategic research methodologies. - Bring scientific, technical, and social science faculty/experts together to look into the future and help understand and anticipate WMD capabilities and the technology needed to counter those capabilities. - Continue to manage and support the Threat Reduction Advisory Committee and the NextGen programs.			
FY 2017 Plans: - Initiate development of concepts and explore capabilities for enabling data collection, fusion and analysis supporting the DTRA WMD Technology Threat Forecasting program. - Continue to conduct a large-scale test series in collaboration with interagency on dense gas release and to develop models to improve atmospheric hazard predictions and consequence management. Develop enhancements and modifications to codes supporting analysis of test results. - Continue to develop and integrate a CWMD sensor framework in collaboration with the Night Vision Laboratory and Common CBRN Sensor Interface sponsors (DTRA's Nuclear Technologies and Counterterrorism Technologies Divisions, and the Joint Program Executive Office for Chemical and Biological Defense) to enable real-time data fusion of deployed sensors with modeling and simulation tools. - Continue to develop environmental degradation parameters of airborne non-traditional chemical agents to better characterize collateral effects after a strike on a WMD facility. - Continue to develop high fidelity Force-on-Force (phenomenology and effects) computational modeling and simulation capabilities integrated with real and virtual sensor responses. - Continue to develop and enhance high fidelity radiation detection training applications for use in mobile devices. - Continue to develop augmented reality displays for mobile devices to enable training with virtual radiation source surrogates.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RA / *Information Sciences and Applications*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Continue to develop data anomaly detection and analysis technology as part of DoD Distributed Common Ground/Surface System and Intelligence Community Information Technology Enterprise-compliant architectures. - Continue to develop enhancements to modeling, simulation, and data architecture capabilities for analysis of higher order effects from nuclear detonation, to include physical infrastructure, political, and economic impacts. - Continue to develop automated methods to consolidate multiple geospatial terrain types into a single virtual globe capable of supporting multiple modeling and simulation platforms. - Continue to develop mobile device-based route planning, force tracking, and geo-tagging applications to support warfighter-unique CWMD missions. - Continue to develop faster-than-real-time analysis code for use in large scale nuclear physical security threat and vulnerability assessments, and conduct independent validation and verification for DoD level accreditation. - Continue to manage and support the Threat Reduction Advisory Committee. The Committee will be completing a top to bottom review of the chemical, biological and nuclear issues on the Korean Peninsula. - Continue Project on Advanced Systems and Concepts for Countering WMD through the Naval Postgraduate School, and grant 20 to 25 research awards that support CWMD efforts. - Continue NextGen activities. The effort will attempt to expand interest in the nuclear enterprise by engaging the French nuclear non-governmental organizations.			
Accomplishments/Planned Programs Subtotals	26.334	29.432	29.127

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention and Defeat*	0.250	12.244	11.422	-	11.422	11.323	12.761	13.004	13.266	Continuing	Continuing
• 151/0605502BR: *Small Business Innovation Research*	9.606	-	-	-	-	-	-	-	-	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the DoD and other government agency laboratories, academia, industry, and international partner organizations.

E. Performance Metrics

Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) *RD / *Detection Technologies*	

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
*RD: *Detection Technologies*	0.000	0.000	25.920	15.936	-	15.936	16.332	16.093	17.586	17.940	Continuing	Continuing

Note

*Project RF-Detection and Forensics Technologies subdivides into Projects RD-Detection Technologies and RF-Forensics Technologies in FY 2016.

A. Mission Description and Budget Item Justification

The Detection Technologies mission is to conduct Research, Development, Test, & Evaluation to 1) identify, develop, and exploit signatures associated with nuclear threat enablers such as nuclear expertise, financing, or unique materials to advance U.S. capabilities to detect and interdict such threats; and 2) locate, identify, and track special nuclear material and improve detection factors such as range, time, sensitivity, or accuracy to enhance Service/Special Mission Unit capabilities. These efforts support Department of Defense (DoD) requirements for countering terrorism, counter/nonproliferation, and homeland defense.

The increase from FY 2015 to FY 2016 is due to the subdivision of Project RF-Detection and Forensics Technologies into Projects RD-Detection Technologies and RF-Forensics Technologies beginning in FY 2016. The decrease from FY 2016 to FY 2017 is due to reduced investment in radiation detection, nuclear threat detection intelligence, surveillance, and reconnaissance technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RD: Detection Technologies	-	25.920	15.936
Description: Project RD develops direct and indirect technologies for the detection of radiation and non-radiative signatures associated with nuclear threats, and to advance warfighter capabilities to rapidly locate, characterize, and counter such threats.			
FY 2016 Plans: - Discover/identify nuclear threat signatures, characteristics, and corresponding detection modalities and collection systems. - Develop algorithms/tools for rapidly and effectively analyzing all-source intelligence to identify nuclear threats. - Prototype systems to remotely monitor small and wide areas that may produce or contain nuclear threats. - Develop algorithms/tools to synthesize the collection and analysis of multiple nuclear threat signatures to improve assessment confidence and cuing of potential nuclear threat events. - Execute robust and operationally relevant testing and evaluation of developmental radiation detection systems to determine and select the best performing technologies and techniques for further development and transition to user groups. - Downselect sensor materials for the most effective/efficient capability and integrate into detection systems. - Downselect detection system algorithms for most effective/efficient processing and integrate into detection systems to improve user capabilities. - Research and develop advanced three-dimensional imaging technologies for high-resolution source characterization and identification to provide new and improved capabilities to detect, locate, identify, and characterize threat materials. - Investigate viability of ultra-low-power, long-duration programmable remote radiation monitoring systems.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** *RD / *Detection Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Investigate organic semiconductors and photo-detectors to improve detection system performance. ***FY 2017 Plans:*** - Continue to develop technologies to identify and catalogue nuclear threat signatures and characteristics and to formulate corresponding detection modalities and collection systems. - Continue to develop algorithms and tools for rapid analysis of all-source intelligence to identify nuclear threats. - Continue to develop initial technologies and subsystems to remotely monitor small and wide areas that may produce or contain nuclear threats. - Continue to develop algorithms and tools to synthesize the collection and analysis of multiple nuclear threat signatures in order to improve assessment confidence and cuing of potential nuclear threat events. - Continue to test and evaluate developmental radiation detection systems to identify the best performing technologies and techniques for transition to advanced technology development efforts. - Develop technologies for next generation nuclear imaging devices with neutron and dual gamma and neutron imaging capability, enabling warfighters to rapidly pinpoint and identify detected radioisotopes. - Develop technologies enabling interoperable architectures for enhanced, real-time mission analysis and common operational pictures within a shared or distributed area of operations. - Develop techniques and technologies for alternative signature detection, processing, and exploitation methods to detect and locate nuclear threats. - Develop novel detection materials and advanced Helium-3 replacement technologies into prototype radiation detection systems to increase range, sensitivity, and accuracy of detection and enable warfighters to more rapidly locate targeted material. - Develop, integrate, and demonstrate prototype radiation detection algorithms to enhance the range of detectability of targeted material.			
Accomplishments/Planned Programs Subtotals	-	25.920	15.936

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention and Defeat*	-	29.893	17.775	-	17.775	17.989	19.047	21.210	21.553	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the Department of Defense and other government agency laboratories, academia, industry and international partner organizations.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** *RD / *Detection Technologies*

E. Performance Metrics

Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) RE / *Counter-Terrorism Technologies*	

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
RE: *Counter-Terrorism Technologies*	6.714	0.963	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Counter-Terrorism Technologies project is an over-arching project that develops and transitions a full spectrum of new technologies to counter emergent Weapons of Mass Destruction (WMD) thus enabling warfighters to improve their ability to detect, disable, interdict, neutralize, and destroy chemical, biological, nuclear production, storage, and weaponization facilities. See paragraph C. for other program funding.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RE: Counter-Terrorism Technologies	0.963	-	-
Description: Project RE provides research and development (R&D) support to Joint U.S. Military Forces, specifically United States Special Operations Command (USSOCOM), in the areas of Explosive Ordnance Disposal Device Defeat; Counter WMD technologies for warfighters; the USSOCOM Countering WMD – Terrorism Support program, and oversight of counterproliferation R&D resources sent directly to USSOCOM for warfighter-unique counterproliferation technologies. ***FY 2015 Accomplishments:*** - Completed JASON study on Hardened and Deeply Buried Targets (HDBT). Study findings were presented in the "C-WMD/HDBT Game Changer Report" for review by the Department of Defense (DoD) Advanced Capability and Deterrence Panel. JASON is an independent group of scientists which advises the DoD and other federal agencies on science and technology matters that are mainly of a sensitive military nature.			
Accomplishments/Planned Programs Subtotals	0.963	-	-

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention, and Defeat*	105.096	104.284	102.976	-	102.976	105.522	107.530	109.729	111.960	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RE / *Counter-Terrorism Technologies*

E. Performance Metrics

Number of technologies developed and delivered, and/or proof of concept, or successful Military Utility Assessments conducted that increase the potential mission success and reduce the number of current gaps in Special Operations Forces capabilities to counter weapons of mass destruction.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) *RF / *Forensics Technologies*	

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
*RF: *Forensics Technologies*	165.205	31.403	9.356	10.008	-	10.008	10.274	10.505	10.717	10.933	Continuing	Continuing

Note

*Project RF-Detection and Forensics Technologies subdivides into Projects RD-Detection Technologies and RF-Forensics Technologies in FY 2016.

A. Mission Description and Budget Item Justification

The Forensics Technologies project develops post-detonation nuclear forensics technologies providing accurate, rapid and reliable means to collect, analyze, and evaluate prompt data and debris from a nuclear or radiological event in support of exploitation and attribution efforts. These forensics technologies also enable the Defense Threat Reduction Agency (DTRA) and its trusted partners to detect, locate, identify, track, and interdict nuclear and radiological threats, including weapons and material, and enablers to their acquisition and development. In accordance with Department of Defense Directive S-2060.04, DTRA serves as the US Government lead for post-detonation National Technical Nuclear Forensics (NTNF) research and development (R&D). As the central NTNF R&D coordinator, DTRA works in consultation with interagency partners to develop and improve ground-based capabilities supporting exploitation and attribution missions.

The decrease from FY 2015 to FY 2016 is due to the realignment of nuclear threat detection activities into Project RD-Detection Technologies. The increase from FY 2016 to FY 2017 reflects increased investment in nuclear device characterization for forensics and nuclear forensic materials exploitation for attribution.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RF: Forensics Technologies	31.403	9.356	10.008
Description: Project RF develops post-detonation nuclear forensics technologies providing accurate, rapid and reliable means to collect, analyze, and evaluate prompt data and debris from a nuclear or radiological event in support of exploitation and attribution efforts.			
FY 2015 Accomplishments: - Transitioned the Man-Portable Detection System, a modular radiation detector kit, to several National Guard Bureau Civil Support Teams. - Transitioned a 3" version of an elpasolite scintillator to a commercial vendor for use in radiation detection devices; commercialization provides a sustainable and affordable supply of new scintillators with combined gamma and thermal neutron detection capabilities to DoD and other federal agencies. - Delivered first iteration prototypes of ultra-low power electronics to an independent performer for testing and evaluation. - Completed initial development of two neutron detection materials as alternatives to Helium-3 neutron detectors. - Completed development of room-temperature high-resolution gamma imaging detector electronics and semiconductor materials. - Completed effort to develop the Mission Planning Tool for operators to design radiological/nuclear search missions based on available equipment, relevant concepts of operation, and anticipated threats. - Completed critical design review for Trace Element Analysis Kit development.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** *RF / *Forensics Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Completed system requirements review for the next generation Polaris gamma-ray imager (3D Polaris). - Completed experimental campaign for Photon Active Search System in an effort to conclude military utility study of active interrogation technology. - Completed development of the Radiation Signature Tagging, Tracking, and Locating system for remote monitoring of nuclear and radiological sources. - Conducted testing and evaluation of developmental radiation detection systems to determine and select the best performing technologies and techniques for further development and transition to user groups. - Developed, tested, demonstrated, and fielded prototype ground-based sensor capabilities for post-detonation prompt diagnostics under DISCREET OCULUS. - Developed, tested, demonstrated, and fielded (prototype) upgraded technical capabilities for prompt diagnostics, debris collection, sample analysis, and modeling to support technical nuclear forensics conclusions. - Continued to develop advanced three-dimensional imaging technologies for high resolution source characterization and identification to provide new and improved capabilities to detect, locate, and identify threat materials. - Led the interagency MIGHTY SABER 2015 technical nuclear forensics and attribution demonstration and evaluation of DTRA-developed prompt diagnostics and device reconstruction technologies and methodologies.			
FY 2016 Plans: - Accelerate development and evaluate the propagation of prompt diagnostics phenomenology to support the deployment of ground-based sensor capabilities in three US cities for post-detonation prompt diagnostics under the DISCREET OCULUS program. - Develop, test, and demonstrate upgraded technical capabilities for prompt diagnostics, debris collection, sample analysis, modeling to support nuclear device reconstruction, and forensics data to decrease timeline, lower uncertainties, and increase confidence in technical nuclear forensics conclusions.			
FY 2017 Plans: - Develop, test and evaluate new and improved technologies for prompt diagnostics, debris collection, data analysis, debris diagnostics, and technical capability modeling to support nuclear device reconstruction, as well as to decrease timeline, lower uncertainty, and increase confidence in technical nuclear forensics conclusions supporting attribution. - Develop, test, and evaluate new and improved technologies and processes for National Technical Nuclear Forensics validation and verification in order to decrease timeline, lower uncertainty, and increase confidence in technical nuclear forensics conclusions supporting attribution. - Investigate and develop novel concepts enabling radical reductions in the time required to reach target areas, to collect fallout debris and conduct analyses in the field, and to obtain significant forensic results and attribution conclusions. - Investigate and develop techniques and algorithms to analyze, combine and integrate speed-of-light (SoL) and speed-of-sound (SoS) phenomena in an urban environment to increase the effectiveness of nuclear detonation yield determinations.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** *RF / *Forensics Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Evaluate and expand current understanding of propagation and transport of prompt diagnostics phenomenologies (SoL, SoS) in an urban environment to support the planned deployment of ground-based sensor capabilities (US Prompt Diagnostics System). - Conduct interagency and international research evaluation events to assess process improvements and identify potential capability gaps in forensic conclusion confidence, timeliness, and accuracy. - Engage with partner nations under appropriate international agreements to improve the understanding of prompt phenomenology, improve modeling tools, and improve sensor technologies. - Expand international collaboration in the area of experiments and modeling in order to improve device reconstruction tools and analysis.			
Accomplishments/Planned Programs Subtotals	31.403	9.356	10.008

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention, and Defeat*	63.115	38.427	38.540	-	38.540	42.454	43.727	42.518	43.367	Continuing	Continuing
• 121/0605000BR: *WMD Defeat Capabilities*	6.667	7.156	4.568	-	4.568	9.092	8.714	7.782	7.938	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the Department of Defense and other government agency laboratories, academia, industry and international partner organizations.

E. Performance Metrics

Percentage of Counter WMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) RG / *Defeat Technologies*	

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
RG: *Defeat Technologies*	62.127	12.955	11.769	11.304	-	11.304	11.601	11.864	12.103	12.345	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Defeat Technologies project develops innovative kinetic and non-kinetic weapon technologies to expand traditional and asymmetric options available to Combatant Commanders to deny, disrupt, and defeat adversarial use of Weapons of Mass Destruction (WMD) while minimizing collateral effects. Technology development focuses on the physical or functional defeat of WMD threat materials, an adversary's ability to deliver the same, and the physical and nonphysical support networks enabling both. It does so through the systematic identification and maturation of technologies capable of defeating WMD agents or agent-based processes and selecting technologies for integration into weapons, delivery systems, or rapid WMD elimination capabilities. This effort includes developing specific WMD agent/agent-based process simulants, sub-scale test infrastructure, and sampling capability required for effective development, testing, and evaluation of next-generation Countering WMD (CWMD) capabilities. The project places a high priority on understanding, characterizing, and validating potential weapon effects within mathematical confidence as it relates to the unintended release of hazardous threat materials. Technologies with the potential for weapon and capability integration are transitioned to the advanced technology development effort under this project. On a limited basis, technology test data is shared with coalition partners.

The decrease from FY2015 to FY2016 is due to reduced investment in next generation CWMD technologies to balance other priorities. The decrease from FY 2016 to FY 2017 is due to further reduced investment in next generation CWMD technologies to balance other priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RG: Defeat Technologies	12.955	11.769	11.304
Description: Project RG develops innovative kinetic and non-kinetic weapon technologies to expand traditional and asymmetric options available to Combatant Commanders to deny, disrupt, and defeat adversarial use of WMD while minimizing collateral effects.			
FY 2015 Accomplishments: - Matured classified component testing. - Continued classified integration and component design. - Continued development of access denial and denial-of-use technologies for WMD targets. - Continued development and integration of concepts for exploiting susceptibility of electronics to electromagnetic fields.			
FY 2016 Plans: - Conduct static demonstration of initial capability of access denial and denial-of-use technologies against WMD representative targets. - Complete electronics susceptibility to electromagnetic fields algorithm development and characterization testing. - Downselect electromagnetic source and start system development and integration. - Continue classified component/system design and integration and conduct initial demonstrations.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RG / *Defeat Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conduct sub-scale tests to assess capability to accurately measure WMD simulant released in a plume.			
FY 2017 Plans: - Continue classified component/system design and development. - Continue static demonstrations of access denial and denial-of-use technologies against representative WMD threats. - Conduct sub-scale tests of new standoff weapon payloads to defeat chemical and biological warfare targets. - Continue sub-scale tests to assess capability to accurately measure WMD simulant released in a plume. - Continue to develop electromagnetic source to functionally defeat WMD threats.			
Accomplishments/Planned Programs Subtotals	12.955	11.769	11.304

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention and Defeat*	29.293	22.489	20.710	-	20.710	22.355	22.752	23.227	23.707	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the Department of Defense and other government agency laboratories, academia, industry and international partner organizations.

E. Performance Metrics

Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) RI / *Nuclear Survivability*	

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
RI: *Nuclear Survivability*	77.615	20.671	29.383	34.051	-	34.051	34.553	35.261	35.978	36.698	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Nuclear Survivability project develops innovative technologies for the protection of mission-essential personnel, critical military and national defense capabilities, and associated control and support systems during a nuclear event. Research under this project supports the mission critical systems identified under Department of Defense Instruction 3150.09, Chemical, Biological, Radiological, and Nuclear Survivability Policy. The Defense Threat Reduction Agency is designated by the Department of Defense (DoD) as the center of excellence for electromagnetic pulse (EMP) survivability assessments. The System Vulnerability and Assessment effort develops nuclear assessment capabilities to support operational planning, weapons effects predictions, and strategic system design. This activity also provides the DoD's nuclear design and protection standards for new and existing systems, e.g., command and control facilities and aircraft. Key systems include the Nuclear Command and Control System, the net-centric thin-line, and both military and civilian satellites and associated support systems. The radiation hardened nano-electronics effort develops and demonstrates radiation-hardened, high-performance prototype nano-electronics to meet DoD space and strategic system requirements. Experimental Capabilities activities provide the warfighter with unique x-ray, gamma ray, and EMP test capabilities in support of system survivability development, certification, and sustainment. This effort leverages research from and coordinates with the National Nuclear Security Administration (United States) and the Atomic Weapons Establishment (United Kingdom) to develop enabling technologies for improved nuclear weapon effects experimentation capabilities. Nuclear Technology Analysis Support provides detailed planning related to policy, strategy, objectives, and programmatic integration. This project also supports international collaboration, user groups, and case study reviews, and the Joint Atomic Information Exchange Group. The Human Survivability effort conducts research to develop and validate mortality and morbidity models associated with radiological and nuclear weapon effects.

The increase from FY 2015 to FY 2016 is due to the realignment of system vulnerabilities and assessment activities from Project RL-Nuclear & Radiological Effects to Project RI. The increase from FY 2016 to FY 2017 is due to the net effect of increased investment in system vulnerability and assessment and nuclear weapons effects experimentation and decreased investment in radiation hardening nano-electronics.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RI: Nuclear Survivability	20.671	29.383	34.051
Description: Project RI provides the capability for DoD nuclear forces and their associated control and support systems and facilities to avoid, repel, endure, or withstand attack or other hostile action, to the extent that essential functions can continue or be resumed after the onset of hostile action.			
FY 2015 Accomplishments: - Completed 32nm Product Demonstration Vehicle. - Completed Program Manager's Handbook for Nuclear Survivability. - Delivered new warm x-ray (10-50 keV) test capability on the Double-Eagle and ZR simulators, in collaboration with Naval Research Laboratory and Sandia National Laboratories. - Initiated a <22nm Rad Hard-by-Design effort.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RI / *Nuclear Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Initiated development of maskless e-beam lithography. - Collaborated with the United Kingdom on EMP research on power grid transformers. - Upgraded the Short Pulse Gamma Facility within the West Coast Facility for hardening and validation of satellite and stockpile subsystems and components. - Explored and validated new pulsed-power neutron and dust test capabilities. - Published survivability standards in support of satellite systems, all air domain effects, and source region electromagnetic pulse environment.			
FY 2016 Plans: - Upgrade electron-beam (cold x-ray) test capability at the DTRA West Coast Facility to allow testing at 2X current capability. - Develop innovative techniques to produce 5X improvement in warm x-ray (10-50 keV) test capability for DTRA Double-Eagle simulator. - Perform a System Generated Electro-Magnetic Pulse radiation effects experiment for 2-dimensional code validation on the National Ignition Facility (NIF). - Publish MIL-STD-4023, High-Altitude Electromagnetic Pulse Protection for Maritime Assets and Comprehensive Atmospheric Nuclear Environment military standards. - Update MIL-STD-188-125-1/2, High-Altitude Electromagnetic Pulse Protection for Fixed and Transportable Facilities and Systems. - Update MIL-HDBK-423 High-Altitude Electromagnetic Pulse Protection for Fixed facilities. - Publish Aircraft High Altitude EMP Protection Handbook. - Conduct electromagnetic pulse assessments on defense critical infrastructure for electric power and telecommunications networks. - Update cost estimates to harden methodology protocols for aircraft, missile, and satellite systems. - Transition Single Event Transient research and mitigation from legacy to 32 nanoscale technology nodes. - Initiate a RadHard-by-Design development for less than 22nm commercial technology. - Transition maskless e-Beam lithography from Small Business Innovation Research project to trusted Rad Hard foundry. - Publish Satellite System Nuclear Survivability Protection Military Standard. - Initiate development of Satellite System Nuclear Survivability protection design handbook. - Initiate a low power design using one 1-D gridded design guidelines in a Rad Hard foundry.			
FY 2017 Plans: - Complete manufacture of maskless e-beam lithography tool prototype in a trusted foundry. - Develop and integrate the latest human radiation exposure models into current DTRA predictive modeling software. - Develop model to evaluate synergistic effects of nuclear weapon combined injuries. - Develop advanced warm x-ray source concepts. - Develop well-characterized x-ray test environments at the NIF.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RI / *Nuclear Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Continue to develop a RadHard-by-Design microprocessor with less than 22nm commercial technology. - Evaluate High Altitude Electromagnetic Pulse (HEMP) threat survivability for Aegis Ashore-Poland and satellite communication ground facilities. - Investigate electromagnetic pulse effects on power grid transformers, as part of a collaborative research effort with the United Kingdom on critical civilian and defense infrastructure. - Provide nuclear scintillation expertise to DoD and Service Program Executive Offices (PEOs) to assist in certification of disturbed channel simulators and new survivable satellite communication systems. - Publish a surface/near-surface nuclear weapon environment military standard to assist DoD and Service PEOs. - Publish update to MIL-STD-188-125-1, HEMP Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions: Part 1 Fixed Facilities. - Publish Nuclear Disturbed Communications Environment Annex to the Consolidated Afloat Networks and Enterprise Services Military Standard to assist DoD and Service PEOs.			
Accomplishments/Planned Programs Subtotals	20.671	29.383	34.051

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention, and Defeat*	5.328	6.191	6.561	-	6.561	6.658	6.738	6.863	7.002	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the DoD and other government agency laboratories, academia, industry and international partner organizations.

E. Performance Metrics

Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) RL / *Nuclear & Radiological Effects*	

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
RL: *Nuclear & Radiological Effects*	98.823	31.666	22.698	28.668	-	28.668	31.146	31.829	32.467	33.120	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Nuclear and Radiological Effects project develops modeling tools to: support military operational planning, weapon effects predictions, and strategic system design decisions; consolidate validated modeling tools into the Joint Information Environment for integrated functionality; predict system responses to nuclear and radiological weapons producing electromagnetic, thermal, blast, shock and radiation environments; provide detailed adversary nuclear infrastructure characterization to enhance counterforce operations and hazard effects; and, develop foreign nuclear weapon outputs.

The decrease from FY 2015 to FY 2016 is due to an administrative realignment of the System Vulnerability and Assessment effort to Project RI-Nuclear Survivability due to the nature of those activities. The increase from FY 2016 to FY 2017 is due to the net effect of increased investment in targeting support and decreased investment in nuclear full effects modeling.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RL: Nuclear & Radiological Effects	31.666	22.698	28.668
Description: Project RL develops nuclear and radiological assessment modeling tools to support military operational planning, weapons effects predictions, and strategic system design decisions. ***FY 2015 Accomplishments:*** - Initiated transition of improved airblast, fallout, fire and Source Region Electromagnetic Pulse models to the DTRA net-centric environment for U.S. Strategic Command (USSTRATCOM) and other nuclear targeting and consequences of execution users. - Initiated implementation of first principle modeling tools for nuclear fire initiation and spread in urban and suburban environments. - Delivered upgraded database of foreign nuclear weapon outputs for Department of Defense and the Military Services. - Developed System Generated EMP simulation codes by adapting physics capabilities of the Maxwell's Equations Equivalent Circuit code and the Improved Concurrent EM Particle-In-Cell high performance computing code. - Developed new magnetosphere experiments using microsatellites (CubeSats) for quantification of the artificial radiation belt formation and decay in order to define the source term for damage and degradation of space assets. - Completed engineering level modeling of the response of airborne systems in nuclear dust clouds, and transitioned the capability to nuclear hardness databases. - Released final draft of MIL-STD-3054 Comprehensive Atmospheric Nuclear Environment Standard (CANES) for review by DoD. - Initiated update of MIL-STD-188-125-1, High Altitude Electromagnetic Pulse Protection for Fixed Facilities. - Performed an electromagnetic pulse assessment study on a warship for the U.S. Navy. - Initiated update of MIL-HDBK-423, High Altitude Electromagnetic Pulse protection for fixed facilities.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RL / *Nuclear & Radiological Effects*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Improved the Electromagnetic Reliability and Effects Prediction (EMREP) tool by adding a Source Region Electromagnetic Pulse capability. - Investigated EMP effects on power grid transformers, as part of a collaborative research effort with the United Kingdom, on critical civilian and defense infrastructure in support of the Weapons Effects Strategic Collaboration (WESC). ***FY 2016 Plans:*** - Deliver airblast, fallout, fire and Source Region Electromagnetic Pulse models to USSTRATCOM (and other nuclear targeting/ consequences of execution users) for improved nuclear targeting using nuclear effects that have not been considered in the past. - Provide improved foreign nuclear weapon outputs, environment models, and Effects Manual 1 (EM-1) chapters. - Develop System Generated Electromagnetic Pulse simulation codes by adapting physics in the Maxwell's Equations Equivalent Circuit code and the Improved Concurrent Electromagnetic Particle-In-Cell high performance computing code. - Further develop a gold standard database with selected historical nuclear weapon output and effects for use in validation of Nuclear Weapons Effects codes. - Via the Nuclear Weapons Effects Network, continue modeling economic and social consequences of nuclear detonation effects and collateral building damage due to nuclear-induced airblast, assess nuclear dust/debris effects on airborne systems, and model nuclear fire initiation, allowing these considerations to be part of the targeting analyses. - Improve high altitude nuclear effects functionality for use in analyzing satellite and missile defense response to a nuclear environment. - Continue implementation of first principle modeling tools for nuclear fire initiation and spread in urban and suburban environments. ***FY 2017 Plans:*** - Deliver initial nuclear induced fire initiation and spread modeling capability. - Develop nuclear weapons effects tools and analyses for effective targeting, including methods to evaluate the consequences of execution of a given course of action. - Develop enhanced High Altitude Radiation Phenomenology functionality for use on modern computer systems. - Develop initial weapon output spectrum extension required by missile defense systems to ensure critical systems can accomplish their designated missions when exposed to a nuclear weapons environment. - Develop a consistent, state-of-the-art combined effects methodology to ensure critical systems can accomplish their designated missions when exposed to a nuclear weapons environment. - Continue to develop an authoritative source of foreign and historical nuclear weapon outputs to aid in the development of uniform nuclear survivability standards, hardening technologies, and the experimental test capabilities.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RL / *Nuclear & Radiological Effects*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Maintain a virtual interagency and international coalition combining capabilities of existing government and industry organizations into cohesive "networks" of people, knowledge, and infrastructure to synchronize research and development across the nuclear weapon effects community of interest.			
Accomplishments/Planned Programs Subtotals	31.666	22.698	28.668

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
• 27/0603000BR: *Counterproliferation Initiatives - Proliferation, Prevention, and Defeat*	0.000	0.000	3.528	-	3.528	1.582	1.617	1.658	1.691	Continuing	Continuing
• 121/0605000BR: *WMD Defeat Capabilities*	-	-	-	-	-	-	-	-	-		

Remarks

See prior year funds related to this this project in program element number 0605000BR.

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the DoD and other government agency laboratories, academia, industry and international partner organizations.

E. Performance Metrics

Percentage of Counter WMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) RM / *WMD Counterforce Technologies*	

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
RM: *WMD Counterforce Technologies*	67.030	12.750	13.295	12.097	-	12.097	12.375	12.814	13.060	13.323	Continuing	Continuing

A. Mission Description and Budget Item Justification

The WMD Counterforce Technologies Project develops Countering Weapons of Mass Destruction (CWMD) weapon effects modeling algorithms, full and sub-scale test series required to investigate CWMD weapon effects and sensor performance, and visualization and situational awareness tools to support the next generation DTRA Technical Reachback cell. These activities are critical enablers for the development of advanced CWMD planning tools. Advanced Energetics develops energetic materials and weapon design technology providing advanced defeat capabilities for engaging hard and deeply buried targets that are well beyond current high explosive blast/frag warhead technology.

The increase from FY 2015 to FY 2016 reflects increased investments in advanced energetics and weapons effects modeling. The decrease from FY 2016 to FY 2017 is due to decreased investment in advanced materials and energetics to balance other priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RM: WMD Counterforce Technologies	12.750	13.295	12.097
Description: Project RM provides novel and enhanced weapons energetic materials and structures, full-scale testing of counter WMD weapon effects, weapon effects modeling, weapon delivery optimization, and technical reachback services.			
FY 2015 Accomplishments: - Developed Hybrid Enhanced Blast Explosives; demonstrated ability to embed detonator system and disperse along with the fuel to initiate cloud reaction as designed. - Conducted a large-scale test of Hybrid Enhanced Blast Explosives and reactive cases for defeat of biological agents using simulants. - Conducted modeling and testing to optimize and improve reactive case technology for use in Joint Multi-Effects Warhead System, Tube-launched, Optically-tracked, Wireless-guided bunker buster, and Hellfire warheads. - Conducted field tests to support optimization and improve effectiveness of biocidal effect fuels used in explosive formulations, innovative common data methods supporting advanced weapons of mass destruction (WMD) effects modeling, and simulation capabilities for consequence management. - Conducted lab and field tests of two new high explosive formulations for use in Conventional Prompt Global Strike warheads: one optimized for blast/fragmented, one optimized for high speed penetration warheads. - Improved hydrocodes to provide high fidelity capability to model post-detonation energy release from non-ideal detonation and other new advanced energetics systems. - Integrated weapons effects model for blast propagation through bunker walls for inventory weapons into planning tools. - Developed weapons effects debris model from bunker walls subjected to internal detonations with inventory weapons.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RM / *WMD Counterforce Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conducted testing to validate high fidelity computational methods for predicting progressive collapse analysis of steel buildings. ***FY 2016 Plans:*** - Complete technology gap analysis for chemical/biological source term modeling. - Enhance computational fluid and structure codes for chemical/biological source term modeling. - Conduct component level, small-scale testing for chemical/biological source term modeling. - Develop fast running engineering models for dispersion of chemical/biological agents. - Test modeling of response of mega columns to near-contact charges. - Perform annual cycle of requirements collection, frontier proposals, resource allocation, and technical support through high performance computing. - Develop/demonstrate small-scale Hybrid Enhanced Blast Explosives. - Test/demonstrate Hybrid Enhanced Blast Explosives and reactive cases for simulated biological agent defeat. - Model and test reactive case technologies for Joint Multi-Effects Warhead System and various warheads. - Improve modeling capability for weapon post detonation reaction using reactive case technologies. - Improve modeling capability for agent defeat using novel weapon energetic payloads. - Conduct field tests to support optimization and improve effectiveness of explosive formulations for chemical, biological, radiological, and nuclear agent defeat. - Conduct lab and field tests of two new explosive formulations tailored (temperature, pressure, and outgases) for WMD defeat operations. ***FY 2017 Plans:*** - Demonstrate upgraded Hybrid Enhanced Blast Explosives for improved agent defeat capability. - Complete medium-scale testing of a new combined effects weapon case that provides enhanced blast and reactive fragments. - Complete scaled testing of two new explosive formulations tailored (temperature, pressure, and outgases) for WMD defeat operations. - Complete calculations and tests to develop agent defeat weapon effects models, to include phenomena and events such as dynamic pressure/fragment, agent release, thermal effects and defeat, particle shattering, agent dispersion, combustion modeling and agent fate. - Complete calculations and tests to develop hardened structure weapon effects models, to include phenomena and events such as dynamic pressure, blast propagation through failing walls, blast and fragmentation on structural elements, multi-hit penetration in high-strength concrete, bunker collapse, blast and debris environment from embedded detonation, and penetration mechanics in ultra-high performance concrete. - Complete high performance computing (HPC) requirements collection, HPC modernization program frontier proposal submission, and HPC resource allocation for improved WMD defeat modeling.			
Accomplishments/Planned Programs Subtotals	12.750	13.295	12.097

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** RM / *WMD Counterforce Technologies*

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention and Defeat*	27.099	20.717	23.138	-	23.138	26.057	24.939	24.299	24.721	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the Department of Defense and other government agency laboratories, academia, industry and international partner organizations.

E. Performance Metrics

Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) **RR / *Countering WMD Test and Evaluation*	

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
**RR: *Countering WMD Test and Evaluation*	52.118	10.277	11.062	13.666	-	13.666	13.978	14.038	14.518	14.864	Continuing	Continuing

Note

**Project RR title changes from Combating WMD Test and Evaluation to Countering WMD Test and Evaluation beginning in FY 2017.

A. Mission Description and Budget Item Justification

The Countering WMD Test and Evaluation project provides a unique national test bed capability for simulated Weapons of Mass Destruction (WMD) facility characterization, weapon-target interaction, and WMD facility defeat testing. The test bed facility provides structured and systematic end-to-end test event planning, preparation, management, execution, and data analysis. The test bed offers test instrumentation (data acquisition systems and optics), scientific analysis and predictions, test article construction, test article/test bed remediation, tunnel mining, architectural and engineering design, systems engineering and integration, and test data management. The facility leverages fifty years of expertise in investigating weapons effects and target response across the spectrum of hostile environments that could be created by proliferant nations or terrorist organizations with access to advanced conventional weapons or WMD. Subject matter experts design full and sub-scale testing strategies focusing on weapon-target interaction with fixed soft and hardened facilities to include above ground facilities, cut-and-cover facilities, and deep underground tunnels. This capability does not exist anywhere else within the Department of Defense (DoD) and supports the counterproliferation pillar of the National Strategy to Counter WMD.

The increase from FY 2015 to FY 2016 is due to increased investment in test and technology support and the national test bed. The increase from FY 2016 to FY 2017 is due to increased investment in test and technology support to revitalize DTRA's CWMD test and evaluation capability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RR: Countering WMD Test and Evaluation	10.277	11.062	13.666
Description: Project RR provides a unique national test bed capability for the study of weapon-target interaction, simulated WMD facility characterization, and WMD facility defeat testing to evaluate the implications of WMD and other special weapon use against U.S. military and civilian assets.			
FY 2015 Accomplishments: - Continued CWMD testing/demonstration at Nevada National Security Site to defeat credible and threat-based scenarios; continue with transition into several related projects/planned events through FY 2017. - Continued technical and testing development and demonstration of TransAtlantic Collaboration Biological Resiliency Demo, a DoD capability to shape interagency approach to counter a wide area biological event impacting U.S. and partner nations' key civilian/military infrastructure. - Continued testing in support of "Speed of Sound" nuclear forensics activities.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** **RR / *Countering WMD Test and Evaluation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Supported revitalized Weapons Effects Phenomenology efforts supporting DTRA test activities. - Continued testing in support of the Treaty Verification Technology program and Source Physics Experiment to support Comprehensive Test Ban Treaty initiatives, New START warhead verification, and detection and verification of biological and chemical weapons. - Continued support of WMD sensor testing at the Technical Evaluation Assessment and Monitor Site to detect and prevent nuclear grade material from entering the United States, U.S. territories, and Allied Nations through air, rail, and ship ports. - Continued testing chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE) sensors, WMD countermeasures, remote geological sensing, and battle management systems designed for surveillance and tracking targets used for WMD activities. - Continued nuclear detection and forensics testing to prevent weapons grade material/dirty bombs from entering the United States, U.S. territories, and Allied Nations. - Continued environmental test bed remediation and compliance activities at the Nevada National Security Site, White Sands Missile Range, and Kirkland AFB in accordance with Environmental Protection Agency (EPA), safety, and environmental guidelines. Defer major demolition and restoration efforts of major test articles while ensuring they are safely closed and sealed at acceptable standards. - Maintained current inventory of infrastructure and instrumentation, extending the life-cycle of these items as long as possible to ensure test beds meet customers' advanced technology testing needs.			
FY 2016 Plans: - Begin testing at Nevada National Security Site in support of the nonproliferation portion of the National Center for Nuclear Security portfolio. - Conduct CWMD testing/demonstration at Nevada National Security Site to defeat credible and threat-based scenarios with transition into several related projects/planned events. - Continue technical and testing development/support of Transatlantic Collaborative Biological Resiliency Demonstration, a DoD capability to shape interagency approach to counter a wide area biological event impacting U.S. and partner nations' key civilian/ military infrastructure. - Perform testing in support of Treaty Verification Technology program and Source Physics Experiment to support Comprehensive Test Ban Treaty initiatives. - Continue support of WMD sensor testing at the Technical Evaluation Assessment and Monitor Site to detect and prevent nuclear grade material from entering the United States, U.S. territories, and Allied Nations through air, rail, and ship ports. - Test chemical, biological, radiological, nuclear and high explosive (CBRNE) sensors, WMD countermeasures, remote geological sensing, and battle management systems designed for surveillance and tracking targets used for WMD activities.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** **RR / *Countering WMD Test and Evaluation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conduct environmental remediation and compliance activities at the Nevada National Security Site, White Sands Missile Range, and Kirtland AFB in accordance with Environmental Protection Agency, safety, and environmental guidelines. Secure major demolition and restoration efforts of major test articles while ensuring they are safely closed and sealed at acceptable standards. - Continue to maintain current inventory of infrastructure and instrumentation, extending the life-cycle of these items as long as possible, to ensure test beds meet customers' advanced technology testing needs. - Continue to document, prioritize, and support test infrastructure requirements. - Conduct collection campaigns with interagency participation specific to relevant CWMD data collection requirements. ***FY 2017 Plans:*** - Develop and test CBRNE sensors, WMD countermeasures, remote geological sensing, and battle management systems designed for surveillance and tracking of WMD targets. - Continue to develop technical and testing capabilities in support of the Transatlantic Collaborative Biological Resiliency Demonstration, a DoD effort to shape interagency approaches to counter a wide area biological event. - Continue testing at the Nevada National Security Site in support of the nonproliferation portion of the National Center for Nuclear Security portfolio. - Continue WMD sensor testing at the Technical Evaluation Assessment and Monitoring site to develop capabilities for detection of nuclear grade material. - Conduct Special Project CWMD testing and demonstrations at the Nevada National Security Site to defeat credible and threat-based scenarios with transition into several related projects/planned events. - Continue environmental remediation and compliance activities at New Mexico and Nevada test sites to meet federal and state environmental guidelines. Remediate major test articles within acceptable standards. - Conduct collection campaigns with interagency participation specific to warfighter CWMD data requirements. - Design diagnostics and instrumentation in support of the Department of Energy and National Laboratories Treaty Verification Technology program and Source Physics Experiment to support Comprehensive Test Ban Treaty initiatives. - Provide required test planning, design, execution, and reporting to ensure the successful execution of the DTRA Agent Defeat Warfighter Capability Strategic Initiative. - Reconstitute and sustain the current inventory of research, development, test and evaluation infrastructure and instrumentation.			
Accomplishments/Planned Programs Subtotals	10.277	11.062	13.666

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** **RR / *Countering WMD Test and Evaluation*

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
• 27/0603160BR: *Counterproliferation Initiatives - Proliferation, Prevention, and Defeat*	12.150	-	-	-	-	-	-	-	-	Continuing	Continuing

Remarks

D. Acquisition Strategy

Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across the DoD and other government agency laboratories, academia, industry and international partner organizations.

E. Performance Metrics

Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *WMD Defeat Technologies*	Project (Number/Name) ***RU / *Basic Research for Countering WMD*	

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
***RU: *Basic Research for Countering WMD*	21.310	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.310

Note

***Project RU title changes from Fundamental Research for Combating WMD to Basic Research for Countering WMD beginning in FY 2017.

A. Mission Description and Budget Item Justification

The Basic Research for Countering Weapons of Mass Destruction (CWMD) project conducts technology reviews of the Defense Threat Reduction Agency's (DTRA's) Basic Research Program to identify promising emerging science with potential to be matured into CWMD technologies. The advancement of technology and science into applied technology development efforts focuses upon increasing the stability and utility of mid-to-long term, moderate risk but high payoff science, and emerging technologies for transition to other DTRA applied technology programs. This effort serves as the bridge between the bench scientist and the applied technologist.

Activities in this project are complete.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: RU: Basic Research for Countering WMD	0.000	-	-
Description: This project provides (1) strategic studies to support the Department of Defense (DoD), (2) decision support tools and analysis to support CWMD research and development investments, and (3) early applied research for technology development.			
FY 2015 Accomplishments: N/A			
Accomplishments/Planned Programs Subtotals	0.000	-	-

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
• 1/0601000BR: *DTRA Basic Research Initiative*	36.607	38.436	35.436	-	35.436	38.408	38.918	39.419	40.185	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Threat Reduction Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602718BR / *WMD Defeat Technologies*	**Project (Number/Name)** ***RU / *Basic Research for Countering WMD*

D. Acquisition Strategy

Assess government, academic, and industrial performers and make selections based upon a "best fit for task" criteria. Common government awardees include DoD Service Laboratories and Department of Energy National Laboratories.

E. Performance Metrics

Project performance is measured via a combination of statistics including the number of publications generated, number of students trained in sciences and engineering supporting DoD's educational goals, number of participating research organizations, and the percentage of participating universities on the U.S. News & World Report "Best Colleges" list. Additional performance indicators include the publication of an annual basic research technical and external programmatic review report. Each study/project will commence within three months of customer's requests and results delivered within three months of completion.

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