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# **Department of Defense Fiscal Year (FY) 2018 Budget Estimates**

May 2017



**Defense Threat Reduction Agency**

*Defense-Wide Justification Book Volume 5 of 5*

***Research, Development, Test & Evaluation, Defense-Wide***

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Defense Threat Reduction Agency • Budget Estimates FY 2018 • RDT&E Program

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**Exhibit R-1, RDT&E Programs Defense**

**Threat Reduction Agency Fiscal**

**Year 2018-2022 President's Budget**

**Appropriation: RDT&E, Defense-Wide**

**Date: May 2017**

**OVERVIEW**

Weapons of mass destruction (WMD), improvised explosive devices (IEDs), and asymmetric techniques present immediate, persistent, and evolving threats to our nation's security. Countering weapons of mass destruction (CWMD) and countering improvised threats are at the forefront of Defense priorities and are the Defense Threat Reduction Agency's (DTRA's) primary focus. DTRA safeguards the United States and its allies from WMD and IEDs by integrating, synchronizing, and providing responsive expertise, technologies, and capabilities. This mission is directly aligned to strategic and operational planning guidance in the National Security Strategy, National Military Strategy, Defense Planning Guidance, Department of Defense (DoD) Agency Strategic Plan, Quadrennial Defense Review, 2014 DoD Strategy for Countering Weapons of Mass Destruction, 2014 Independent Review of the Department of Defense Nuclear Enterprise, 2010 Nuclear Posture Review, 2015 Implementation Directive for Better Buying Power 3.0, Assistant Secretary of Defense for Nuclear, Chemical, and Biological (NCB) Defense Programs Strategic Planning Guidance for FY 2018-2022, and DTRA/Strategic Command Center for Combating WMD (SCC-WMD) 2016-2020 Strategic Plan.

The Research, Development, Test & Evaluation (RDT&E) budget funds research supporting DTRA's chartered responsibilities and national commitments across the chemical, biological, radiological, nuclear, and high-yield explosives mission space. This research provides critical, cost-effective solutions to strategic, operational, and technical challenges associated with WMD surveillance, detection, defeat, prevention, nonproliferation, counterproliferation, consequence management, and monitoring and verification.

As a strategic component of the DTRA mission to safeguard the United States and its allies from global WMD, the Basic Research balances the imperatives of unconstrained exploration, discovery, and experimentation with near- and mid-term priorities arising because of continuously evolving threat environments. In support of this mission, the portfolio has two principle goals: (1) To facilitate innovative solutions and revolutionary technologies that transition to cost effective threat reduction capabilities; and (2) to actively promote the development of the next generation of scientists and researchers committed to maintaining U.S. technological superiority in achieving the Countering WMD (CWMD) mission.

The CounterWMD Applied Research portfolio advances DTRA's CWMD mission by balancing the following imperatives: (1) Invest in DTRA's applied research capabilities and increase the CWMD technology base to maximize future pay-off; (2) 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 (3) ensure applied research efforts are directly aligned to the mission-specific capability requirements of the Military Departments, Combatant Commanders, other DoD and federal agencies and international partners.

The Counter WMD Advanced Technology Development portfolio advances the CWMD mission by selecting initiatives that meet the following criteria: (1) Transitioning technologies meet mission-specific capability requirements of the Military Departments, Combatant Commanders, other DoD and federal agencies, and international partners; (2) preliminary assessments of components and subsystems confirm the highest potential for technological feasibility, operability, and producibility upon transition out of science and technology (S&T) research; and, (3) programs demonstrate cost effectiveness or cost reduction potential during field testing or simulation at scale. Additional investment in the CounterWMD Systems Development and portfolio supports International Monitoring System technology requirements under the Nuclear Arms Control Technology program. This portfolio directly supports U.S. and allied warfighter and national technical monitoring requirements and provides vital data used by the treaty monitoring community.

DTRA is committed to supporting Small Business Innovation Research and Small Business Technology Transfer programs. These programs stimulate technological innovation in the private sector, strengthen the role of small business in meeting DoD research and development needs, foster participation of minority and disadvantaged businesses in technological innovation, and increase the commercial application of DoD-supported research and development results.

DTRA rebalanced the overall Agency portfolio to align with strategic direction and minimize risk. The FY 2018 budget submission balances near term operational needs with future technical developments and capabilities. Reductions to the RDT&E portfolio impacted investment in efforts with lower return on investment, lower customer demand, or that were early in the development cycle. Additionally, the submission reflects Service Requirement Review Board reductions, as part of the Department of Defense reform agenda, for consolidation and reduction of service contracts.

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Department of Defense  
 FY 2018 President's Budget Request  
 Exhibit R-1 FY 2018 President's Budget Request  
 Total Obligational Authority  
 (Dollars in Thousands)

25 Apr 2017

Appropriation	FY 2017			FY 2017			FY 2017			FY 2017		
	FY 2016 Base + OCO	PB Request with CR Adj Base	Total PB Requests* with CR Adj Base	FY 2017 PB Request with CR Adj OCO	FY 2017 PB Request with CR Adj OCO	P.B. Requests* with CR Adj OCO	Total P.L.114-254** with CR Adj OCO	Less Enacted Div B OCO	FY 2017 Remaining Req OCO			
Research, Development, Test & Eval, DW	503,342	461,305	461,305									
<b>Total Research, Development, Test &amp; Evaluation</b>	<b>503,342</b>	<b>461,305</b>	<b>461,305</b>									

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 (Dollars in Thousands)

25 Apr 2017

Appropriation	FY 2017 Total PB Requests** with CR Adj Base+OCO+SAA	FY 2017 Total PB Requests* with CR Adj Base + OCO	FY 2017 Less Enacted Div B P.L.114-254** OCO	FY 2017 Remaining Req with CR Adj Base + OCO	FY 2018 Base	FY 2018 OCO	FY 2018 Total
	-----	-----	-----	-----	-----	-----	-----
Research, Development, Test & Eval, DW	461,305	461,305		461,305	469,957		469,957
Total Research, Development, Test & Evaluation	461,305	461,305		461,305	469,957		469,957

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 • Total Obligational Authority  
 (Dollars in Thousands)

25 Apr 2017

Summary Recap of Budget Activities	FY 2016 Base + OCO	FY 2017 PB Request with CR Adj Base	FY 2017 Total PB Requests* with CR Adj Base	FY 2017 PB Request with CR Adj OCO	FY 2017 Total PB Requests* with CR Adj OCO	FY 2017 Less Enacted Div B P.L.114-254**	FY 2017 Remaining Req with CR Adj OCO
Basic Research	38,288	35,436	35,436				
Applied Research	149,302	154,857	154,857				
Advanced Technology Development	298,123	266,444	266,444				
System Development And Demonstration	7,156	4,568	4,568				
Management Support	10,473						
Total Research, Development, Test & Evaluation	503,342	461,305	461,305				
Summary Recap of FYDP Programs							
Research and Development	503,342	461,305	461,305				
Total Research, Development, Test & Evaluation	503,342	461,305	461,305				

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Summary Recap of Budget Activities	FY 2017 Total PB Requests** with CR Adj Base+OCO+SAA	FY 2017 Total PB Requests* with CR Adj Base + OCO	FY 2017 Less Enacted Div B P.L.114-254** OCO	FY 2017 Remaining Req with CR Adj Base + OCO	FY 2018 Base	FY 2018 OCO	FY 2018 Total
<hr/>							
Basic Research	35,436	35,436		35,436	37,201		37,201
Applied Research	154,857	154,857		154,857	157,908		157,908
Advanced Technology Development	266,444	266,444		266,444	268,607		268,607
System Development And Demonstration	4,568	4,568		4,568	6,241		6,241
Management Support							
Total Research, Development, Test & Evaluation	461,305	461,305		461,305	469,957		469,957
<hr/>							
Summary Recap of FYDP Programs							
Research and Development	461,305	461,305		461,305	469,957		469,957
Total Research, Development, Test & Evaluation	461,305	461,305		461,305	469,957		469,957

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Defense-Wide  
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 (Dollars in Thousands)

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	FY 2016 Base + OCO	FY 2017 PB Request with CR Adj Base	FY 2017 Total PB Requests* with CR Adj Base	FY 2017 PB Request with CR Adj OCO	FY 2017 Total PB Requests* with CR Adj OCO	FY 2017 Less Enacted Div B P.L.114-254**	FY 2017 Remaining Req with CR Adj OCO
<b>Summary Recap of Budget Activities</b>							
Basic Research	38,288	35,436	35,436				
Applied Research	149,302	154,857	154,857				
Advanced Technology Development	298,123	266,444	266,444				
System Development And Demonstration	7,156	4,568	4,568				
Management Support	10,473						
<b>Total Research, Development, Test &amp; Evaluation</b>	<b>503,342</b>	<b>461,305</b>	<b>461,305</b>				
<b>Summary Recap of FYDP Programs</b>							
Research and Development	503,342	461,305	461,305				
<b>Total Research, Development, Test &amp; Evaluation</b>	<b>503,342</b>	<b>461,305</b>	<b>461,305</b>				

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FY 2018 President's Budget Request  
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Summary Recap of Budget Activities	FY 2017 Total PB Requests** with CR Adj Base+OCO+SAA	FY 2017 Total PB Requests* with CR Adj Base + OCO	FY 2017 Less Enacted Div B P.L.114-254** OCO	FY 2017 Remaining Req with CR Adj Base + OCO	FY 2018 Base	FY 2018 OCO	FY 2018 Total
<hr/>							
Basic Research	35,436	35,436		35,436	37,201		37,201
Applied Research	154,857	154,857		154,857	157,908		157,908
Advanced Technology Development	266,444	266,444		266,444	268,607		268,607
System Development And Demonstration	4,568	4,568		4,568	6,241		6,241
Management Support							
Total Research, Development, Test & Evaluation	461,305	461,305		461,305	469,957		469,957
<hr/>							
Summary Recap of FYDP Programs							
Research and Development	461,305	461,305		461,305	469,957		469,957
Total Research, Development, Test & Evaluation	461,305	461,305		461,305	469,957		469,957

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 (Dollars in Thousands)

25 Apr 2017

Appropriation	FY 2017			FY 2017			FY 2017			FY 2017		
	FY 2016 Base + OCO	FY 2017 PB Request with CR Adj Base	Total PB Requests* with CR Adj Base	FY 2017 PB Request with CR Adj OCO	FY 2017 PB Requests* with CR Adj OCO	P.L.114-254**	Div B	Less Enacted	Remaining Req	FY 2017 with CR Adj OCO		
Defense Threat Reduction Agency	503,342	461,305	461,305									
Total Research, Development, Test & Evaluation	503,342	461,305	461,305									

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Appropriation	FY 2017 Total PB Requests** with CR Adj Base+OCO+SAA	FY 2017 Total PB Requests* with CR Adj Base + OCO	FY 2017 Less Enacted Div B P.L.114-254** OCO	FY 2017 Remaining Req with CR Adj Base + OCO	FY 2018 Base	FY 2018 OCO	FY 2018 Total
	Defense Threat Reduction Agency	461,305	461,305		461,305	469,957	
Total Research, Development, Test & Evaluation	461,305	461,305		461,305	469,957		469,957

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Appropriation: 0400D Research, Development, Test &amp; Eval, DW

Program Line Element No	Item	Act	FY 2016	FY 2017	FY 2017	FY 2017	FY 2017	FY 2017	FY 2017	FY 2017	
			Base + OCO	PB Request with CR Adj Base	Total PB Requests* with CR Adj Base	PB Request with CR Adj OCO	Total PB Requests* with CR Adj OCO	Less Div B P.L.114-254** OCO	Remaining Req with CR Adj OCO	S	
1 0601000BR	DTRA Basic Research	01	38,288	35,436	35,436						U
	Basic Research		38,288	35,436	35,436						
20 0602718BR	Counter Weapons of Mass Destruction Applied Research	02	149,302	154,857	154,857						U
	Applied Research		149,302	154,857	154,857						
26 0603160BR	Counter Weapons of Mass Destruction Advanced Technology Development	03	298,123	266,444	266,444						U
	Advanced Technology Development		298,123	266,444	266,444						
123 0605000BR	Counter Weapons of Mass Destruction Systems Development	05	7,156	4,568	4,568						U
	System Development And Demonstration		7,156	4,568	4,568						
154 0605502BR	Small Business Innovation Research	06	10,473								U
	Management Support		10,473								
<b>Total Research, Development, Test &amp; Eval, DW</b>			<b>503,342</b>	<b>461,305</b>	<b>461,305</b>						

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Total Obligational Authority  
(Dollars in Thousands)

25 Apr 2017

Appropriation: 0400D Research, Development, Test &amp; Eval, DW

Program Line Element No	Item	FY 2017 Total	FY 2017 Total	FY 2017 Less Enacted	FY 2017 Remaining Req	FY 2018 Base	FY 2018 OCO	FY 2018 Total	S e c
		PB Requests** with CR Adj	PB Requests* with CR Adj	Div B P.L.114-254** OCO	with CR Adj				
		Act Base+OCO+SAA	Base + OCO		Base + OCO				
1 0601000BR	DTRA Basic Research	01	35,436	35,436		35,436	37,201	37,201	U
	Basic Research		35,436	35,436		35,436	37,201	37,201	
20 0602718BR	Counter Weapons of Mass Destruction Applied Research	02	154,857	154,857		154,857	157,908	157,908	U
	Applied Research		154,857	154,857		154,857	157,908	157,908	
26 0603160BR	Counter Weapons of Mass Destruction Advanced Technology Development	03	266,444	266,444		266,444	268,607	268,607	U
	Advanced Technology Development		266,444	266,444		266,444	268,607	268,607	
123 0605000BR	Counter Weapons of Mass Destruction Systems Development	05	4,568	4,568		4,568	6,241	6,241	U
	System Development And Demonstration		4,568	4,568		4,568	6,241	6,241	
154 0605502BR	Small Business Innovation Research	06	-----	-----	-----	-----	-----	-----	U
	Management Support		-----	-----	-----	-----	-----	-----	
Total Research, Development, Test & Eval, DW			461,305	461,305		461,305	469,957	469,957	

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 (Dollars in Thousands)

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Appropriation: 0400D Research, Development, Test &amp; Eval, DW

Program Line Element No	Item	Act	FY 2016	FY 2017	FY 2017	FY 2017	FY 2017	FY 2017	FY 2017	FY 2017	
			Base + OCO	PB Request with CR Adj Base	Total PB Requests* with CR Adj Base	PB Request with CR Adj OCO	Total PB Requests* with CR Adj OCO	Less Enacted P.L.114-254** OCO	Remaining Req with CR Adj OCO	S	
1 0601000BR	DTRA Basic Research	01	38,288	35,436	35,436						U
	Basic Research		38,288	35,436	35,436						
20 0602718BR	Counter Weapons of Mass Destruction Applied Research	02	149,302	154,857	154,857						U
	Applied Research		149,302	154,857	154,857						
26 0603160BR	Counter Weapons of Mass Destruction Advanced Technology Development	03	298,123	266,444	266,444						U
	Advanced Technology Development		298,123	266,444	266,444						
123 0605000BR	Counter Weapons of Mass Destruction Systems Development	05	7,156	4,568	4,568						U
	System Development And Demonstration		7,156	4,568	4,568						
154 0605502BR	Small Business Innovation Research	06	10,473								U
	Management Support		10,473								
<b>Total Defense Threat Reduction Agency</b>			<b>503,342</b>	<b>461,305</b>	<b>461,305</b>						

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25 Apr 2017

Appropriation: 0400D Research, Development, Test &amp; Eval, DW

Program Line Element No	Item	FY 2017		FY 2017		FY 2017		FY 2018 Base	FY 2018 OCO	FY 2018 Total	S e c
		Act	PB Requests** with CR Adj Base+OCO+SAA	Total PB Requests* with CR Adj Base + OCO	Less Enacted Div B P.L.114-254** OCO	Remaining Req with CR Adj Base + OCO					
1 0601000BR	DTRA Basic Research	01	35,436	35,436		35,436	37,201			37,201	U
Basic Research			35,436	35,436		35,436	37,201			37,201	
20 0602718BR	Counter Weapons of Mass Destruction Applied Research	02	154,857	154,857		154,857	157,908			157,908	U
Applied Research			154,857	154,857		154,857	157,908			157,908	
26 0603160BR	Counter Weapons of Mass Destruction Advanced Technology Development	03	266,444	266,444		266,444	268,607			268,607	U
Advanced Technology Development			266,444	266,444		266,444	268,607			268,607	
123 0605000BR	Counter Weapons of Mass Destruction Systems Development	05	4,568	4,568		4,568	6,241			6,241	U
System Development And Demonstration			4,568	4,568		4,568	6,241			6,241	
154 0605502BR	Small Business Innovation Research Management Support	06									U
Total Defense Threat Reduction Agency			461,305	461,305		461,305	469,957			469,957	

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***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

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Line #	Budget Activity	Program Element Number	Program Element Title	Page
1	01	0601000BR	*DTRA Basic Research.....	Volume 5 - 1

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20	02	0602718BR	*Counter Weapons of Mass Destruction Applied Research.....	Volume 5 - 7

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Line #	Budget Activity	Program Element Number	Program Element Title	Page
26	03	0603160BR	*Counter Weapons of Mass Destruction Advanced Technology Development.....	Volume 5 - 41

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***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

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123	05	0605000BR	*Counter Weapons of Mass Destruction Systems Development.....	Volume 5 - 75

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154	06	0605502BR	Small Business Innovation Research.....	Volume 5 - 83

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*Counter Weapons of Mass Destruction Advanced Technology Development	0603160BR	26	03.....	Volume 5 - 41
*Counter Weapons of Mass Destruction Applied Research	0602718BR	20	02.....	Volume 5 - 7
*Counter Weapons of Mass Destruction Systems Development	0605000BR	123	05.....	Volume 5 - 75
*DTRA Basic Research	0601000BR	1	01.....	Volume 5 - 1
Small Business Innovation Research	0605502BR	154	06.....	Volume 5 - 83

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Defense Threat Reduction Agency • Budget Estimates FY 2018 • RDT&amp;E Program

## Exhibit R-1

(Listing by Budget Activity, then Program Element Number)

**BA# 01: Basic Research**

				Cost (\$ in Millions)					
Line#	BA#	PE#	PE Title	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
1	01	0601000BR	*DTRA Basic Research	216.027	38.288	35.436	37.201	-	37.201
<b>Total:</b> Basic Research				216.027	38.288	35.436	37.201	-	37.201

**BA# 02: Applied Research**

				Cost (\$ in Millions)					
Line#	BA#	PE#	PE Title	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
20	02	0602718BR	*Counter Weapons of Mass Destruction Applied Research	831.914	149.302	154.857	157.908	-	157.908
<b>Total:</b> Applied Research				831.914	149.302	154.857	157.908	-	157.908

**BA# 03: Advanced Technology Development (ATD)**

				Cost (\$ in Millions)					
Line#	BA#	PE#	PE Title	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
26	03	0603160BR	*Counter Weapons of Mass Destruction Advanced Technology Development	1,398.986	298.123	266.444	268.607	-	268.607

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**Exhibit R-1**

(Listing by Budget Activity, then Program Element Number)

**BA# 03: Advanced Technology Development (ATD)**

Line#	BA#	PE#	PE Title	Cost (\$ in Millions)				
				Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 Total
			<b>Total:</b> Advanced Technology Development (ATD)	1,398.986	298.123	266.444	268.607	- 268.607

**BA# 05: System Development & Demonstration (SDD)**

Line#	BA#	PE#	PE Title	Cost (\$ in Millions)				
				Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 Total
123	05	0605000BR	*Counter Weapons of Mass Destruction Systems Development	77.733	7.156	4.568	6.241	- 6.241
			<b>Total:</b> System Development & Demonstration (SDD)	77.733	7.156	4.568	6.241	- 6.241

**BA# 06: RDT&E Management Support**

Line#	BA#	PE#	PE Title	Cost (\$ in Millions)				
				Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 Total
154	06	0605502BR	Small Business Innovation Research	38.612	10.473	0.000	0.000	- 0.000
			<b>Total:</b> RDT&E Management Support	38.612	10.473	0.000	0.000	- 0.000

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Exhibit R-1

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## ACRONYMS

AA-HPRT	Analytics Hard Problem Research Team
ACES	Arms Control Enterprise System
AD	Agent Defeat
ADMB	Agent Defeat Modeling and Simulation Baseline
AEHF	Advanced Extremely High Frequency
AFX	Air Force Explosive
AI	Active Interrogation
AOR	Area of Responsibility
ARAT	Adversarial Route Analysis Tool
ARIEL	Autonomous Reconnaissance Infrared Electro-optical Loitering
ASIC	Application Specific Integrated Circuit
ATAC	Advanced Targeting Assessment Capability
ATD	Advanced Technology Development
AUV	Autonomous Underwater Vehicle
AWE	Atomic Weapons Establishment
BAA	Broad Agency Announcement
BDA	Battle Damage Assessment
BDI	Battle Damage Information
BLADE	BDI Link Advanced Demonstrator
BLU	Bomb, Live Unit
C4I	Command, Control, Communications, Computers, and Intelligence
CANES	Consolidated Afloat Network and Enterprise Services
CAPE	Cost Assessment and Program Evaluation
CARDS	CBRN Air-droppable Remotely Deployed Sensor System
CATTS	Cost Analysis Tool for Test Sites
C-B	Chemical-Biological
CBP	Customs and Border Protection
CBRNE	Chemical, Biological, Radiological, Nuclear, and High-yield Explosives
CCDR	Combatant Commander
CFD	Computational Fluid Dynamics
CHAMP	Counter Electronics High Power Microwave Advanced Missile Project
CJCS	Chairman, Joint Chiefs of Staff
CNDSP	Computer Network Defense Service Provider
CCMD	Combatant Command
COE	Consequence of Execution
CoE-NI	Consequence of Execution – Nuclear Integration
COI	Community of Interest
CONOPS	Concept of Operations
CONUS	Continental United States
COOP	Continuity of Operations
COP	Common Operating Picture
CP	Counter-proliferation

CPGS	Conventional Prompt Global Strike
CSM	Computational Structure Mechanics
CTBT	Comprehensive Nuclear Test Ban Treaty
CT/CP	Counterterrorism / Counterproliferation
CTS	Component Test Structure
CTTS	CBRNE Tactical Training System
C-WAC	Counter-WMD Analysis Center
CWMD	Countering Weapons of Mass Destruction
CWMD-T	Combating Weapons of Mass Destruction –Terrorism
DAPSS	Denied Area Persistent Sensor System
DEL	DTRA Experimentation Lab
DHS	Department of Homeland Security
DIAMONDS	Defense Integration and Management of Nuclear Data Services
DIOCC/DIA	Defense Intelligence Operations Coordination Center/Defense Intelligence Agency
DITEC	DTRA Integration Technical Experimentation Center
DoD	Department of Defense
DO	DISCREET OCULUS
DOE	Department of Energy
DOJ	Department of Justice
DPG	Dugway Proving Ground
DPPG	Defense Policy and Planning Guidance
DRDC	Defence Research and Development Canada
DSCS	Defense Satellite Communications System
DTRA	Defense Threat Reduction Agency
DT&E	Development, Test and Evaluation
ECBC	Edgewood Chemical Biological Center
EDTC	Engineering and Development Test Center
EM-1	Capabilities of Nuclear Weapons: Effects Manual Number 1
EMP	Electromagnetic Pulse
EMREP	Electromagnetic Reliability and Effects Predictions
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
FEFLO	Finite Element Flow Solver
FFRDC	Federally Funded Research and Development Center
FinFets	Fin-Shaped Field Effect Transistors
FOC	Full Operational Capability
FYDP	Future Years Defense Program
GCC	Global Command and Control
GEF	Guidance for Employment of the Force
GKMC	Global Knowledge Management System
GSA	Global Situational Awareness
GSM	Global System for Mobile Communications
GUI	Graphical User Interface

HAMMER	Heated and Mobile Munitions Employing Rockets
HANE	High Altitude Nuclear Environments
HARP	High Altitude Radiological Phenomenology
HEBX	Hybridized Enhanced Blast Explosive
HEMP	High Altitude Electro Magnetic Pulse
HDBT	Hard and Deeply Buried Target
HPAC	Hazard Prediction and Assessment Capability
HPC	High Performance Computing
HPCMP	High Performance Computing Modernization Program
HTD	Hard Target Defeat
IBRD	Interagency Biological Restoration Demonstration
ICEPIC	Improved Concurrent Electromagnetic Particle-in-Cell
IED	Improvised Explosive Device
IMEA	Integrated Munitions Effects Assessment
IMS	International Monitoring System
IOC	Initial Operational Capability
IPODS	Integrated Precision Ordnance Delivery System
ISIS	Integrated Stand-off Inspection System
ISR	Intelligence, Surveillance, Reconnaissance
ISS	Integrated Sensor System
IR	Infrared
IT	Information Technology
ITD	Integrated Technology Demonstration
IWMDT	Integrated Weapons of Mass Destruction Toolset
JAIEG	Joint Atomic Information Exchange Group
JCAM	Joint Collaborative Analysis Model
JCDE	Joint Concept Development & Experimentation
JCIDS	Joint Capabilities Integration and Development System
JCTD	Joint Concept Technology Demonstration
JDAM	Joint Direct Attack Munition
JEM	Joint Effects Model
JMEWS	Joint Multi-Effects Warhead System
JSAF	Joint Semi-Automated Forces
JWICS	Joint Worldwide Intelligence Communications System
KAFB	Kirtland Air Force Base
keV	kilo-electronvolt
LCP	Large Caliber Penetrator
LLE	Laboratory for Laser Energetics
LLNL	Lawrence Livermore National Laboratory
LTS	Large Test Structure
MACS	Modular Autonomous Countering WMD System
MASS	MILSATCOM Atmospheric Scintillation Simulator
MCNP	Monte Carlo N-Particle
MDA	Missile Defense Agency

M&S	Modeling and Simulation
MEEC	Maxwell's Equivalent Equations Circuit
MET	Modernization of Enterprise Terminals
MILSATCOM	Military Satellite Communications
MFK-R	Mobile Field Kit – Radiological
MIL STD	Military Standard
MPAS	Mission Planning and Assessment System
NACT	Nuclear Arms Control Technology
NATO	North Atlantic Treaty Organization
NAVSATCOMMFACT	Naval Satellite Communications Facility
NBCRV	Nuclear Biological Chemical Reconnaissance Vehicle
NCNS	National Center for Nuclear Security
NCPC	National Counterproliferation Center
NIF	National Ignition Facility
NLP	Natural Language Processing
nm	nanometer
NM	Nuclear Matters
NMCC	National Military Command Center
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NPS	Naval Postgraduate School
NSB	Navy Standardization Board
NSPD	National Security Presidential Directive
NST	New START Treaty
NTNF	National Technical Nuclear Forensics
NTPR	Nuclear Test Personnel Review
NuCS	Nuclear Capability Services
NWE	Nuclear Weapon Effects
NWEN	Nuclear Weapon Effects Network
NWEDS	Nuclear Weapons Effects Database System
NWRM	Nuclear Weapons Related Materiel
OCO	Overseas Contingency Operations
OCONUS	Outside the Continental United States
ODX	Operationally demonstrated/exercised
O&M	Operation and Maintenance
ORNL	Oak Ridge National Laboratory
OSD CAPE	Office of the Secretary of Defense Capability Assessment and Program Evaluation
OSTP	Office of Science and Technology Policy
PASCC	Project on Advanced Systems and Concepts for Countering WMD
PDCALC	Probability of Damage Calculator
PDV	Product Demonstration Vehicle

PMESII	Political, Military, Economic, Social, Infrastructure, and Information
PNAF	Prime Nuclear Airlift Forces
PPD	Presidential Policy Directive
PTS	Provisional Technical Secretariat
QDR	Quadrennial Defense Review
R2TD	Rapid Reaction Tunnel Detection
R&D	Research and Development
RadHard	Radiation Hardened
RFIS	Robust Fuzewell Instrumentation System
RHBD	Radiation Hardened by Design
RHM	Radiation Hardened Microelectronics
RL-16	US radionuclide laboratory
R/N	Radiological/Nuclear
ROM	Rough Order of Magnitude
S&T	Science & Technology
SBIR	Small Business Innovative Research
SCSP	Special Operations Command CWMD-Terrorism Support Program
SEE	Single Event Effects
SGEMP	System-Generated Electromagnetic Pulse
SHAMRC	Second-order Hydrodynamic Automatic Mesh Refinement Code
SHAPE	Supreme Headquarters Allied Powers, Europe
SHIST	Seismic Hardrock in Situ Test
SMDC	US Army Space and Missile Development Command
SNL	Sandia National Laboratory
SNM	Special Nuclear Material
SOF	Special Operations Forces
SOX	Standoff Operational Exercise
SPE	Source Physics Experiment
SPG	Short Pulse Gamma
SREMP	Source Region Electromagnetic Pulse
START	Strategic Arms Reduction Treaty
STTR	Small Business Technology Transfer
TACBRD	TransAtlantic Collaboration Biological Resiliency Demo
TB	Test Bed
TEAMS	Technical Evaluation Assessment and Monitor Site
TNF	Technical Nuclear Forensics
TOA	Total Obligation Authority
TOW	Tube-launched, Optically-tracked, Wireless-guided
TPMM	Technology Program Management Model
TRAC	Threat Reduction Advisory Committee
TRL	Technology Readiness Level
TSG	Technical Support Group
TTL	Tag, Track, Locate

TWAC	Targeting and Weaponeering Analysis Cell
TXL	Transportable Xenon Laboratory
UAS	Unmanned Aerial Systems
UCP	Unified Command Plan
UGF	Underground Facility
UGT	Underground Test
UHPC	Ultra-High Performance Concrete
UK	United Kingdom
USAANCA	U.S. Army Nuclear and Combating WMD Agency
USEUCOM	U.S. European Command
USFK	U.S. Forces Korea
USG	United States Government
USNORTHCOM	U.S. Northern Command
USPACOM	U.S. Pacific Command
USSOCOM	U.S. Special Operations Command
USSTRATCOM	U.S. Strategic Command
UTAS	Underground Targeting and Analysis System
VAPO	Vulnerability Assessment Protection Option
VEO	Violent Extremist Organization
VOIP	Voice Over Internet Protocol
WACS	WMD Aerial Collection System
WCF	West Coast Facility
WEP	Weapon Effects Phenomenology
WESC	Weapon Effects Steering Committee
WMD	Weapons of Mass Destruction
WSMR	White Sands Missile Range

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Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 1: Basic Research					PE 0601000BR / *DTRA Basic Research							
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	216.027	38.288	35.436	37.201	-	37.201	37.340	37.563	38.609	39.644	Continuing	Continuing
RU: **Basic Research for Countering WMD	216.027	38.288	35.436	37.201	-	37.201	37.340	37.563	38.609	39.644	Continuing	Continuing

**Note**

\*Program Element 0601000BR name changes from DTRA Basic Research Initiative to DTRA Basic Research beginning in FY 2018.

\*\*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**

Defense Threat Reduction Agency (DTRA) Basic Research funds research across physical, material, engineering, computational, and life sciences directed toward greater knowledge and understanding of the fundamental aspects of observable phenomena associated with weapons of mass destruction (WMD).

DTRA's Basic Research is the Nation's only basic research program solely dedicated to countering weapons of mass destruction (CWMD). It provides for the discovery and development of basic knowledge by research performers comprised from academia and world-class research institutions in government and industry. This investment helps motivate the scientific community to conduct research benefiting WMD-related defense missions, advancing the body of CWMD knowledge, and improving knowledge of research efforts that benefit nonproliferation, counter proliferation, and consequence management efforts. These efforts are closely coordinated with DTRA's Chemical and Biological Technologies Department, which executes a basic research program under DoD's Chemical and Biological Defense Program.

Each year, program and technical managers conduct formal assessments of the portfolio, leveraging deep Science and Technology (S&T) expertise within DTRA, as well as from the Defense Basic Research Advisory Group, independent external panel reviews, and other CWMD-focused stakeholders. This coordination facilitates unique, CWMD-relevant basic research while eliminating unintended duplication of effort in the broader defense S&T community.

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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> FY 2018 Defense Threat Reduction Agency					<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b>	<b>R-1 Program Element (Number/Name)</b>				
0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide / BA 1: Basic Research</i>	PE 0601000BR / *DTRA Basic Research				
<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>
Previous President's Budget	38.436	35.436	38.408	-	38.408
Current President's Budget	38.288	35.436	37.201	-	37.201
Total Adjustments	-0.148	0.000	-1.207	-	-1.207
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.075	-			
• SBIR/STTR Transfer	-0.073	-			
• Realignments	-	-	-1.207	-	-1.207
<b>Change Summary Explanation</b>					
The decrease in FY 2018 from the previous President's Budget submission is due to a shift in investment priorities to fund Special Test Bed capability requirements for missile defeat in Program Element 0603160BR.					

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency										Date: May 2017		
Appropriation/Budget Activity 0400 / 1					R-1 Program Element (Number/Name) PE 0601000BR / *DTRA Basic Research				Project (Number/Name) RU I **Basic Research for Countering WMD			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
RU: **Basic Research for Countering WMD	216.027	38.288	35.436	37.201	-	37.201	37.340	37.563	38.609	39.644	Continuing	Continuing

**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 WMD project, as the nation's only basic research solely dedicated to countering weapons of mass destruction (CWMD), is a core strategic investor in future scientific and technological progress across the full spectrum of Defense Threat Reduction Agency's (DTRA's) CWMD mission areas. This project concentrates on high risk, high-payoff basic research, leveraging world-class expertise in academia, government, and industry to increase the foundational body of scientific knowledge supporting DTRA's Applied Research and Advanced Technology Development projects. This Initiative aligns with DTRA's strategic objectives that 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 addresses this guidance through capability enhancements, projects, and Science and Technology (S&T) investments that support CWMD and reduce global nuclear dangers. Specifically, they include: Accelerating the development of standoff radiological/nuclear detection capabilities; researching countermeasures and defenses to non-traditional agents; enhancing nuclear forensics; securing vulnerable materials; developing new verification technologies; developing an in-depth understanding of the capabilities, values, intent, and decision making of potential adversaries, whether they are states, networks, or individuals; defeating WMD agents; researching biologically-based and inspired materials for DoD applications; and leveraging science, technology, and innovation through domestic and international partnerships and agreements. This project solicits, coordinates, and conducts basic research aligned to five Thrust Areas. Each Thrust Area Manager coordinates an independently reviewed portfolio of research projects selected for scientific merit, technical quality, and the potential for innovation.

Thrust Area 1: Science of WMD Sensing and Recognition. This thrust area explores novel methodologies to investigate physical properties of sensitive materials as they interact with phenomena associated with WMD, such as ionizing radiation. This research provides the basis for developing capabilities to discover the presence, identity, and quantity of material or energy in the environment that may be significant, in turn providing the means to develop advanced forensic applications that enable detection, characterization, and attribution, particularly in post-detonation radiative environments.

Thrust Area 2: Network Sciences. This thrust area explores analytical, numerical, computational, and other mathematical approaches to model and simulate the behavior of layered, interdependent physical networks affected by WMD. This interdisciplinary, theoretical research provides the basis for developing advanced algorithms and analytical frameworks that accurately predict and depict WMD environments by characterizing impacts and vulnerabilities, representing root causes of cascading failures, and assessing robustness, resilience, restoration, and recovery in varying degrees of disruption.

Thrust Area 3: Science for Protection. This thrust area employs experimental, computational, and theoretical approaches to explore and understand the causal mechanisms and deleterious characteristics of ionizing radiation and the tolerance, response, and resistance characteristics of affected sensitive electronic systems and microorganisms. This research provides the basis for engineering resilient systems and technologies, offering radical improvements to the survivability and performance of mission-critical electronic equipment and personnel in hostile radiative environments.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency		<b>Date:</b> May 2017	
<b>Appropriation/Budget Activity</b> 0400 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601000BR / *DTRA Basic Research	<b>Project (Number/Name)</b> RU I **Basic Research for Countering WMD	
Thrust Area 4: Science to Defeat WMD. Through experimentation and computational modeling and simulation, this thrust area investigates phenomena associated with penetration physics, shock propagation and turbulence dynamics, and researches novel energetic and reactive materials for defeat of targets containing WMD. This research provides the scientific foundation necessary to develop advanced solutions for: (1) Accessing WMD in hardened and deeply buried infrastructure, (2) defeating (non-nuclear) targets with minimal unintended collateral effects, and (3) predicting post-detonation (non-nuclear) weapon effects.			
Thrust Area 5: Science to Secure WMD. This thrust area leverages a wide range of scientific and mathematical disciplines to explore phenomena related to physical, biological, and chemical interactions with radioactive particles and waveforms. This research provides the technical basis for development of innovative, unconventional applications to improve security oversight and control of WMD materials and facilities and to improve monitoring and surveillance systems related to arms control and nonproliferation.			
The decrease from FY 2016 to FY 2017 balances near term operational needs with future technical developments and capabilities. The increase from FY 2017 to FY 2018 is due to the relative impact of the decrease in FY 2017.			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<p><b>Title:</b> Project RU: Basic Research for Countering WMD</p> <p><b>Description:</b> Project RU funds the exploration and discovery of fundamental scientific knowledge related to DTRA's CWMD mission by research performers from academia, government, and industry.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"><li>- Managed over 150 active basic research awards on a three to five year cycle. The Agency's Basic Research portfolio directly addresses the DoD CWMD S&amp;T priority and supports the specific priorities on Autonomy, Data to Decisions, Electronic Protection, and Engineered Resilient Systems.</li><li>- Supported the development of the future Science, Technology, Engineering, and Mathematics workforce by supporting world-class talent in WMD research at universities and laboratories.</li><li>- Conducted an annual technical review of each grant to assess the scientific advancements and progress in meeting the award's technical objectives and to foster collaboration and build relationships within the scientific community.</li><li>- Conducted an annual external panel review of the basic research program that is open to DoD research stakeholders. The review will assess the focus and scope of the program concerning CWMD challenges and assess the coordination of CWMD basic research across the DoD mission space and the broader basic research community to avoid duplication and ensure successful partnerships.</li><li>- Researchers discovered that cognitive impairment from radiation exposure occurs at much lower levels, and on later timelines than previously thought. New data rewrites the exposure/protection guidelines in consideration of after-battlefield effects.</li><li>- Researchers developed a new model to characterize and assess power grid responses to WMD events on a country-wide scale. The Defense Advanced Research Projects Agency, the National Science Foundation, and Advanced Research Projects Agency-Energy have awarded research grants based on these results.</li></ul>	38.288	35.436	37.201

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601000BR / *DTRA Basic Research	Project (Number/Name) RU / **Basic Research for Countering WMD	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016      FY 2017      FY 2018
<p>- Researchers found the use of micro-vesicles harvested from normal adult stem cells could reverse the effects of radiation-induced cognitive impairment. The finding has potential to lead to a new class of therapeutics to counteract battlefield radiation exposure.</p> <p>- Researchers developed a novel spectroscopic technique to differentiate isotopic signatures in molecules. The findings suggest shortened timelines for developing capabilities to perform rapid in-field isotopic analysis of nuclear debris, critical for nuclear forensics.</p> <p>- Researchers developed a new method to reduce noise 100x below the classical limit for atom interferometric sensors; published in Nature. The findings show the potential to greatly improve gravimetric sensors for radiological/nuclear search and tunnel detection.</p> <p>- Researchers developed new low-noise contacts for solid-state radiation detectors by taking advantage of a photon-exchange effect. This research has the potential to eliminate the need for cooling, leading to the development of field ready, high-resolution radiological/nuclear detectors. This research has transitioned to Iljin Radiation Engineering for further development.</p> <p>- A DTRA-funded researcher was chosen as a DoD National Security Science and Engineering Faculty Fellow and another researcher was awarded the Presidential Early Career Award for Scientists and Engineers. These prestigious DoD and Presidential awards showcase the quality of DTRA-funded principal investigators working within the CWMD science and technology mission space.</p>			
<p><b>FY 2017 Plans:</b></p> <p>- Manage over 150 active basic research awards on a three to five year cycle. The Agency's Basic Research portfolio directly addresses the DoD priority on CWMD S&amp;T and supports specific priorities on Autonomy, Data to Decisions, Electronic Protection, and Engineered Resilient Systems.</p> <p>- Support the development of the future Science, Technology, Engineering, and Mathematics workforce by supporting world-class talent in WMD research at universities and laboratories.</p> <p>- Conduct an annual technical review of each grant to assess the scientific advancements and progress in meeting the award's technical objectives and to foster collaboration and build relationships within the scientific community.</p> <p>- Conduct an annual external panel review of the basic research program that is open to DoD research stakeholders. The panel will assess the focus and scope of the program related to CWMD challenges and will assess the coordination of CWMD basic research across the DoD mission space and the broader basic research community to avoid duplication and ensure successful partnerships.</p>			
<p><b>FY 2018 Plans:</b></p> <p>- Shape and oversee the CWMD Basic Research portfolio, comprised of approximately 150 active basic research awards on a three to five year cycle. This portfolio continues to address the DoD priority on CWMD science and technology, and supports specific priorities on Autonomy, Data-driven Decisions, Electronic Protection, System Resiliency and other emerging areas of interest.</p>			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601000BR / *DTRA Basic Research	Project (Number/Name) RU I **Basic Research for Countering WMD		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		FY 2016	FY 2017	FY 2018
- Support world-class talent in WMD research at universities and laboratories to bolster the development of the future Science, Technology, Engineering, and Mathematics workforce by supporting. - Assess entire CWMD Basic Research portfolio on an annual basis. - Assure progress toward technical objectives and support collaborative relationships within the scientific community through an annual technical review of each grant to assess scientific advancement. - Assess the focus and scope of the program related to CWMD challenges and assess the coordination of CWMD basic research across the DoD mission space and the broader basic research community to avoid duplication and ensure successful partnerships via an External Panel Review.				
<b>Accomplishments/Planned Programs Subtotals</b>		38.288	35.436	37.201
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
*Prior year funds are related to this project in program element 0602718BR.				
<b>D. Acquisition Strategy</b>				
Procurement methods include competitive selection awards through DTRA's Broad Agency Announcement and collaborative funding through other organizations.				
<b>E. Performance Metrics</b>				
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 educational goals, number of participating research organizations, and percentage of awards transitioned to other programs for further development.				

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Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Defense Threat Reduction Agency										Date: May 2017		
Appropriation/Budget Activity				R-1 Program Element (Number/Name)								
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 2: Applied Research				PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research								
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	831.914	149.302	154.857	157.908	-	157.908	160.417	160.386	162.878	166.692	Continuing	Continuing
RA: Information Sciences and Applications	160.287	29.133	29.127	30.270	-	30.270	32.325	28.286	29.083	30.077	Continuing	Continuing
**RD: Detection Technologies	0.000	15.083	15.936	14.769	-	14.769	17.005	18.451	17.677	18.035	Continuing	Continuing
RE: Counter-Terrorism Technologies	7.677	0.795	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
**RF: Forensics Technologies	196.608	10.525	10.008	10.274	-	10.274	10.345	10.560	10.771	10.991	Continuing	Continuing
RG: Defeat Technologies	75.082	10.946	11.304	11.060	-	11.060	11.290	11.530	11.770	12.017	Continuing	Continuing
RI: Nuclear Survivability	98.286	30.896	34.051	34.103	-	34.103	34.736	35.438	36.161	36.896	Continuing	Continuing
RL: Nuclear & Radiological Effects	130.489	28.333	28.668	29.228	-	29.228	29.640	30.324	30.999	31.695	Continuing	Continuing
RM: WMD Counterforce Technologies	79.780	12.873	12.097	14.552	-	14.552	12.612	12.852	13.129	13.395	Continuing	Continuing
***RR: Countering WMD Test and Evaluation	62.395	10.718	13.666	13.652	-	13.652	12.464	12.945	13.288	13.586	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**

\*Program Element 0602718BR name changes from WMD Defeat Technologies to Counter Weapons of Mass Destruction Applied Research beginning in FY 2018.

\*\*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) Counter Weapons of Mass Destruction (WMD) Applied Research 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 WMD surveillance, detection, defeat, prevention, nonproliferation, counterproliferation, consequence management, and treaty verification.

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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> FY 2018 Defense Threat Reduction Agency				<b>Date:</b> May 2017				
<b>Appropriation/Budget Activity</b>	<b>R-1 Program Element (Number/Name)</b>							
0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide / BA 2: Applied Research</i>	PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research							
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. 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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>			
Previous President's Budget	152.915	154.857	163.514	-	163.514			
Current President's Budget	149.302	154.857	157.908	-	157.908			
Total Adjustments	-3.613	0.000	-5.606	-	-5.606			
• Congressional General Reductions	-	-						
• Congressional Directed Reductions	-	-						
• Congressional Rescissions	-	-						
• Congressional Adds	-	-						
• Congressional Directed Transfers	-	-						
• Reprogrammings	-	-						
• SBIR/STTR Transfer	-3.613	-						
• Realignments	-	-	-5.606	-	-5.606			
<b>Change Summary Explanation</b>								
The decrease in FY 2018 from the previous President's Budget submission is due to a shift in investment priorities to fund a test and technology capability gap in this program element and incremental Service Requirement Review Board reductions, as part of the Department of Defense reform agenda, for consolidation and reduction of service contracts.								

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) RA / Information Sciences and Applications				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RA: Information Sciences and Applications	160.287	29.133	29.127	30.270	-	30.270	32.325	28.286	29.083	30.077	Continuing	Continuing	
<b>A. Mission Description and Budget Item Justification</b>													
<p>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's) technical reachback teams. This project develops and maintains continuously improving collaborative architectures and Chemical, Biological, Radiological, Nuclear and High-yield Explosives (CBRNE) modeling &amp; 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 through FY 2017. 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 Defense for Nuclear, Chemical, and Biological Defense Matters. This effort also funds the Next Generation Nuclear Professionals (NextGen) activities. This outreach effort 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.</p> <p>The increase from FY 2017 to FY 2018 is due to the net effect of increased investment in hazard and effects characterization and technology-driven WMD threat forecasting and decreased investment in advanced analytics and operations analysis, modeling, and simulations.</p>													
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>											FY 2016	FY 2017	FY 2018
<p><b>Title:</b> RA: Information Sciences and Applications</p> <p><b>Description:</b> Project RA develops concepts and technologies in the areas of high speed information processing, modeling and simulation, signal detection, and data-driven decision analysis.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Delivered Integrated Weapons of Mass Destruction Toolset (IWMDT) V4.0 with 100% updated commercial-off-the-shelf software necessary for compliance with Defense Information Systems Agency Information Assurance standards. This release updates and enhances nuclear models, 3D mapping and scenario visualization capabilities, and supports explicit vulnerability modeling for the Defense Intelligence Agency and U.S. Army Nuclear and Chemical Agency.</li> <li>- Delivered Virtual Radiation Through Ubiquity System (VIRTUS) 1.0 to the Department of Energy Counter Terrorism Operations Support and National Guard Bureau. This baseline virtual training suite of applications for smartphones serves as the basis of curricula training for first responders performing radiation searches and for new sensor familiarization for 57 Weapons of Mass Destruction (WMD) Civil Support Teams.</li> </ul>											29.133	29.127	30.270

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	Project (Number/Name) RA / Information Sciences and Applications		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2016	FY 2017	FY 2018
<p>- Deployed and provided training on Enhanced Mapping and Positioning System (EMAPS) at training exercises in the San Diego, CA area with the 9th, 42nd, 91st WMD Civil Support Team (CST), Customs and Border Patrol, Department of Energy Radiological Assistance Program Team 7, and Federal Bureau of Investigation. EMAPS is currently the only capability enabling mapping and tracking of personnel in GPS-denied settings. The 9th CST will be generating an official requirement for EMAPS to the National Guard Bureau.</p> <p>- Deployed CITRUS text analytic technology to Sandia National Laboratory for use and evaluation with real world application. This technology was demonstrated to be effective in a WMD counter-trafficking mission.</p> <p>- Collaborated with the U.S. Air Force to successfully connect and distribute data from airborne cloud instantiations to ground cloud instantiations via a commercial mesh network. This collaboration prepared two national labs to deploy technology flight tests with integrated advanced analytic imagery based-capabilities.</p> <p>- Participated in an interagency, large-scale test series of dense gas release. Analyzed data and developed models to improve atmospheric hazard predictions to enhance Consequence Management decision support.</p> <p>- Developed environmental degradation parameters of airborne chemical agents to better characterize collateral effects after a strike on a WMD facility.</p> <p>- In support of the U.S. Strategic Command (USSTRATCOM), developed capabilities to support analysis of higher order effects, such as infrastructure and economic impacts, from nuclear strike.</p> <p>- Developed high fidelity Force-on-Force (phenomenology and effects) computational modeling and simulation capabilities integrated with real and virtual sensor responses.</p> <p>- Developed high fidelity radiation detection trainer technologies utilizing mobile devices and augmented reality displays to enable training with virtual radiation source surrogates.</p> <p>- Integrated commercial graphical processor technologies to enable near real-time high fidelity radiation transport calculations.</p> <p>- Integrated new first principle high fidelity blast and nuclear fallout codes into the DOD/DHS/DOE radiation particle transport code suite.</p> <p>- Developed a CWMD sensor framework with the Night Vision Laboratory to enable real-time data fusion of deployed sensors with modeling and simulation tools.</p> <p>- Continued 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.</p> <p>- Continued 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.</p> <p>- Continued 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.</p>				
<p><b>FY 2017 Plans:</b></p>				

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)	
0400 / 2	PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	RA / Information Sciences and Applications	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			
<p>- Initiate development of concepts and explore capabilities for enabling data collection, fusion, and analysis supporting DTRA's Technology-Driven WMD Threat Forecasting program.</p> <p>- 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.</p> <p>- 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.</p> <p>- Continue to develop environmental degradation parameters of airborne non-traditional chemical agents to better characterize collateral effects after a strike on a WMD facility.</p> <p>- Continue to develop high fidelity Force-on-Force (phenomenology and effects) computational modeling and simulation capabilities integrated with real and virtual sensor responses.</p> <p>- Continue to develop and enhance high fidelity radiation detection training applications for use in mobile devices.</p> <p>- Continue to develop augmented reality displays for mobile devices to enable training with virtual radiation source surrogates.</p> <p>- 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.</p> <p>- 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.</p> <p>- Continue to develop automated methods to consolidate multiple geospatial terrain types into a single virtual globe capable of supporting multiple modeling and simulation platforms.</p> <p>- Continue to develop mobile device-based route planning, force tracking, and geo-tagging applications to support warfighter-unique CWMD missions.</p> <p>- 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.</p> <p>- 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.</p> <p>- 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.</p> <p>- Continue NextGen activities. The effort will attempt to expand interest in the nuclear enterprise by engaging the French nuclear non-governmental organizations.</p>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>
<b>FY 2018 Plans:</b>			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017		
Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)			
0400 / 2	PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	RA / Information Sciences and Applications			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016	FY 2017	FY 2018
- Continue to pursue methodologies and explore capabilities for enabling data collection, toolset automation, and distributed analysis / synthesis of emerging and disruptive technology information that supports the Technology-Driven WMD Threat Forecasting program.					
- 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 maturation of DTRA Experimental Laboratory capabilities in support of whole-of-government CWMD research and development mission areas.					
- Enhance the software stack to include a minimum of two new nuclear effect phenomenology code capabilities in support of the Mission Planning Analysis System (MPAS) allowing the use of the user interface and web services to acquire effects assessments within the USSTRATCOM operational environment					
- 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 conduct a large-scale test series in of with interagency on dense gas release and to develop enhancement of models to improve atmospheric hazard predictions; improvement of models reduces uncertainty of analyses used by staff planners and first responders. Develop enhancements and modifications to codes supporting analysis of test results.					
- Complete development of environmental degradation parameters of airborne non-traditional chemical agents to characterize collateral effects after a strike on a WMD facility; improvement of models reduces uncertainty in collateral effects from WMD in support of combat operations.					
- 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 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.					
- 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.					
<b>Accomplishments/Planned Programs Subtotals</b>			29.133	29.127	30.270

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency											<b>Date:</b> May 2017			
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research						<b>Project (Number/Name)</b> RA / Information Sciences and Applications				
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<u>Line Item</u>	<u>FY 2016</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>Base</u>	<u>FY 2018</u>	<u>OCO</u>	<u>FY 2018</u>	<u>Total</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• 26/0603160BR: Counter Weapons of Mass Destruction	11.494	11.422	10.229	-	10.229	-	11.983	12.183	12.468	12.733	Continuing	Continuing		
<i>Advanced Technology Development</i>														
• 154/0605502BR: Small Business Innovation Research	10.473	-	-	-	-	-	-	-	-	-	-	Continuing	Continuing	
<b>Remarks</b>														
<b>D. Acquisition Strategy</b>														
Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.														
<b>E. Performance Metrics</b>														
Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).														

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) **RD / Detection Technologies				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
**RD: Detection Technologies	0.000	15.083	15.936	14.769	-	14.769	17.005	18.451	17.677	18.035	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 2016 to FY 2017 is due to increased investment in radiation detection and nuclear threat detection intelligence, surveillance, and reconnaissance. The decrease from FY 2017 to FY 2018 is due to a shift in investment priorities to fund test and technology development requirements and full effects modeling.

**B. Accomplishments/Planned Programs (\$ in Millions)**

**Title:** RD: Detection Technologies

**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 Accomplishments:**

- Discovered/identified nuclear threat signatures, characteristics, and corresponding detection modalities and collection systems.
- Developed algorithms for rapidly and effectively analyzing all-source intelligence to identify nuclear threats.
- Developed prototype systems to remotely monitor small and wide areas that may produce or contain nuclear threats.
- Developed algorithms to synthesize the collection and analysis of multiple nuclear threat signatures to improve assessment confidence and cuing of potential nuclear threat events.
- Executed 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.
- Down-selected sensor materials for integration into detection systems.
- Down-selected detection system algorithms for processing and integration into detection systems to improve user capabilities.
- Researched and developed 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.
- Investigated viability of ultra-low power, long-duration programmable remote radiation monitoring systems.

FY 2016	FY 2017	FY 2018
15.083	15.936	14.769

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017		
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	Project (Number/Name) **RD / Detection Technologies			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016	FY 2017	FY 2018
- Investigated organic semiconductors and photo-detectors to improve detection system performance.					
<b>FY 2017 Plans:</b> - 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.					
<b>FY 2018 Plans:</b> - Continue to develop radiation and nuclear threat detection systems to identify the best performing technologies and techniques for transition to advanced technology development efforts. - Continue to develop technologies for next generation nuclear imaging devices with dual gamma and neutron imaging capability, enabling warfighters to rapidly pinpoint and identify detected radioisotopes. - Continue to develop technologies to enable interoperable architectures for enhanced, real-time mission analysis and common operational pictures within a shared or distributed area of operations. - Continue to develop and integrate 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 rapidly locate targeted material. - Continue to develop, integrate, and demonstrate prototype radiation and nuclear threat detection algorithms, electronics and communications capabilities to enhance the range of detectability of targeted material.					

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				<b>Project (Number/Name)</b> **RD / Detection Technologies		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>
<ul style="list-style-type: none"> <li>- Initiate investigation of computer learning and computer vision technologies to enhance nuclear threat situational awareness and nuclear threat identification.</li> <li>- Initiate investigation of various sensor capabilities for far-field identification and tracking of nuclear threats.</li> <li>- Identify exploitable observables to inform technology development and investigate emerging technologies that indicate the presence of nuclear threats.</li> </ul>										
<b>Accomplishments/Planned Programs Subtotals</b>								15.083	15.936	14.769
<b>C. Other Program Funding Summary (\$ in Millions)</b>										
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	26.415	17.775	17.556	-	17.556	18.530	20.697	21.250	21.681	Continuing
										Total Cost
<b>Remarks</b>										
<b>D. Acquisition Strategy</b>	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.									
<b>E. Performance Metrics</b>	Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).									

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) RE / Counter-Terrorism Technologies				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RE: Counter-Terrorism Technologies	7.677	0.795	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing	
<b>A. Mission Description and Budget Item Justification</b>													
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.													
The decrease from FY 2016 to FY 2017 is due to the relative impact of a one-time increase in the year of budget execution in FY 2016 for investment in a chemical sampling tool.													
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>											FY 2016	FY 2017	FY 2018
<b>Title:</b> RE: Counter-Terrorism Technologies											0.795	-	-
<b>Description:</b> 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.													
<b>FY 2016 Accomplishments:</b>													
- Developed a chemical sampling tool to fit a specific form factor. This tool prevents chemical hazard exposure to personnel and the environment.													
<b>Accomplishments/Planned Programs Subtotals</b>											0.795	-	-
<b>C. Other Program Funding Summary (\$ in Millions)</b>													
Line Item	FY 2016	FY 2017	FY 2018	Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	107.265	102.976	103.869	-	103.869	105.915	108.099	110.632	112.871	Continuing	Continuing		
<b>Remarks</b>													

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency		<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	<b>Project (Number/Name)</b> RE / Counter-Terrorism Technologies
<b>D. Acquisition Strategy</b> N/A		
<b>E. Performance Metrics</b> 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.		

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) **RF / Forensics Technologies				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
**RF: Forensics Technologies	196.608	10.525	10.008	10.274	-	10.274	10.345	10.560	10.771	10.991	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 U.S. 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 2016 to FY 2017 is due to decreased investment in prompt nuclear effects exploitation for attribution. The increase from FY 2017 to FY 2018 is due to increased investment in nuclear device characterization for forensics.

**B. Accomplishments/Planned Programs (\$ in Millions)**

**Title:** RF: Forensics Technologies

**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 2016 Accomplishments:**

- Accelerated development of the propagation of prompt diagnostics phenomenology to support the deployment of ground-based sensor capabilities in three U.S. cities for post-detonation prompt diagnostics under the DISCREET OCULUS program.
- Developed, tested, and demonstrated upgraded technical capabilities for prompt diagnostics, debris collection, sample analysis, and modeling to support nuclear device reconstruction, and forensics data to decrease timeline, lower uncertainties, and increase confidence in technical nuclear forensics conclusions. Utilized cooperative R&D relationship with the UK to conduct peer review of nuclear forensics technologies and validation of U.S. DISCREET OCULUS system models.

**FY 2017 Plans:**

	FY 2016	FY 2017	FY 2018
	10.525	10.008	10.274

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	Project (Number/Name) **RF / Forensics Technologies		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		FY 2016	FY 2017	FY 2018
<p>- 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.</p> <p>- 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.</p> <p>- 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.</p> <p>- 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.</p> <p>- 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 (U.S. Prompt Diagnostics System).</p> <p>- Conduct interagency and international research evaluation events to assess process improvements and identify potential capability gaps in forensic conclusion confidence, timeliness, and accuracy.</p> <p>- Engage with partner nations under appropriate international agreements to improve the understanding of prompt phenomenology, improve modeling tools, and improve sensor technologies.</p> <p>- Expand international collaboration in the area of experiments and modeling in order to improve device reconstruction tools and analysis.</p>				
<b>FY 2018 Plans:</b>				
<p>- Continue to develop and evaluate new and improved prompt diagnostics, debris collection, analysis and diagnostics, and device modeling concepts and methodologies to support nuclear device reconstruction, as well as decrease timelines for, lower uncertainty of, and increase confidence in technical nuclear forensics conclusions supporting attribution.</p> <p>- Continue to engage with partner nations under appropriate international agreements to improve understanding of prompt phenomenology, improve modeling tools, and improve sensor technologies.</p> <p>- Continue to develop and improve 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 and accuracy of nuclear detonation yield determinations and weapon characterizations.</p> <p>- Initiate investigation and evaluation of innovative ground-based prompt diagnostic sensor concepts and technologies, such as ubiquitous networks and sensors with reduced size, weight, and power consumption, to improve sensor portability and expand operational capability and flexibility.</p> <p>- Continue to expand international collaboration in the areas of experiments and weapons modeling to improve device reconstruction tools and analysis.</p>				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017						
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research						<b>Project (Number/Name)</b> **RF / Forensics Technologies						
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2016</b>		<b>FY 2017</b>	<b>FY 2018</b>					
<ul style="list-style-type: none"> <li>- Continue to develop and evaluate new and improved validation and verification technologies and methodologies, such as surrogate debris and representative isotopes, to support post-detonation National Technical Nuclear Forensics laboratory analysis and decrease timelines, lower uncertainties, and increase confidence in technical nuclear forensics conclusions supporting attribution.</li> <li>- Continue to investigate and develop novel concepts enabling radical reductions in the time required to conduct ground fallout debris collections, conduct analyses in the field, and obtain nuclear forensic results.</li> </ul>																
<b>Accomplishments/Planned Programs Subtotals</b>										10.525	10.008	10.274				
<b>C. Other Program Funding Summary (\$ in Millions)</b>																
<b>Line Item</b>		<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2018</b>						<b>Cost To Complete</b>				
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development		40.373	38.540	40.286	OCO -	Total 40.286	FY 2019 42.580	FY 2020 40.925	FY 2021 42.144	FY 2022 43.124	Continuing	Total Cost Continuing				
• 123/0605000BR: Counter Weapons of Mass Destruction Systems Development		7.156	4.568	6.727	-	6.727	6.710	5.367	5.899	6.172	Continuing	Continuing				
<b>Remarks</b>																
<b>D. Acquisition Strategy</b>																
Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.																
<b>E. Performance Metrics</b>																
Percentage of Counter WMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).																

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) RG / Defeat Technologies				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RG: Defeat Technologies	75.082	10.946	11.304	11.060	-	11.060	11.290	11.530	11.770	12.017	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 simulators, 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 increase from FY 2016 to FY 2017 is due to increased investment in CWMD weapons technologies. The decrease from FY 2017 to FY 2018 supports the funding profile for CWMD weapons technologies' planned activities.

**B. Accomplishments/Planned Programs (\$ in Millions)**

Title: RG: Defeat Technologies	FY 2016	FY 2017	FY 2018
<p><b>Description:</b> 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.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Developed and demonstrated autonomous air and ground vehicle collaboration for the Modular Autonomous Countering WMD System, Increment B. This demonstration proved interoperability concepts for a robust family-of-systems approach to functionally defeating targets of interest, integrating mapping, improved communications, sensor/payload execution, and intelligence gathering capabilities.</li> <li>- Conducted static demonstration of initial capability of access denial and denial-of-use technologies against WMD representative targets.</li> <li>- Completed electronics susceptibility to electromagnetic fields algorithm development and characterization testing.</li> <li>- Down-selected electromagnetic source and initiated system development and integration.</li> <li>- Conducted sub-scale tests to assess capability to accurately measure WMD simulant released in a plume.</li> </ul>	10.946	11.304	11.060

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency								<b>Date:</b> May 2017						
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				<b>Project (Number/Name)</b> RG / Defeat Technologies						
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>				
<ul style="list-style-type: none"> <li>- Continued classified system design and integration work and initiated demonstrations.</li> </ul> <p><b>FY 2017 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue classified component/system design and development.</li> <li>- Continue static demonstrations of access denial and denial-of-use technologies against representative WMD threats.</li> <li>- Conduct sub-scale tests of new standoff weapon payloads to defeat chemical and biological warfare targets.</li> <li>- Continue sub-scale tests to assess capability to accurately measure WMD simulant released in a plume.</li> <li>- Continue to develop electromagnetic source to functionally defeat WMD threats.</li> </ul> <p><b>FY 2018 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue static demonstrations of access denial and denial-of-use technologies against representative WMD threats.</li> <li>- Conduct scaled demonstrations of access denial and denial-of-use technologies against representative WMD threats.</li> <li>- Continue sub-scale tests of new standoff weapon payloads to defeat chemical and biological warfare targets.</li> <li>- Continue sub-scale tests of emergent technologies to accurately measure WMD simulant released in a plume.</li> </ul>														
<b>Accomplishments/Planned Programs Subtotals</b>								10.946	11.304	11.060				
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>				
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	21.002	20.710	22.161	Base	OCO	Total	22.161	22.557	23.031	23.145				
				-					23.619	Continuing				
										Total Cost				

**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 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).

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) RI / Nuclear Survivability				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RI: Nuclear Survivability	98.286	30.896	34.051	34.103	-	34.103	34.736	35.438	36.161	36.896	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, 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 2016 to FY 2017 is due to the net effect of increased investment in system vulnerability and assessment, nuclear weapons effects experimentation, and nuclear technology analysis support and decreased investment in radiation-hardened nano-electronics.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<b>Title:</b> RI: Nuclear Survivability	30.896	34.051	34.103
<b>Description:</b> 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 2016 Accomplishments:**

- Completed redesign and testing of critical communications radios for new fleet of presidential helicopters to meet C3 systems survivability standards for High-Altitude Electromagnetic Pulse (HEMP) events. This technology transitioned to the U.S. Navy and the White House Military Office.
- Initiated HEMP survivability testing and risk assessments for the F-15E Dual Capable Aircraft platform as part of Continuous Wave Illumination planning and testing efforts. This was the first such test for a combat Dual Capable Aircraft.

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	Project (Number/Name) RI / Nuclear Survivability		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		FY 2016	FY 2017	FY 2018
<ul style="list-style-type: none"><li>- Transitioned Single Event Transient research and mitigation from legacy to 32 nanoscale technology nodes.</li><li>- Developed innovative techniques to produce 5X improvement in warm x-ray (10-50 keV) test capability for Double-Eagle simulator.</li><li>- Performed a System Generated Electro-Magnetic Pulse radiation effects experiment for 2-dimensional code validation on the National Ignition Facility (NIF).</li><li>- Initiated development of Satellite System Nuclear Survivability protection design handbook.</li><li>- Initiated a low power design using one 1-D grid design guidelines in a RadHard foundry.</li><li>- Conducted electromagnetic pulse assessments on defense critical infrastructure for electric power and telecommunications networks.</li><li>- Upgraded electron-beam (cold x-ray) test capability at the DTRA West Coast Facility to allow testing at 2X current capability.</li><li>- Updated cost estimates to harden methodology protocols for aircraft, missile, and satellite systems.</li><li>- Published MIL-STD-4023, High-Altitude Electromagnetic Pulse Protection for Maritime Assets and Comprehensive Atmospheric Nuclear Environment military standards.</li><li>- Updated MIL-STD-188-125 -1/2, High-Altitude Electromagnetic Pulse Protection for Fixed and Transportable Facilities and Systems.</li><li>- Updated MIL-HDBK-423 High-Altitude Electromagnetic Pulse Protection for Fixed facilities.</li><li>- Published Aircraft High Altitude EMP Protection Handbook.</li><li>- Published Satellite System Nuclear Survivability Protection Military Standard.</li></ul>				
<b>FY 2017 Plans:</b> <ul style="list-style-type: none"><li>- Complete manufacture of maskless e-beam lithography tool prototype in a trusted foundry.</li><li>- Develop and integrate the latest human radiation exposure models into current predictive modeling software.</li><li>- Develop model to evaluate synergistic effects of nuclear weapon combined injuries.</li><li>- Develop advanced warm x-ray source concepts.</li><li>- Develop well-characterized x-ray test environments at the NIF.</li><li>- Continue to develop a RadHard-by-Design microprocessor with less than 22nm commercial technology.</li><li>- Evaluate High Altitude Electromagnetic Pulse (HEMP) threat survivability for Aegis Ashore-Poland and satellite communication ground facilities.</li><li>- 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.</li><li>- 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.</li><li>- Publish a Surface/Near-Surface Nuclear Weapon Environment Military Standard to assist DoD and Service PEOs.</li></ul>				

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)	
0400 / 2	PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	RI / Nuclear Survivability	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			
- 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.		FY 2016	FY 2017
<b>FY 2018 Plans:</b> - Initiate nuclear countermeasure and glass penetration injury criteria modeling in DTRA's existing Health Effects from Radiological & Nuclear Environments (HENRE) R&D computer code and, upon validation and verification, update United States Strategic Command (USSTRATCOM) and DTRA operational codes; this modeling will assist DoD and other federal agencies in selecting and supporting specific nuclear countermeasures. - Complete development of and implement a methodology for comprehensive analysis of the DoD Chemical, Biological, Radiological, and Nuclear Mission-Critical Reports for nuclear survivability and hardening of Mission-Critical Systems/Equipment per DoDI 3150.09. - Continue to evaluate High Altitude Electromagnetic Pulse (HEMP) threat survivability for Aegis Ashore-Poland and satellite communication ground facilities. - Continue to 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. - Continue to 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 update to MIL-STD-188-125-1, HEMP Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions: Part 1 Fixed Facilities and update to MIL-HDBK-423 HEMP Protection for Ground-based, Mission-Critical Facilities Part 1 Fixed Facilities, Part I. - Publish Nuclear Disturbed Communications Environment Annex to the Consolidated Afloat Networks and Enterprise Services Military Standard to assist DoD and Service PEOs. - Complete HEMP Certification recommendation to USSTRATCOM for the Missile Defense Complex, Ft. Greely, AK. - Apply advanced electron beam diagnostics to characterize the PITHON test capability at the DTRA West Coast Facility for strategic reentry systems survivability. - Continue to develop or initiate development of and demonstrate an advanced warm x-ray spectrometer to reduce uncertainties and design margins for code validation and electronics certification. - Demonstrate an advanced Single Wire Radiator array warm x-ray source on Double-EAGLE at the DTRA West Coast Facility for strategic reentry systems survivability. - Demonstrate multi-point x-ray sources at the National Ignition Facility to improve cold x-ray test capabilities for strategic and missile defense systems.			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency							Date: May 2017													
<b>Appropriation/Budget Activity</b> 0400 / 2			<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				<b>Project (Number/Name)</b> RI / Nuclear Survivability													
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>							<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>											
<ul style="list-style-type: none"> <li>- Demonstrate a large-area direct laser impulse test capability at the National Ignition Facility for strategic system survivability certification.</li> <li>- Complete study of satellite solar power array response phenomenologies in pulsed x-ray environments.</li> <li>- Support Missile Defense Agency cold x-ray survivability experiments at the National Ignition Facility.</li> <li>- Continue to develop the 16/14nm Radiation Hardened by Design (RHBD) Library.</li> <li>- Continue development of Complementary e-Beam Lithography (CeBL) technologies to reduce the cost of low volume DoD radiation hardened micro and nano-electronics.</li> <li>- Continue development of RHBD Single Event Effects (SEE) mitigation techniques for &lt;32nm digital CMOS and Analog Mixed Signal Devices.</li> <li>- Complete development of the Satellite System Natural &amp; Nuclear Environment Protection Standard.</li> <li>- Complete exploration of technology-agnostic radiation hardening for Boolean logic and multipliers using the principles of information theory and transition results to the 14nm RHBD program.</li> </ul>																				
<b>Accomplishments/Planned Programs Subtotals</b>							30.896	34.051	34.103											
<b>C. Other Program Funding Summary (\$ in Millions)</b>																				
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>										
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	6.621	6.561	6.658	-	6.658	6.729	6.854	6.992	7.132	Continuing										
<b>Remarks</b>																				
<b>D. Acquisition Strategy</b>																				
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.																				
<b>E. Performance Metrics</b>																				
Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).																				

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)				
0400 / 2					PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				RL / Nuclear & Radiological Effects				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RL: Nuclear & Radiological Effects	130.489	28.333	28.668	29.228	-	29.228	29.640	30.324	30.999	31.695	Continuing	Continuing	

**A. Mission Description and Budget Item Justification**

The Nuclear and Radiological Effects project develops modeling tools to: support military operational planning, weapons 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 increase from FY 2016 to FY 2017 is due to increased investment in targeting support. The increase from FY 2017 to FY 2018 is due to increased investment in full effects modeling.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2016	FY 2017	FY 2018
<b>Title:</b> RL: Nuclear & Radiological Effects	28.333	28.668	29.228
<b>Description:</b> Project RL develops nuclear and radiological assessment modeling tools to support military operational planning, weapons effects predictions, and strategic system design decisions.			
<b>FY 2016 Accomplishments:</b>			
- Delivered air blast, fallout, fire, and Source Region Electromagnetic Pulse models to United States Strategic Command (and other nuclear targeting and consequences of execution users) for improved nuclear targeting using nuclear effects that have not been considered in the past.			
- Developed 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.			
- Continued to develop a selected historical nuclear weapon outputs and effects standard database for validating Nuclear Weapons Effects codes.			
- Continued implementation of first principle modeling tools for nuclear fire initiation and spread in urban and suburban environments.			
- Via the Nuclear Weapons Effects Network, continued modeling economic and social consequences of nuclear detonation effects and collateral building damage due to nuclear-induced air blast, assessed nuclear dust/debris effects on airborne systems, and modeled nuclear fire initiation, allowing these considerations to be part of targeting analyses.			
- Improved high altitude nuclear effects functionality for use in analyzing satellite and missile defense responses to a nuclear environment.			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017		
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	Project (Number/Name) RL / Nuclear & Radiological Effects			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016	FY 2017	FY 2018
- Improved foreign nuclear weapon outputs, environment models, and Effects Manual 1 (EM-1) chapters.					
<b>FY 2017 Plans:</b> - 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. - 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.					
<b>FY 2018 Plans:</b> - Continue to develop nuclear weapons effects tools and analyses for effective targeting, including methods to evaluate the consequences of execution of a given course of action. - Continue to develop enhanced High Altitude Radiation Phenomenology functionality for use on modern computer systems. - Continue to 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. - Continue to develop combined effects methodologies 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 experimental test capabilities.					
<b>Accomplishments/Planned Programs Subtotals</b>			28.333	28.668	29.228

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research						<b>Project (Number/Name)</b> RL / Nuclear & Radiological Effects
<b>C. Other Program Funding Summary (\$ in Millions)</b>										
<u>Line Item</u>	<u>FY 2016</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2018</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>Cost To Complete</u>
• 26/0603000BR: Counter Weapons of Mass Destruction Advanced Technology Development	0.000	3.528	3.500	-	3.500	3.456	3.457	3.455	3.455	Continuing

**Remarks**

\*Prior year funds related to 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 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).

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											<b>Date:</b> May 2017			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 2					PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				RM / WMD Counterforce Technologies					
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
RM: WMD Counterforce Technologies	79.780	12.873	12.097	14.552	-	14.552	12.612	12.852	13.129	13.395	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 decrease from FY 2016 to FY 2017 is due to the net effect of decreased investment in advanced materials/energetics and increased investment in weapons effects and planning tools. The increase from FY 2017 to FY 2018 is due to increased investment in advanced materials/energetics and weapons effects and planning tools.

B. Accomplishments/Planned Programs (\$ in Millions)	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>
<p><b>Title:</b> RM: WMD Counterforce Technologies</p> <p><b>Description:</b> 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.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Developed and demonstrated reactive material for enhanced breaching capabilities for Special Operations Forces (SOF). Incorporation of this material into shotgun shells for SOF breaching operations increases operational effectiveness and reduces tactical risk to the warfighter.</li> <li>- Performed signature analysis of pilot-scale Chemical Warfare Agent emissions to define chemical search system requirements. This research addresses modeling capability deficits for characterization of pilot-scale emissions and transport, and exploits temporal and spatial signature exploitation opportunities to support prototype development of chemical search tools.</li> <li>- Completed calibration of the Computational High-Fidelity Agent Release Model using new test data, improving the current capability to assess CWMD strikes and providing insight into sources of modeling uncertainty being addressed by the Agent Defeat Modeling and Simulation Baseline project.</li> <li>- Tested and demonstrated Hybrid Enhanced Blast Explosives and reactive cases for simulated biological agent defeat.</li> <li>- Developed and demonstrated small-scale Hybrid Enhanced Blast Explosives.</li> <li>- Developed fast running engineering models for dispersion of chemical/biological agents via the Agent Release Model and Complex Hazardous Air Release Model.</li> <li>- Conducted component level, small-scale testing for chemical/biological source term modeling.</li> </ul>	12.873	12.097	14.552

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)		
0400 / 2	PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	RM / WMD Counterforce Technologies		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>				
- Modeled response of mega columns to near-contact charges. - Modeled and tested reactive case technologies for Joint Multi-Effects Warhead System and various warheads. - Conducted field tests to support optimization and improved effectiveness of explosive formulations for chemical, biological, radiological, and nuclear agent defeat. - Conducted lab and field tests of two new explosive formulations tailored (temperature, pressure, and outgases) for WMD defeat operations. - Improved modeling capability for weapon post-detonation reaction using reactive case technologies. - Improved modeling capability for agent defeat using novel weapon energetic payloads. - Enhanced computational fluid and structure codes for chemical/biological source term modeling. - Completed technology gap analysis for chemical/biological source term modeling.		FY 2016	FY 2017	FY 2018
<b>FY 2017 Plans:</b>				
- 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.				
<b>FY 2018 Plans:</b>				
- Continue to demonstrate upgraded small scale Hybrid Enhanced Blast Explosives for improved agent defeat capability. - Deliver agent defeat weapon effects models to include post blast agent release and dispersion from multiple agent release mechanisms, agent mass transport, break-up and phase change, and agent fate for Modeling and Simulation (M&S) planning tool enhancements. - Complete tests to deliver data for updating chemical agent source term models within the Integrated Munitions Effects Assessment (IMEA) and for calibration and validation of Second-order Closure Integrated Puff (SCIPUFF).				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017				
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research						<b>Project (Number/Name)</b> RM / WMD Counterforce Technologies				
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>				
- Complete calculations and mid / large-scale tests, and deliver weapons effects models to include blast and debris environment from embedded detonation, blast dynamic pressure, fragmentation, and blast through blast doors.														
						<b>Accomplishments/Planned Programs Subtotals</b>			12.873	12.097	14.552			
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>Base</b>	<b>FY 2018</b>	<b>OCO</b>	<b>FY 2018</b>	<b>Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	19.374	23.138	24.663	-	24.663		25.447	25.892	26.473	27.006	Continuing	Continuing		
<b>Remarks</b>														
<b>D. Acquisition Strategy</b> Competitive selection of most appropriate performers to fulfill science and technology development needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.														
<b>E. Performance Metrics</b> Percentage of CWMD technologies selected for transition to advanced technology development (6.3) and advanced component development and prototypes (6.4).														

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) ***RR / Countering WMD Test and Evaluation			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
***RR: Countering WMD Test and Evaluation	62.395	10.718	13.666	13.652	-	13.652	12.464	12.945	13.288	13.586	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 2016 to FY 2017 is due to increased investment in environmental compliance, the WMD national test bed, and test and technology support to revitalize DTRA's CWMD test and evaluation capability.

**B. Accomplishments/Planned Programs (\$ in Millions)**

Title: RR: Countering WMD Test and Evaluation	FY 2016	FY 2017	FY 2018
<p><b>Description:</b> 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.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Conducted CWMD testing and demonstration at Nevada National Security Site to defeat credible and threat-based scenarios with transition into several related projects/planned events.</li> <li>- Tested 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.</li> <li>- Performed tests in support of Treaty Verification Technology program and Source Physics Experiment to support Comprehensive Test Ban Treaty initiatives.</li> </ul>	10.718	13.666	13.652

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	Project (Number/Name) ***RR / Countering WMD Test and Evaluation		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		FY 2016	FY 2017	FY 2018
<ul style="list-style-type: none"><li>- Initiated testing at Nevada National Security Site in support of the nonproliferation portion of the National Center for Nuclear Security portfolio.</li><li>- Continued support of WMD sensor testing and developed new test capabilities 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 shipping ports.</li><li>- Continued 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.</li><li>- Continued to document, prioritize, and support test infrastructure requirements.</li><li>- Conducted 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. Secured major demolition and restoration efforts of major test articles, ensuring they are safely closed and sealed at acceptable standards.</li><li>- Conducted collection campaigns with interagency participation specific to relevant CWMD data collection requirements.</li></ul>				
<b>FY 2017 Plans:</b> <ul style="list-style-type: none"><li>- Develop and test CBRNE sensors, WMD countermeasures, remote geological sensing, and battle management systems designed for surveillance and tracking of WMD targets.</li><li>- 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.</li><li>- Continue testing at the Nevada National Security Site in support of the nonproliferation portion of the National Center for Nuclear Security portfolio.</li><li>- Continue WMD sensor testing at the Technical Evaluation Assessment and Monitoring site to develop capabilities for detection of nuclear grade material.</li><li>- 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.</li><li>- 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.</li><li>- Conduct collection campaigns with interagency participation specific to warfighter CWMD data requirements.</li><li>- 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.</li><li>- Provide required test planning, design, execution, and reporting to ensure the successful execution of the DTRA Agent Defeat Warfighter Capability Strategic Initiative.</li><li>- Reconstitute and sustain the current inventory of research, development, test and evaluation infrastructure and instrumentation.</li></ul>				
<b>FY 2018 Plans:</b>				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency			<b>Date:</b> May 2017		
<b>Appropriation/Budget Activity</b> 0400 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	<b>Project (Number/Name)</b> ***RR / Countering WMD Test and Evaluation			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>					
<ul style="list-style-type: none"> <li>- Continue to support Combatant Commands with development and testing of Chemical, Biological, Radiological, Nuclear, and high-Explosive (CBRNE) sensors, weapons of mass destruction (WMD) countermeasures, remote geological sensing, and battle management systems designed for surveillance and tracking of WMD targets.</li> <li>- Support Combatant Command exercises and planning events at the Nevada Test Bed in order to develop existing missile defeat technologies, tools, and capabilities.</li> <li>- Continue pursuit of state-of-the-art chemical and biological testing capabilities with participation in the Integrated Early Warning program, the inter-agency Layered Sensing Initiative, the Integrated Sensor Architecture, and the Army Technical Support and Operational Analysis (TSOA) in order to satisfy identified warfighting gaps.</li> <li>- Extend testing at the Nevada National Security Site in support of the nonproliferation portion of the National Center for Nuclear Security portfolio.</li> <li>- Continue to develop nuclear material detection capabilities through testing of candidate technologies at the Technical Evaluation Assessment and Monitoring Site.</li> <li>- Continue to test and demonstrate credible and threat-based WMD attack scenarios at the Nevada National Security Site for DTRA and partner agency projects supporting development of warfighter-identified missile defeat capability requirements.</li> <li>- Continue to conduct diagnostics, instrumentation, and explosives handling research in support of Department of Energy and National Laboratories Source Physics Experiments, supporting Treaty Verification Technology and Comprehensive Test Ban Treaty initiatives.</li> <li>- Initiate reconstitution of instrumentation and diagnostics sensors infrastructure capabilities in support of Counter-WMD technology development projects.</li> <li>- Continue planning the design and execution of tests characterizing a chemical/biological plume generated by an explosive event in support of the Defense Threat Reduction Agency (DTRA) Agent Defeat Modeling and Simulation Baseline (ADMB) initiative.</li> <li>- Continue to design and build testbeds in small-, mid-, and large-scale environments capable of capturing data needed to improve and validate high-fidelity modeling and simulation tools used to predict weapons effects on WMD storage facilities.</li> <li>- Initiate decoupling test program using conventional explosives to develop modern seismic-acoustic data sets at varying levels of coupling, for the purpose of deriving signatures that are similar to recent nuclear test detonations for treaty verification purposes.</li> <li>- Reconstitute the Photogrammetry Laboratory equipment inventory (static &amp; dynamic) for pre- and post-test characterization of geology deriving seismic-acoustic signatures, and providing imagery for warfighter planning and targeting analyses.</li> </ul>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>		
<b>Accomplishments/Planned Programs Subtotals</b>			10.718	13.666	13.652

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency											<b>Date:</b> May 2017			
<b>Appropriation/Budget Activity</b> 0400 / 2				<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research						<b>Project (Number/Name)</b> ***RR / Countering WMD Test and Evaluation				
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<u>Line Item</u>	<u>FY 2016</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>Base</u>	<u>FY 2018</u>	<u>OCO</u>	<u>FY 2018</u>	<u>Total</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	2.000	0.000	12.500	-	12.500		12.500	12.500	12.500	12.500	12.500	12.500	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 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).

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research				Project (Number/Name) ****RU / Basic Research for Countering WMD				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	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	
<b>Note</b> ***Project RU title changes from Fundamental Research for Combating WMD to Basic Research for Countering WMD beginning in FY 2017.													
<b>A. Mission Description and Budget Item Justification</b> 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>B. Accomplishments/Planned Programs (\$ in Millions)</b>											FY 2016	FY 2017	FY 2018
<b>Title:</b> RU: Basic Research for Countering WMD											0.000	-	-
<b>Description:</b> 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.													
<b>FY 2016 Accomplishments:</b> N/A													
Accomplishments/Planned Programs Subtotals											0.000	-	-
<b>C. Other Program Funding Summary (\$ in Millions)</b>													
Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
• 1/0601000BR: <i>DTRA Basic Research</i>	38.288	35.436	37.201	-	37.201	37.340	37.563	38.609	-	Continuing	Continuing		
<b>Remarks</b>													

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency		<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602718BR / *Counter Weapons of Mass Destruction Applied Research	<b>Project (Number/Name)</b> ****RU / Basic Research for Countering WMD
<b>D. Acquisition Strategy</b> 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.		
<b>E. Performance Metrics</b> 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 customers' requests and results delivered within three months of completion.		

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Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)								
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development								
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
Total Program Element	1,398.986	298.123	266.444	268.607	-	268.607	273.973	277.360	283.382	288.959	Continuing	Continuing	
RA: Information Sciences and Applications	21.532	11.494	11.422	10.229	-	10.229	11.983	12.183	12.468	12.733	Continuing	Continuing	
*RD: Detection Technologies	0.000	26.415	17.775	17.556	-	17.556	18.530	20.697	21.250	21.681	Continuing	Continuing	
RE: Counter-Terrorism Technologies	551.315	107.265	102.976	103.869	-	103.869	105.915	108.099	110.632	112.871	Continuing	Continuing	
*RF: Forensics Technologies	356.817	40.373	38.540	40.286	-	40.286	42.580	40.925	42.144	43.124	Continuing	Continuing	
RG: Defeat Technologies	95.067	21.002	20.710	22.161	-	22.161	22.557	23.031	23.145	23.619	Continuing	Continuing	
RI: Nuclear Survivability	37.908	6.621	6.561	6.658	-	6.658	6.729	6.854	6.992	7.132	Continuing	Continuing	
RL: Nuclear & Radiological Effects	0.000	0.000	3.528	3.500	-	3.500	3.456	3.457	3.455	3.455	Continuing	Continuing	
RM: WMD Counterforce Technologies	131.135	19.374	23.138	24.663	-	24.663	25.447	25.892	26.473	27.006	Continuing	Continuing	
**RR: Countering WMD Test and Evaluation	14.052	2.000	0.000	12.500	-	12.500	12.500	12.500	12.500	12.500	Continuing	Continuing	
RT: Target Assessment Technologies	191.160	63.579	41.794	27.185	-	27.185	24.276	23.722	24.323	24.838	Continuing	Continuing	

**Note**

\*Program Element 0603160BR name changes from Counterproliferation Initiatives - Proliferation, Prevention and Defeat to Counter Weapons of Mass Destruction Advanced Technology Development beginning in FY 2018.

\*\*Project RF-Detection and Forensics Technologies subdivides 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.

**A. Mission Description and Budget Item Justification**

The Defense Threat Reduction Agency (DTRA) Counter Weapons of Mass Destruction (WMD) Advanced Technology Development program element funds the development and testing of subsystems and components for integration into prototype systems with the potential to transition into mature, state-of-the-art WMD surveillance, detection, defeat, prevention, nonproliferation, counterproliferation, consequence management, and treaty verification capabilities.

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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> FY 2018 Defense Threat Reduction Agency				<b>Date:</b> May 2017			
<b>Appropriation/Budget Activity</b> 0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)		<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development					
The Counterproliferation Initiatives - Proliferation, Prevention, and Defeat portfolio is aligned with strategic planning objectives as well as with Science and Technology (S&T) investment direction which is established annually by DTRA. 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 the Countering WMD (CWMD) mission by selecting advanced technology development initiatives that meet the following criteria: (1) Efforts are clearly defined and directly linked to mission-specific capability requirements of DTRA, the Military Departments, Combatant Commanders, other DoD and federal agencies, and international partners; (2) preliminary assessments of subsystems and components offer the highest potential for technological feasibility, operability and producibility upon transition out of S&T research; (3) activities demonstrate cost effectiveness or cost reduction potential of technologies during field testing or simulation at scale.							
<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>		
Previous President's Budget	290.310	266.444	259.490	-	259.490		
Current President's Budget	298.123	266.444	268.607	-	268.607		
Total Adjustments	7.813	0.000	9.117	-	9.117		
• Congressional General Reductions	-	-					
• Congressional Directed Reductions	-	-					
• Congressional Rescissions	-	-					
• Congressional Adds	-	-					
• Congressional Directed Transfers	-	-					
• Reprogrammings	14.600	-					
• SBIR/STTR Transfer	-6.787	-					
• Realignments	-	-	9.117	-	9.117		
<b>Change Summary Explanation</b>							
The increase in FY 2018 from the previous President's Budget submission is due to the net effect of a shift in investment priorities to fund the Special Test Bed capability requirements for missile defeat in this program element, a realignment of funds from O&M to RDT&E for the Hard Target Research and Analysis Center (HTRAC) to fund new R&D subject matter expertise to identify, characterize, increased investment in consequence of execution, and incremental Service Requirement Review Board reductions, as part of the Department of Defense reform agenda, for consolidation and understand and exploit vulnerabilities in adversary WMD programs, activities, and capabilities. reduction of service contracts.							

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)			
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RA / Information Sciences and Applications			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
RA: Information Sciences and Applications	21.532	11.494	11.422	10.229	-	10.229	11.983	12.183	12.468	12.733	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Information Sciences and Applications project provides technical expertise and reach-back support to the United States and its allies across the Countering Weapons of Mass Destruction (CWMD) mission space. The project performs continuous modeling of ad hoc computational analyses on the consequences of Weapons of Mass Destruction (WMD) in consultation with military and civilian planners, warfighters, and first responders and leverages research performed by the Project on Advanced Systems and Concepts for CWMD at the Naval Postgraduate School. The project also supports international CWMD cooperation by developing technologies and concepts suitable for foreign release.

The decrease from FY 2017 to FY 2018 is due to decreased investment in hazard and effects characterization and technical reachback support.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<p><b>Title:</b> RA: Information Sciences and Applications</p> <p><b>Description:</b> Project RA develops modeling and simulation capabilities and provides technical reachback support to maintain and increase decision advantage for the United States and its allies through improved situational understanding across the complete CWMD mission space.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Continued development of global synthetic population and activity database for modeling secondary and tertiary effects using agent-based, socially coupled simulations to enable rapid modeling of infectious disease propagation and impacts of population behaviors and movement after a WMD event.</li> <li>- Continued to develop detailed models of specified nuclear facilities to analyze vulnerabilities and estimate hazards.</li> <li>- Completed over 500 WMD collateral effects products in support of Central Command Area of Responsibility targeting/planning; completed 930 Requests for Information (RFIs) from across Combatant Commands, services and Interagency; supported the Federal Emergency Management Agency as the Interagency Modeling Atmospheric Analysis Center (IMAAC) Operations Hub; the IMAAC participated and completed analyses for 6 activations and supported 25 exercises. Collateral effects products, RFIs and IMAAC analyses provided immediate and direct support to CWMD operational planning, incident response, and training across the DoD and Interagency.</li> </ul> <p><b>FY 2017 Plans:</b></p>	11.494	11.422	10.229

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency										Date: May 2017				
Appropriation/Budget Activity		R-1 Program Element (Number/Name)			Project (Number/Name)									
0400 / 3		PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development			RA / Information Sciences and Applications									
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>							<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>					
<ul style="list-style-type: none"> <li>- Continue to develop the global synthetic population and activity database for modeling infectious disease propagation and impacts of population behaviors and movement after a WMD event.</li> <li>- Continue to develop detailed models of specified nuclear facilities to analyze vulnerabilities and estimate hazards.</li> <li>- Enhance 64-bit version of CWMD modeling and simulation planning tools for analysis of large data sets.</li> </ul>														
<b>FY 2018 Plans:</b>														
<ul style="list-style-type: none"> <li>- Continue to develop the global synthetic population and activity database for modeling infectious disease propagation and impacts of population behaviors and movement after a WMD event in support of Combatant Command force health protection and consequence management planning.</li> <li>- Continue to develop detailed models of specified nuclear facilities to analyze vulnerabilities and estimate hazards in support of target and consequence management planning.</li> <li>- Continue to develop processes, capabilities, and expertise in Chemical, Biological, Radiological, Nuclear, and High-yield Explosives (CBRNE) in order to provide tailored support to DoD with 24/7 Technical Reachback.</li> </ul>														
<b>Accomplishments/Planned Programs Subtotals</b>							11.494	11.422	10.229					
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>			
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	29.133	29.127	30.270	-	30.270	32.325	28.286	29.083	30.077	Continuing	Continuing			
• 154/0605502BR: Small Business Innovation Research	10.473	-	-	-	-	-	-	-	-	Continuing	Continuing			
<b>Remarks</b>														
<b>D. Acquisition Strategy</b>														
Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.														
<b>E. Performance Metrics</b>														
Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")														

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)			
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				*RD / Detection Technologies			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
*RD: Detection Technologies	0.000	26.415	17.775	17.556	-	17.556	18.530	20.697	21.250	21.681	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 project continues research formerly conducted under project RF. This project develops, integrates, and transitions advanced concepts, technologies, and subsystems enabling enhanced nuclear and radiological location, identification, and tracking capabilities. Leveraging gains made in applied research efforts, this project produces advancements in range, process time, sensitivity, and accuracy. In addition, this project continues the development of novel concepts and technologies enabling the identification and exploitation of non-radiation based signatures associated with nuclear threats (e.g., transportation of nuclear materials, patterns of activity, or unique materials).

The decrease from FY 2016 to FY 2017 is due to decreased investment in radiation detection and nuclear threat detection intelligence, surveillance and reconnaissance technologies.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2016	FY 2017	FY 2018
<p><b>Title:</b> RD: Detection Technologies</p> <p><b>Description:</b> Project RD develops, integrates and transitions radiation detection technologies, as well as systems, tools, techniques, and procedures that take advantage of non-radiation based signatures, in order to advance warfighter capabilities to rapidly detect, localize, characterize, and interdict nuclear and radiological threats.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Demonstrated, tested, and fielded systems to remotely monitor small and wide areas which may produce or contain nuclear threats.</li> <li>- Designed and fabricated prototype passive detection systems for determining the location and signature of nuclear material and tested and characterized developmental prototype passive detection systems.</li> <li>- Transitioned near-term technologies to generate prototypes and design packages that will assist operational users.</li> <li>- Developed prototype of a new high resolution detector with reduced weight and improved form factors that can be concealed in container consistent with the operational environment.</li> <li>- Conducted advanced/operational testing and evaluation of radiation detection systems to assess their performance.</li> <li>- Tested and evaluated the integration of high resolution detectors with lower resolution detectors to determine the potential to meet threshold radiological/nuclear (R/N) detection requirements.</li> </ul>	26.415	17.775	17.556

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	Project (Number/Name) *RD / Detection Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016    FY 2017    FY 2018
<ul style="list-style-type: none"><li>- Integrated nuclear threat analysis algorithms into existing systems to test and evaluate effectiveness in reducing processing time.</li><li>- Integrated advances in materials science into lightweight, high-resolution radiation spectrometers for use in field operations.</li><li>- Integrated new cellular technology into the Radiological/Nuclear (R/N) search network to ensure rapid flow of data from detectors.</li><li>- Improved performance of new detector materials; imaging and spectroscopy systems; and signals analysis methods through rigorous laboratory and field testing.</li><li>- Analyzed nuclear threat signatures to improve or integrate collection into sensor systems.</li></ul>			
<p><b>FY 2017 Plans:</b></p> <ul style="list-style-type: none"><li>- Continue to develop and integrate nuclear and radiological signature collections into new sensor systems.</li><li>- Continue to integrate nuclear threat analysis algorithms into existing systems in order to evaluate accuracy and effectiveness in reducing process time.</li><li>- Continue to demonstrate, test, and transition systems that remotely monitor nuclear and radiological threat signatures in small and wide areas.</li><li>- Continue to develop high-fidelity radiation test objects supporting advanced assessment capabilities in order to improve radiation detection prototypes.</li><li>- Continue to develop, test, and evaluate a hand-held radiation monitor replacement providing radioisotope identification capability and real-time information feed.</li><li>- Develop and deploy devices enabling low cost operational testing and evaluation of radiation signature detectors against mock special nuclear material sources of interest.</li><li>- Develop and integrate interoperable systems enabling a true common operational picture among nuclear and radiological search teams, across platforms, and within shared or distributed areas.</li><li>- Test and evaluate new radiation detection technologies in order to validate capabilities, improve prototypes, and provide required performance data to support follow-on development.</li><li>- Test and evaluate an operational high resolution gamma-ray imager suited for multiple mission sets to support integration with next generation nuclear imaging systems.</li><li>- Simulate and evaluate loose nuke scenarios in order to validate nuclear threat mitigation plans developed by Department of Defense and civilian users.</li></ul>			
<p><b>FY 2018 Plans:</b></p> <ul style="list-style-type: none"><li>- Transition sensor capabilities to replace Nuclear Biological Chemical Reconnaissance Vehicle (NBCRV) and Stryker obsolete radiological/nuclear equipment.</li></ul>			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency								Date: May 2017					
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development			Project (Number/Name) *RD / Detection Technologies								
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2016	FY 2017	FY 2018			
<ul style="list-style-type: none"> <li>- Continue to develop, test, and evaluate a handheld radiation monitor replacement that provides radioisotope identification capability and real-time information feed.</li> <li>- Continue to develop and deploy devices to enable low-cost operational testing and evaluation of radiation and nuclear threat signature detectors against simulated special nuclear material sources of interest, high-fidelity radiation test objects, and realistic threat mockups.</li> <li>- Continue to integrate interoperable systems enabling a true common operating picture among nuclear and radiological search teams, across platforms, and within shared or distributed areas.</li> <li>- Continue to test and evaluate new radiation and nuclear threat detection technologies in an operationally relevant environment to validate capabilities, improve prototypes, and provide required performance data.</li> <li>- Complete testing and evaluation of an operational high resolution gamma-ray imager suited for multiple mission sets to support integration with next generation nuclear imaging systems.</li> <li>- Design, fabricate, test, and characterize prototype passive roadside detection systems to determine the location and signature of nuclear material.</li> <li>- Transition near-term technologies, such as helium-3 alternatives and automated particle identification, to generate prototypes and design packages that will meet operational needs.</li> <li>- Conduct advanced, operational testing and evaluation of radiation and nuclear threat detection systems to assess their performance.</li> <li>- Integrate back-end unit capabilities such as internal electronics and communications capabilities, nuclear and radiological signature collections, and non-radiation nuclear threat signature collections into new sensor systems.</li> <li>- Continue to integrate radiation and nuclear threat analysis algorithms into existing systems to evaluate accuracy and effectiveness in reducing process time and form factors.</li> <li>- Continue to demonstrate, test, and transition systems that remotely monitor nuclear and radiological threat signatures in local and wide area searches.</li> </ul>													
<b>Accomplishments/Planned Programs Subtotals</b>								26.415	17.775	17.556			
C. Other Program Funding Summary (\$ in Millions)													
Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	15.083	15.936	14.769	-	14.769	17.005	18.451	17.677	18.035	Continuing	Continuing		

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency								Date: May 2017		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development			Project (Number/Name) *RD / Detection Technologies					
<b>C. Other Program Funding Summary (\$ in Millions)</b>										
Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022 Complete	Cost To Total Cost
<u>Remarks</u>										
<b>D. Acquisition Strategy</b>										
Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.										
<b>E. Performance Metrics</b>										
Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")										

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)			
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RE / Counter-Terrorism Technologies			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
RE: Counter-Terrorism Technologies	551.315	107.265	102.976	103.869	-	103.869	105.915	108.099	110.632	112.871	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Counter-Terrorism Technologies project develops and transitions a full spectrum of new technologies to counter emergent weapons of mass destruction (WMD) threats. This project supports the U.S. Special Operations Command (USSOCOM) in two research areas: (1) Countering WMD-Terrorism (CWMD-T) Counterproliferation Research and Development is a collaborative effort to develop advanced, warfighter-unique technologies to defeat terrorist WMD development/acquisition pathways, to include defeat of the devices themselves, while minimizing risks to U.S. forces; (2) USSOCOM CWMD-T Support develops concepts and technologies to integrate and synchronize operations and activities that prevent terrorists and rogue nation states from developing, acquiring, proliferating, or using WMD. This effort supports Commander USSOCOM responsibilities under the Chairman, Joint Chiefs of Staff Unified Command Plan.

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

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<p><b>Title:</b> RE: Counter-Terrorism Technologies</p> <p><b>Description:</b> Project RE supports Joint U.S. Military Forces, specifically USSOCOM, in the research areas of warfighter-unique, mission-specific WMD defeat, denial, counterproliferation, and interdiction technologies.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Transitioned Multi-path COTS/GOTS Software Defined Radio. Over-the-horizon prototype permits deep install receiver upstream of production and capability to monitor, manage, and execute OCONUS mission from CONUS.</li> <li>- Transitioned Very Low Frequency (VLF) receiver prototype. VLF prototype permits capability to monitor, manage, and execute low-visibility WMD missions.</li> <li>- Transitioned a Special Applications Module for MODI providing special enhanced countermeasures.</li> <li>- Deployed WMDpedia link onto the Dynamic Picture of the Operating Environment (DPOE) portal. This tool provides SME-level information on Chemical, Biological, Radiological, Nuclear (CBRN) threats for analysts and planners.</li> <li>- Deployed a Common Operating Picture/Common Intelligence Picture enabling users to create, share, and consume information.</li> <li>- Released DPOE V2.6, providing enhancements for searching, mapping, and collaboration.</li> <li>- Demonstrated sensor collection capability (validation and collection) from an operational facility in a configuration that can be integrated across DoD, the Intelligence Community (IC), and 17 other government organizations.</li> </ul>	107.265	102.976	103.869

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	Project (Number/Name) RE / Counter-Terrorism Technologies		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2016	FY 2017	FY 2018
<ul style="list-style-type: none"><li>- Demonstrated the DARPA Deep Exploration and Filtering of Text (DEFT) Automated World Actor Knowledge Extractor (AWAKE) capability to show how information from multiple formats could be combined to create a capability for analysts to research a topic by analysis and synthesis rather than by reading the document.</li><li>- Transitioned next generation imaging technologies to enhance Explosive Ordnance Disposal (EOD) forces advanced diagnostic capabilities.</li><li>- Developed tools used to impede Improvised Explosive Device (IED) triggers and conducted render safe diagnostics validation tests on emergent threat articles.</li><li>- Developed precision shaped charges using a proven manufacturing process through the use or modification of an existing shaped charge design.</li><li>- Initiated the development of rational choice and game theory algorithms and integrated into advanced Bayesian models in support of probabilistic forecasting.</li><li>- Continued development of new counterproliferation technologies for Joint U.S. Military Forces to counter WMD, enabling warfighters to improve their ability to detect, disable, interdict, neutralize, and destroy chemical, biological, and nuclear production, storage, and weaponization facilities.</li><li>- Continued multi-year efforts to develop innovative CWMD technologies and tools designed to locate, identify, characterize, assess, and attack WMD production and storage facilities with engineered capabilities to minimize loss of life and collateral damage.</li><li>- Continued work on multi-year efforts to develop high fidelity test articles and enhanced electronic test objects for EOD Device Defeat.</li></ul>				

**FY 2017 Plans:**

- Integrate enhancements in Natural Language Processing and Machine Reading capabilities into Joint Worldwide Intelligence Communications System (JWICS) knowledge management and planning tools.
- Integrate, test, and deploy socio-cultural and behavioral factor data into the Intent Model to enhance threat prediction capabilities.
- Develop applications enabling seamless information sharing between the USSOCOM CWMD Support Program (SCSP) and other intelligence agency databases.
- Develop customizable dashboards displaying user-driven data displays and functionality on the SCSP JWICS portal.
- Continue to support Combatant Command exercises and planning events in order to enhance existing SCSP tools and databases, and to identify and validate new requirements.
- Continue to monitor and collaborate with other agencies, such as the Defense Advanced Research Projects Agency and the Intelligence Advanced Research Projects Agency, on advanced analytics technologies.

**FY 2018 Plans:**

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency								<b>Date:</b> May 2017						
<b>Appropriation/Budget Activity</b> 0400 / 3		<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				<b>Project (Number/Name)</b> RE / Counter-Terrorism Technologies								
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>				
<ul style="list-style-type: none"> <li>- Continue to develop offensive counter proliferation, counter-WMD technologies.</li> <li>- Continue to develop threat specific test articles and analyses for Tiered Threat Modeling Archive.</li> <li>- Continue to develop technologies that defeat unintended radio emissions.</li> <li>- Continue to develop lighter, smaller, more effective breaching capabilities.</li> <li>- Continue to develop next generation flexible x-ray technology applications.</li> <li>- Continue to develop WMD facility breaching technology applications.</li> <li>- Continue to develop Nuclear, Biological, and Chemical (NBC) defense technologies.</li> <li>- Continue to develop WMD render safe technologies.</li> <li>- Continue to develop technologies to maneuver in a WMD environment.</li> <li>- Continue to develop WMD pathway (process &amp; facility) defeat technologies.</li> <li>- Perform prototype testing of machine learning tools for integration with the USSOCOM CWMD Support Program's (SCSP) Next Generation Joint Worldwide Intelligence Communications System (JWICS) Portal.</li> <li>- Integrate High Performance Computing (HPC) into the JWICS operating environment to provide more robust data analytics and improve accuracy of emerging WMD threat forecasts.</li> <li>- Develop and test technologies for evaluating large quantities of data and intelligence information to improve smart discovery, data inferencing, and system-generated cueing and alerting capabilities.</li> <li>- Develop Graphic Analytics and Knowledge-Base Reasoning HPC applications.</li> <li>- Initiate development of models to enhance Discover &amp; Search components of the Anticipatory WMD Analyst Reasoning Environment (AWARE) tool.</li> <li>- Continue to develop DPOE Knowledge Graphic and Predictive Analytics for Unknown Unknowns.</li> <li>- Develop Course of Action models for anticipatory adversarial actions.</li> </ul>														
<b>Accomplishments/Planned Programs Subtotals</b>								107.265	102.976	103.869				
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>Base</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	0.795	-	-	-	-	-	-	-	-	-	-	Continuing	Continuing	
<b>Remarks</b>														

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency		<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of <i>Mass Destruction Advanced Technology</i> <i>Development</i>	<b>Project (Number/Name)</b> RE / Counter-Terrorism Technologies
<b>D. Acquisition Strategy</b> Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.		
<b>E. Performance Metrics</b> Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")		

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency											<b>Date:</b> May 2017	
<b>Appropriation/Budget Activity</b> 0400 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				<b>Project (Number/Name)</b> *RF / Forensics Technologies			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
*RF: <i>Forensics Technologies</i>	356.817	40.373	38.540	40.286	-	40.286	42.580	40.925	42.144	43.124	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, integrates, tests, and demonstrates post-detonation nuclear forensics systems 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 forensic capabilities 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 DoD Directive S-2060.04, DTRA serves as the U.S. 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. NTNF R&D supports advanced research in the following areas: (1) Prompt nuclear effects exploitation for attribution; (2) nuclear device characterization for forensics; (3) nuclear forensic materials exploitation for attribution.

The decrease from FY 2016 to FY 2017 is due to decreased investment in monitoring and verification technology, device characterization for forensics, and materials exploitation for attribution. The increase from FY 2017 to FY 2018 is due to the relative impact of reduction in FY 2017.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>
<b>Title:</b> RF: Forensics Technologies	40.373	38.540	40.286
<b>Description:</b> Project RF supports nuclear forensics by developing: (1) technologies, systems and procedures for post detonation nuclear forensics; (2) on/off-site analysis to meet forensic, verification, monitoring and confidence-building requirements; (3) technologies to detect, locate, identify, track, and interdict nuclear and radiological threats, including enablers to their acquisition and development.			

**FY 2016 Accomplishments:**

- Completed final set of DISCREET OCULUS installations in the Washington DC metropolitan area, enabling the capture of prompt diagnostic data signatures in the event of a nuclear or radiological detonation. Two of three city/region area installation efforts are complete, with a third ongoing in NYC/Newark in preparation for transition to the USAF U.S. Prompt Diagnostics System in FY 2018.

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	Project (Number/Name) *RF / Forensics Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016    FY 2017    FY 2018
- Tested and demonstrated performance of DISCREET OCULUS speed-of-light sensors and ability to determine reaction time history using the Sandia National Laboratories High-Energy Radiation Megavolt Electron Source (HERMES) III accelerator facility as a simulated nuclear detonation source. - Transitioned advanced gamma spectroscopic capabilities to the operational user providing reliable forensic analytical results on several fission/activation products directly, with no radiochemical separations, significantly reducing the time and cost required to measure these nuclides. - Completed a major joint experimental campaign with the National Nuclear Security Administration (NNSA) at the National Criticality Experiments Research Center (NCERC) within the Device Assembly Facility (DAF) at NNSA providing vital nuclear material diagnostic information to the nuclear forensics community. - Developed a modular prototype using advanced materials and techniques to collect and detect gaseous radionuclide signatures of evasive nuclear testing. - Developed and delivered tools to DoD operational units for estimation of probable delay times before escape of radio isotopic gases from underground nuclear tests. - Developed methodology for quantitative determination of systematic uncertainty in detection and discrimination of nuclear testing signatures. - Developed prototype cosmic-ray muon imaging solution for standoff detection of nuclear warheads in storage or deployed on strategic launch and delivery systems. Enhanced detection capabilities could lead to adoption of this technology for verification of future Strategic Arms Reduction Treaties. - Developed infrastructure and capability for iterative testing, refinement, and integration of national monitoring capabilities. - Continued to develop, test, demonstrate, and field upgraded prototypes for prompt diagnostics, debris collection, and sample analysis; modeling to support nuclear device reconstruction; and forensics data to decrease timeline, lower uncertainties, and increase confidence in technical nuclear forensics conclusions. - Continued to develop tools based on near-source small-scale strong-motion science to assist detection and characterization of low yield and evasive nuclear testing. - Conducted laboratory experiments with lasers to assess shock/seismic signatures from underground nuclear tests. - Evaluated advanced methods to better integrate the collection, detection, and analysis of low-yield or evasive nuclear weapons testing signatures. - Continued to develop long-term operational solutions to detect, collect, and analyze gas and radionuclide signatures of nuclear testing. - Validated alternate signatures of nuclear weapons testing and developed measurement techniques. - Enhanced the on-site inspection system and virtual training tool with additional operational scenarios for nuclear materials production monitoring in support of the Fissile Material Cutoff Treaty and the Army nuclear disablement/elimination mission.			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	Project (Number/Name) *RF / Forensics Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			FY 2016    FY 2017    FY 2018
- Provided technical support for certification of compliance of foreign digital electro-optical sensors with Open Skies Treaty limits.			
<b>FY 2017 Plans:</b> <ul style="list-style-type: none"><li>- Complete initial operational assessment of advanced prompt diagnostics for ground-based sensor prototype systems.</li><li>- Complete plans and carry out associated acquisition activities for the transition of advanced prompt diagnostics sensor prototype systems to the U.S. Prompt Diagnostics System.</li><li>- Demonstrate advanced technologies for the collection of alternative nuclear detonation signatures, such as electromagnetic pulse and transient ionospheric disturbances, to detect and locate clandestine nuclear testing.</li><li>- Demonstrate advanced technologies for cosmic ray, muon-excited remote counting of nuclear warheads in delivery vehicles and in storage, supporting treaty monitoring, and verification.</li><li>- Develop, test, and demonstrate a portable ground-based sensor prototype for post-detonation prompt diagnostics under DISCREET OCULUS.</li><li>- Develop, test, and demonstrate enhanced prototype technologies for prompt diagnostics, debris collection, data analysis, debris diagnostics, and technical capability modeling to support nuclear device reconstruction and attribution, as well as to decrease timeline, lower uncertainty, and increase confidence in technical nuclear forensics conclusions supporting attribution.</li><li>- Develop, test, and demonstrate enhanced prototype technologies to support validation and verification processes and capabilities in order to decrease timeline, lower uncertainty, and increase confidence in technical nuclear forensics conclusions supporting attribution.</li><li>- Develop, evaluate, and demonstrate surrogate debris materials used in validation and verification technologies and in field and fixed laboratory analytic processes.</li><li>- Develop advanced radionuclide gas collection technologies in support of counterproliferation and compliance verification for the Non-Proliferation Treaty and the Comprehensive Test Ban Treaty.</li><li>- Develop advanced technologies to detect and monitor for low-yield nuclear tests, including novel techniques for collecting and observing material emissions and source region seismic signatures.</li><li>- Continue to develop new prompt diagnostic technologies to improve sensor portability, with emphasis on size, weight, and power consumption reduction, and on expanded operational capability.</li><li>- Prepare and conduct an interagency technology demonstration of end-to-end nuclear forensics capabilities.</li><li>- Prepare an international technical demonstration of post-detonation nuclear forensics research and development capabilities.</li><li>- Coordinate with partner nations to improve global U.S. nuclear forensics and attribution capabilities, under appropriate international agreements.</li><li>- Integrate nuclear threat analysis algorithms into existing systems to test and evaluate their effectiveness in reducing processing time.</li><li>- Demonstrate, test, and field systems to remotely monitor small and wide areas which may produce or contain nuclear threats.</li></ul>			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	Project (Number/Name) *RF / Forensics Technologies		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2016	FY 2017	FY 2018
<p><b>FY 2018 Plans:</b></p> <ul style="list-style-type: none"><li>- Design and fabricate prototype passive detection systems for determining the location and signature of nuclear material and test and characterize developmental prototype passive detection systems.</li><li>- Transition near-term technologies to generate prototypes and design packages that will assist operational users.</li><li>- Conduct advanced/operational testing and evaluation of radiation detection systems to assess their performance.</li><li>- Develop and build a new high-resolution detector with reduced weight and improved form factors that can be concealed in container consistent with the operational environment.</li><li>- Integrate new cellular technology into the Radiological/Nuclear (R/N) search network to ensure rapid flow of data from detectors.</li><li>- Test and evaluate the integration of high-resolution detectors with lower resolution detectors to determine the potential to meet threshold R/N detection requirements.</li></ul>				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017		
<b>Appropriation/Budget Activity</b> 0400 / 3			<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				<b>Project (Number/Name)</b> *RF / Forensics Technologies					
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>							<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>			
<ul style="list-style-type: none"> <li>- Collect and analyze physical response data from natural and man-made events that provide signals similar to those from low-yield, evasive underground nuclear explosions. Compare these data with results produced by computer simulation of the events.</li> <li>- Continue to develop advanced, modular radionuclide gas collection technologies in support of counterproliferation goals and compliance verification for the Non-Proliferation Treaty and the Comprehensive Test Ban Treaty.</li> <li>- Continue to develop advanced technologies to detect and monitor low-yield nuclear tests, including novel techniques for collecting and observing material and electromagnetic emissions and source-region seismic signatures.</li> </ul>												
<b>Accomplishments/Planned Programs Subtotals</b>							40.373	38.540	40.286			
<b>C. Other Program Funding Summary (\$ in Millions)</b>												
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>Base</b>	<b>FY 2018</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	10.525	10.008	10.274	-	10.274	10.345	10.560	10.771	10.991	Continuing	Continuing	
• 123/0605000BR: Counter Weapons of Mass Destruction Systems Development	7.156	4.568	6.727	-	6.727	6.710	5.367	5.899	6.172	Continuing	Continuing	
<b>Remarks</b>												
<b>D. Acquisition Strategy</b>												
Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.												
<b>E. Performance Metrics</b>												
Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")												

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)			
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RG / Defeat Technologies			
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
RG: Defeat Technologies	95.067	21.002	20.710	22.161	-	22.161	22.557	23.031	23.145	23.619	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Defeat Technologies project develops, integrates, demonstrates, and transitions innovative kinetic and non-kinetic weapon capabilities to expand traditional and asymmetric options available to Combatant Commanders to deny, disrupt, and defeat Weapons of Mass Destruction (WMD) while minimizing collateral effects. Technology development focuses on the physical or functional defeat of (1) chemical, biological, nuclear, and radiological threat materials, (2) an adversary's ability to deliver the same, as well as (3) the physical and non-physical support networks enabling both. This program achieves these goals through the systematic identification and maturation of technologies capable of defeating WMD agents or agent-based processes, then integrating them into weapons, delivery systems, or rapid WMD elimination capabilities. This effort includes developing specific WMD agent/agent-based process simulants, test infrastructure, and sampling capability required for effective development, testing, and evaluation of next generation capabilities to ensure optimum weapon solutions are achieved. Requirements are delineated in Agency Priority Lists for lethal and non-lethal Countering WMD (CWMD) capability. Based on specified requirements, weapons and capabilities are transitioned to a Service program of record for system acquisition.

The decrease from FY 2016 to FY 2017 is due to decreased investment in next generation CWMD technologies to balance other priorities. The increase from FY 2017 to FY 2018 is due to the relative impact of reductions in FY 2017.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<b>Title:</b> RG: Defeat Technologies <b>Description:</b> Project RG develops advanced technologies and weapon concepts and validates their applicability to CWMD. <b>FY 2016 Accomplishments:</b> - Completed design refinements to and initiated demonstration of Heated and Mobile Munitions Employing Rockets (HAMMER) weapon system and subsystems and integration through analysis and testing up to and including full scale static testing to achieve Technology Readiness Level (TRL) 4/5. HAMMER provides a concept demonstration for penetrating weapons which mitigate collateral contamination effects through: low overpressure, minimal target structure damage, and no aerosolization. - Conducted Modular Autonomous CWMD System Increment A (MACS-A) Risk Reduction Test 2, which demonstrated increased supervised autonomous technologies addressing multiple payload configurations to enhance combating WMD and included navigation in an underground facility in extreme obscurants with limited communications. MACS-A addresses the ability to enable plug-and-play technologies as a force multiplier. - Transitioned initial MACS-A concept to U.S. Army for further development. - Demonstrated a highly resilient weapon design that survived two separate shock environments at different velocities, enabling detailed prototype work on other sub-systems with a known shock environment to meet TRL 6 specifications prior to	21.002	20.710	22.161

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)	
0400 / 3	PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	RG / Defeat Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			
transition. Additionally, the body of knowledge resulting from the construction of high fidelity targets (softer than cement) to meet specifications of analogous high fidelity soil-codes, penetration tools, and build properties will serve many communities of interest investigating earth penetrating weapons and ground sensor designs. - Continued development of access denial or denial-of-use technologies for CWMD applications. - Continued functional defeat system development, testing, and demonstration.			<b>FY 2016</b>
<b>FY 2017 Plans:</b> - Conduct static tests of full-scale HAMMER weapon system and initiate preparation for full-scale dynamic tests. - Conduct static demonstration of initial capability of access denial and denial-of-use technologies against WMD representative targets. - Initiate Agent Defeat Penetrator weapon system design effort. - Initiate access denial weapon concept design effort. - Continue to develop and integrate classified component and system designs. Prepare to conduct initial demonstrations. - Continue to develop and test functional defeat system. - Continue to develop and test diagnostic capability to meet emerging needs for agent defeat.			<b>FY 2017</b>
<b>FY 2018 Plans:</b> - Conduct dynamic sled tests of full-scale HAMMER weapon system and prepare for technology transition starting in FY 2019. - Conduct full scale demonstration of access denial and denial-of-use technologies against WMD representative targets. - Accomplish static testing of a full-scale Agent Defeat Penetrator weapon system against a representative WMD target. - Continue development and testing of a new access denial weapon concept. - Continue to develop technologies in support of agent defeat and associated facilities. - Continue to develop and test diagnostic capability to meet emerging needs for agent defeat. - Conduct MACS follow-on incremental component/system demonstration. - Conduct functional defeat system demonstration. - Develop and integrate MACS Family of Systems Enabling Technologies in preparation for a system demonstration.			<b>FY 2018</b>
<b>Accomplishments/Planned Programs Subtotals</b>			21.002
20.710			22.161

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017	
<b>Appropriation/Budget Activity</b> 0400 / 3				<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				<b>Project (Number/Name)</b> RG / Defeat Technologies			
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	10.946	11.304	11.060	-	11.060	11.290	11.530	11.770	12.017	Continuing	Continuing
<b>Remarks</b>											
<b>D. Acquisition Strategy</b> Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.											
<b>E. Performance Metrics</b> Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")											

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RI / Nuclear Survivability					
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
RI: Nuclear Survivability	37.908	6.621	6.561	6.658	-	6.658	6.729	6.854	6.992	7.132	Continuing	Continuing		

**A. Mission Description and Budget Item Justification**

The Nuclear Survivability project develops, integrates, demonstrates, and transitions 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 (DoD) Instruction 3150.09, Chemical, Biological, Radiological, and Nuclear (CBRN) Survivability Policy. The Defense threat Reduction Agency (DTRA) is the DoD-designated center of excellence for electromagnetic pulse survivability assessments. The System Vulnerability and Assessment effort develops nuclear assessment capabilities to support operational planning, weapon 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 integrates radiation-hardened, high-performance prototype nano-electronics to meet DoD space and strategic system requirements. The Human Survivability supports the Nuclear Test Personnel Review Program (NTPR), confirming the participation of Atomic Veterans in nuclear testing and radiological events and providing radiation dose assessments. The NTPR is administered by the Department of Veterans Affairs and the Department of Justice for radiogenic disease compensation programs.

The decrease from FY 2016 to FY 2017 is due to decreased investment in Nuclear Surety.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<p><b>Title:</b> RI: Nuclear Survivability</p> <p><b>Description:</b> Project RI develops, integrates, and transitions novel technologies that radically enhance the survivability and resilience of DoD nuclear forces and their associated control and support systems in the event of an attack or other hostile action.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Executed Mighty Guardian XVIII force-on-force test to evaluate nuclear security policy at the Navy's Strategic Weapons Facility Pacific, Naval Base Kitsap, WA.</li> <li>- Published Hazard Prediction Analysis Capability Health Effects from Nuclear and Radiological Environments Version 1.0 Technical Reference Manual.</li> <li>- Continued the development of the next generation of Defense Integration and Management of Nuclear Data Services (DIAMONDS) network and infrastructure design.</li> <li>- Modernized DIAMONDS software code with design reviews and meetings with users for future needs/requirements.</li> </ul>	6.621	6.561	6.658

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017				
<b>Appropriation/Budget Activity</b> 0400 / 3										<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	<b>Project (Number/Name)</b> RI / Nuclear Survivability			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>										<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>		
<p>- Fielded and continued to evaluate test-bed system at select user sites.</p> <p><b>FY 2017 Plans:</b></p> <ul style="list-style-type: none"> <li>- Produce technical reports to address DoD concerns for radiogenic disease related to potential ionizing radiation exposure.</li> <li>- Fabricate Pathfinder &amp; Product Demonstration Vehicle to support technology transfer from (6.2) Applied Research to the United States Air Force/Space &amp; Missile Center and National Reconnaissance Office, for maturation in their Productization &amp; Qualification program in 6.4 Advanced Component Development and Prototypes.</li> </ul> <p><b>FY 2018 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue producing technical reports addressing DoD radiogenic disease concerns; which address Congressional interest in historical veteran radiation exposure and present day radiological exposures of the DoD-affiliated population.</li> <li>- Complete development of the Satellite System Natural &amp; Nuclear Environment Protection Standard.</li> <li>- Initiate development of a Satellite System Natural &amp; Nuclear Environment Protection Handbook.</li> <li>- Complete update of the NATO Allied Engineering Publication AEP-04 Nuclear Survivability Criteria for Armed Forces Material and Installations.</li> </ul>														
<b>Accomplishments/Planned Programs Subtotals</b>										6.621	6.561	6.658		
<b>C. Other Program Funding Summary (\$ in Millions)</b>														
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>Base</b>	<b>FY 2018</b>	<b>OCO</b>	<b>FY 2018</b>	<b>Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	30.896	34.051	34.103	-	34.103		34.103	34.736	35.438	36.161	36.896	Continuing	Continuing	
<b>Remarks</b>														
<b>D. Acquisition Strategy</b>														
Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.														
<b>E. Performance Metrics</b>														
Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")														

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)				
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RL / Nuclear & Radiological Effects				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RL: Nuclear & Radiological Effects	0.000	0.000	3.528	3.500	-	3.500	3.456	3.457	3.455	3.455	Continuing	Continuing	
<b>A. Mission Description and Budget Item Justification</b>													
The Nuclear and Radiological Effects project develops, integrates, and transitions nuclear and radiological assessment modeling tools for use in military planning processes. The assessment modeling tools provide critical analytics for Consequence of Execution (COE) considerations during nuclear targeting and post-detonation nuclear response, supporting interagency strategic and tactical decision making. These COE considerations can include the full range of political, military, economic, social, infrastructure, and information (PMESII) factors and their interaction, extending analytical capabilities beyond common damage assessment practices and into second and third order effects. These activities/efforts support Combatant Commands and other Department of Defense (DoD) organizations by providing accurate and reliable consequence assessment and response information.													
The increase from FY 2016 to FY 2017 is due to the transition of nuclear effects modeling applied research efforts to advanced technology development.													
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>											FY 2016	FY 2017	FY 2018
<b>Title:</b> RL: Nuclear and Radiological Effects											0.000	3.528	3.500
<b>Description:</b> Project RL develops nuclear and radiological assessment modeling tools to support military operational planning, weapons effects predictions, and strategic system design decisions.													
<b>FY 2016 Accomplishments:</b> N/A													
<b>FY 2017 Plans:</b> - Develop nuclear weapon effects tools specifically designed for transition to military targeting systems. - Develop nuclear weapon effects tools specifically designed to support nuclear survivability and standards formulation.													
<b>FY 2018 Plans:</b> - Continue to add militarily significant nuclear weapon effects to tools specifically designed for transition to military targeting systems. - Continue to add militarily significant nuclear weapon effects to tools specifically designed to support nuclear survivability and standards formulation.													
<b>Accomplishments/Planned Programs Subtotals</b>											0.000	3.528	3.500

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017	
<b>Appropriation/Budget Activity</b> 0400 / 3				<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				<b>Project (Number/Name)</b> RL / Nuclear & Radiological Effects			
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	28.333	28.668	29.228	-	29.228	29.640	30.324	30.999	31.695	Continuing	Continuing
• *123/0605000BR: Counter Weapons of Mass Destruction Systems Development	-	-	-	-	-	-	-	-	-	0.000	64.199
<b>Remarks</b>											
Prior year funds related to this project in program element number 0605000BR.											
<b>D. Acquisition Strategy</b>											
N/A											
<b>E. Performance Metrics</b>											
Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")											

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											<b>Date:</b> May 2017			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RM / WMD Counterforce Technologies					
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
RM: WMD Counterforce Technologies	131.135	19.374	23.138	24.663	-	24.663	25.447	25.892	26.473	27.006	Continuing	Continuing		

**A. Mission Description and Budget Item Justification**

The Weapons of Mass Destruction (WMD) Counterforce Technologies project develops, integrates, demonstrates, and transitions emerging technologies enabling efforts to find, characterize, assess, and plan for the defeat of WMD threats. There are two core research efforts in this project. The WMD battlespace awareness effort provides warfighters with capabilities to find, characterize, and assess WMD threats. This effort develops and integrates sensing technologies with multi-mission Unmanned Aerial System payloads. The Countering WMD (CWMD) weapons effects effort develops modernized, fast-running, validated CWMD planning tools and integrates modeling and simulation software to optimize the execution of WMD and associated hard target defeat operations.

The increase from FY 2016 to FY 2017 is due to increased investment in WMD reconnaissance technology and weapons effects and planning tools. The increase from FY 2017 to FY 2018 is due to increased investment in weapons effects and planning tools technology development.

B. Accomplishments/Planned Programs (\$ in Millions)	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>
<p><b>Title:</b> RM: WMD Counterforce Technologies</p> <p><b>Description:</b> Project RM provides: (1) full-scale testing of CWMD weapons effects, weapon effects modeling, and weapon delivery system optimization; and (2) WMD sensor, surveillance, and data processing technologies.</p> <p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Validated correlation between Biological Intelligence, Surveillance, and Reconnaissance (Bio-ISR) Mobile Ground Sensor (MGS) training aid and high priority biological warfare agent; this successful test was critical for continued development of counter-biological warfare search capabilities meeting customer requirements.</li> <li>- Developed first generation Bio-ISR Loop Mediated Isothermal Amplification (LAMP) Bio Identifier; the LAMP system will provide end-users with a field presumptive identification capability for biological warfare threat agents.</li> <li>- Developed and transitioned Granite Toupee CWMD system (GT) Phase I to meet emergent customer requirements; GT reduces operator CWMD target engagement dwell times and increases operator safety during neutralization of WMD materials.</li> <li>- Transitioned initial biological search technologies (Biological-Intelligence, Surveillance and Reconnaissance (Bio-ISR) Spiral 1) to DoD and Interagency end-users. Initiated planning for Bio-ISR Spiral 2 demonstration of improved biological search technologies.</li> <li>- Transitioned models for blast propagation through failing blast doors, sufficient to predict both the response of the blast door and the hazard to people and equipment. A stand-alone fast running model (FRM) was delivered to U.S. Forces Korea and the Republic of Korea (ROK) Agency for Defense Development.</li> </ul>	19.374	23.138	24.663

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)	
0400 / 3	PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	RM / WMD Counterforce Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			
<p>- Completed Integrated Munitions Effectiveness Assessment (IMEA) 11.1, supporting target characterization (e.g., 4D processes, adobe structures, barrier walls, scalable equipment), ground operations (e.g., Concept Development and Experimentation (CDE), fragment, and crater debris effects and visualization), and air delivered weapon planning (e.g., GPS jamming, slab strength reduction for follow-on weapons, and hard target void sensing fuse updates), along with DTRA informal accreditation to allow the use of IMEA 11.1 for Targeting Weaponeering Assistance Cell Reachback support.</p> <p>- Supported Army Program Manager for Unmanned Systems in performing analysis of WMD Aerial Collection System transition activities, fielding, and procurement.</p> <p>- Delivered prototype 64-bit version of CWMD modeling and simulation planning tools for analysis of large data sets.</p> <p>- Delivered Targeting/Weaponeering academics and targeting recommendation packages for Combatant Commands.</p> <p>- Delivered agent defeat modeling capabilities (Human Injury, Dynamic Pressure, and Structural Response) for DTRA's Reachback mission.</p> <p>- Demonstrated unmanned platform capable of high-altitude/long-range glide, vertical takeoff, and landing transition, and egress for covert emplacement of Chemical, Biological, Radiological, and Nuclear (CBRN) payloads/sensors.</p> <p>- Demonstrated nano-material based sensor/reporting system for detection of biological and chemical threats.</p> <p>- Designed, developed, integrated, and tested computer vision and autonomous navigation on unmanned systems to enable precise CBRN payload emplacement.</p> <p>- Initiated the development of a low-visibility sensor/detection device for chemical search missions.</p> <p>- Continued to develop technology for enhanced area search, localization, and point detection/identification tools for biological threats of interest (Spiral 2).</p> <p>- Continued to develop improved agent defeat modeling capabilities for WMD target attack planning.</p> <p>- Provided U.S. Central Command, Air Forces Central Command, and the Combined Joint Task Force Operation Inherent Resolve with over 300 Target Recommendation Packages.</p>	FY 2016	FY 2017	FY 2018
<b>FY 2017 Plans:</b>			
<p>- Demonstrate proof of concept for next-generation chemical warfare agent detector.</p> <p>- Demonstrate enhanced WMD sample collection system for low-visibility search operations.</p> <p>- Demonstrate Biological Intelligence Surveillance and Reconnaissance (Bio-ISR) Spiral 2 enhanced area search sensors/ capabilities for counter-bio search missions.</p> <p>- Integrate, test and demonstrate CBRN defeat technologies in a remotely-operated unmanned payload.</p> <p>- Test and validate the Vertical Take-off and Landing Autonomous Precision Emplacement System delivering chemical, biological, radiological and nuclear defeat payloads.</p> <p>- Transition enhanced structural response and WMD agent dispersion/neutralization models, using new software architecture for improved WMD vulnerability assessment and force protection planning capabilities.</p>			

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017																																					
<b>Appropriation/Budget Activity</b> 0400 / 3			<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				<b>Project (Number/Name)</b> RM / WMD Counterforce Technologies																																								
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>							<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>																																						
<ul style="list-style-type: none"> <li>- Transition final prototype of advanced area search sensor to counter biological warfare threats.</li> <li>- Complete phase one of three new software architecture developments, allowing WMD defeat modeling and simulation planning tools (i.e., IMEA) to enhance integration with partner agency tools.</li> <li>- Publish targeting/weaponeering academics and targeting recommendation packages for Combatant Commands.</li> </ul>																																															
<b>FY 2018 Plans:</b> <ul style="list-style-type: none"> <li>- Demonstrate sample extraction prototype capability for rapid sampling of hazardous chemicals from solid storage.</li> <li>- Continue to demonstrate enhanced WMD sample collection and analysis systems for low-visibility search operations.</li> <li>- Demonstrate mission planning and analytical tools for chem-search operations, including sensor emplacement and source attribution.</li> <li>- Design, test and integrate Granite Toupee Phase II agitation and injection system upgrades to increase target prosecution efficiency and effectiveness.</li> <li>- Conduct Hydra Spear End-User Evaluation to gain operator perspective and catalog recommended prototype system upgrades for final system production.</li> <li>- Conduct Hydra Shield Operational Evaluation to determine system effectiveness and operational utility against WMD targets in representative environments.</li> <li>- Begin phase two of three new software architecture developments, allowing WMD defeat modeling and simulation planning tools (i.e., IMEA, VAPO) to more quickly and efficiently enhance integration with planning tools used by partner agencies and international allies.</li> <li>- Conduct proof of concept demonstrations for enhanced area search sensors and capabilities for biological weapon search missions.</li> </ul>																																															
<b>Accomplishments/Planned Programs Subtotals</b>										19.374	23.138	24.663																																			
<b>C. Other Program Funding Summary (\$ in Millions)</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 25%;">Line Item</th> <th style="text-align: center; width: 15%;">FY 2016</th> <th style="text-align: center; width: 15%;">FY 2017</th> <th style="text-align: center; width: 15%;">FY 2018</th> <th style="text-align: center; width: 15%;">FY 2018</th> <th style="text-align: center; width: 15%;">FY 2018</th> <th style="text-align: center; width: 15%;">FY 2019</th> <th style="text-align: center; width: 15%;">FY 2020</th> <th style="text-align: center; width: 15%;">FY 2021</th> <th style="text-align: center; width: 15%;">FY 2022</th> <th style="text-align: center; width: 15%;">Cost To Complete</th> <th style="text-align: center; width: 15%;">Total Cost</th> </tr> <tr> <th></th> <th></th> <th></th> <th>Base</th> <th>OCO</th> <th>Total</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research</td> <td style="text-align: center;">12.873</td> <td style="text-align: center;">12.097</td> <td style="text-align: center;">14.552</td> <td style="text-align: center;">-</td> <td style="text-align: center;">14.552</td> <td style="text-align: center;">12.612</td> <td style="text-align: center;">12.852</td> <td style="text-align: center;">13.129</td> <td style="text-align: center;">13.395</td> <td style="text-align: center;">Continuing</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table>												Line Item	FY 2016	FY 2017	FY 2018	FY 2018	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost				Base	OCO	Total							• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	12.873	12.097	14.552	-	14.552	12.612	12.852	13.129	13.395	Continuing	Continuing
Line Item	FY 2016	FY 2017	FY 2018	FY 2018	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost																																				
			Base	OCO	Total																																										
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	12.873	12.097	14.552	-	14.552	12.612	12.852	13.129	13.395	Continuing	Continuing																																				
<b>Remarks</b>																																															

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency		<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of <i>Mass Destruction Advanced Technology</i> <i>Development</i>	<b>Project (Number/Name)</b> RM / WMD Counterforce Technologies
<b>D. Acquisition Strategy</b> Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.		
<b>E. Performance Metrics</b> Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")		

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				**RR / Countering WMD Test and Evaluation					
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
**RR: Countering WMD Test and Evaluation	14.052	2.000	0.000	12.500	-	12.500	12.500	12.500	12.500	12.500	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**

Project RR provides a unique national test bed capability for simulated weapons of mass destruction (WMD) facility characterization, weapon-target interaction, and WMD facility defeat testing to respond to operational needs by developing and maintaining test beds used by the Department of Defense (DoD), the Military Services, the Combatant Commanders and other Federal Agencies to evaluate the implications of WMD, conventional, and other special weapon use against U.S. military or civilian systems and targets.

The decrease from FY 2016 to FY 2017 is due to a relative impact of increased investment in FY 2016 for crane operations and build-out of the test bed structures at the Nevada National Security Site for sensor development and testing. The increase from FY 2017 to FY 2018 is due to increased investment in the Special Test Bed for missile defense.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2016	FY 2017	FY 2018
<b>Title:</b> RR: Countering WMD Test and Evaluation	2.000	0.000	12.500
<b>Description:</b> Project RR provides a unique national test bed capability for simulated WMD facility characterization, weapon-target interaction, and WMD facility defeat testing.			
<b>FY 2016 Accomplishments:</b>			
- Initiated crane operations 7 and 8 and the build-out of test bed structures at the Nevada National Security Site for sensor development and testing.			
<b>FY 2017 Plans:</b>			
N/A			
<b>FY 2018 Plans:</b>			
- Support Combatant Command exercises and planning events at the Nevada Test Bed in order to develop missile defeat technologies, tools, and capabilities.			
- Develop interagency capabilities and special tests in support of national priority programs and mission requirements.			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017			
<b>Appropriation/Budget Activity</b> 0400 / 3										<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development			
										<b>Project (Number/Name)</b> **RR / Countering WMD Test and Evaluation			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>										<b>FY 2016</b> <b>FY 2017</b> <b>FY 2018</b>			
- Augment scheduling, test planning, maintenance and analysis capabilities for missile defeat technology tests and demonstrations.													
										<b>Accomplishments/Planned Programs Subtotals</b> 2.000    0.000    12.500			
<b>C. Other Program Funding Summary (\$ in Millions)</b>										<b>Cost To</b>			
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>Base</b>	<b>FY 2018</b>	<b>OCO</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	10.718	13.666	13.652	-	13.652		12.464	12.945	13.288	13.586	Continuing	Continuing	
<b>Remarks</b>													
<b>D. Acquisition Strategy</b>													
Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.													
<b>E. Performance Metrics</b>													
Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")													

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)					
0400 / 3					PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development				RT / Target Assessment Technologies					
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost		
RT: Target Assessment Technologies	191.160	63.579	41.794	27.185	-	27.185	24.276	23.722	24.323	24.838	Continuing	Continuing		

**A. Mission Description and Budget Item Justification**

The Target Assessment Technologies project develops, integrates, tests, demonstrates, and transitions processes and technologies providing advanced capabilities in the areas of Weapons of Mass Destruction (WMD) target assessment and functional defeat. The functional defeat process includes finding and identifying a facility, characterizing its function and physical layout, determining current or future vulnerabilities to available defeat mechanisms, planning and executing an attack, assessing damage, and denying reconstitution efforts. Applying these processes to time-dependent constraints related to WMD target characterization and threat analysis presents a further technical challenge. This project develops analytical tools and processes required to (1) find and characterize WMD targets and associated hard and deeply buried targets and to (2) assess in real time the results of physical and functional defeat operations (such as a direct attack). These novel, dynamic capabilities enable Combatant Commands and the intelligence community (IC) to hold at risk high value targets possessed by adversaries.

The decrease from FY 2016 to FY 2017 is due to the projected completion of the development and integration of high-priority find, characterize, and assess sensor technologies and supporting algorithms and software. The decrease from FY 2017 to FY 2018 is due to decreased investment reflecting the transition of the previously mentioned high-priority sensor technology and supporting algorithms to the combatant commands.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<b>Title:</b> RT: Target Assessment Technologies	63.579	41.794	27.185
<b>Description:</b> Project RT provides Combatant Commands and the IC with technologies and processes to find and characterize WMD targets and hard and deeply buried targets and then assess the results of attacks against those targets.			

**FY 2016 Accomplishments:**

- Completion of two developmental demonstrations/exercises (Crane Ops 5 and Crane Ops 6) to gather sensor data, develop signatures, and conduct sensor phenomenology analysis in support of further program development.
- Designed, built, and delivered realistic test article to enhance fidelity of sensor demonstrations and testing.
- Developed new and enhanced (range/sensitivity) detection capabilities and enhanced delivery capabilities of the deployable sensor project.
- Developed and demonstrated Nuclear WMD Defeat Model for support of IC CWMD analysis and functional defeat targeting.
- Developed and demonstrated Chemical-Biological Weapons Emerging Threats Model capability for support of IC CWMD analysis and course of action selection.
- Conducted validation and verification of thermal process modeling capability for support of IC functional vulnerability analysis of hard or deeply buried WMD related targets.

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017
<b>Appropriation/Budget Activity</b> 0400 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of Mass Destruction Advanced Technology Development	<b>Project (Number/Name)</b> RT / Target Assessment Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>			
- Demonstrated initial soil composition and layering penetration prediction model for support of target characterization and mission planning.		<b>FY 2016</b>	<b>FY 2017</b>
<b>FY 2017 Plans:</b> - Demonstrate range and sensitivity detection capabilities and enhanced delivery system for a deployable remote ground sensor. - Conduct integration testing and algorithm validation of a deployable prototype ground sensor. - Integrate deployable ground sensor data outputs into Dynamic Characterization Modeling Tools to support time-dependent target analysis. - Develop processes and approaches for characterization of "Pattern of Life" based upon multiple modalities of data input. - Develop analytical processes for planning Functional Defeat of UGFs based on "Pattern of Life" analysis and near-real-time information updates. - Continue to develop WMD complex process models into target facility characterizations. - Continue to develop geo-technical soil and rock models for use in target characterization and sensor deployment planning.			<b>FY 2018</b>
<b>FY 2018 Plans:</b> - Complete prototype development, final documentation, and technical report in preparation for transition of a deployable remote ground sensor project. - Develop detailed feasibility study and program plan for WMD and Hard Target automated characterization capability. - Continue to develop comprehensive soil model library for support of geotechnical site characterization of WMD target sites. - Refine and enhance WMD complex modeling capabilities for integration with automated target characterization. - Integrate functional defeat and "pattern of life" models into automated target characterization capability. - Deliver enhanced counter-WMD and UGF schoolhouse training exercises to IC and Combatant Commands.			
<b>Accomplishments/Planned Programs Subtotals</b>			63.579    41.794    27.185
<b>C. Other Program Funding Summary (\$ in Millions)</b>			
N/A			
<b>Remarks</b>			
<b>D. Acquisition Strategy</b> Assessment and selection of best performer for developmental requirements to meet specific military capability needs. Performer base includes best-of-breed researchers across DoD and other government agency laboratories, academia, industry, and international partner organizations.			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency		<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603160BR / *Counter Weapons of <i>Mass Destruction Advanced Technology</i> <i>Development</i>	<b>Project (Number/Name)</b> RT / Target Assessment Technologies
<b>E. Performance Metrics</b> Percentage of completed demonstration programs transitioning each year. (This is Priority Goal 4.1.2, as cited in U.S. Department of Defense Agency Strategic Plan for Fiscal Years 2015-2018, in support of Strategic Objective 4.1, "Preserve investments to maintain our decisive technological superiority.")		

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Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)								
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 5: System Development & Demonstration (SDD)					PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development								
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
Total Program Element	77.733	7.156	4.568	6.241	-	6.241	6.216	4.864	5.388	5.652	Continuing	Continuing	
**RF: Forensics Technologies	13.534	7.156	4.568	6.241	-	6.241	6.216	4.864	5.388	5.652	Continuing	Continuing	
RL: Nuclear & Radiological Effects	64.199	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	64.199	

### Note

\*Program Element 0605000BR name changes from WMD Defeat Capabilities to Counter Weapons of Mass Destruction Systems Development beginning in FY 2018.  
 \*\*Project RF-Detection and Forensics Technologies subdivides into Projects RD-Detection Technologies and RF-Forensics Technologies in FY 2016. This impacts these projects in PE 0602718BR and PE 0603160BR. See C. Other Program Funding Summary below.

### A. Mission Description and Budget Item Justification

The Counter Weapons of Mass Destruction (WMD) Systems Development program element supports the development and demonstration of verification and monitoring technologies and systems for the Countering Weapons of Mass Destruction (CWMD) mission. This funding specifically supports International Monitoring System technology requirements under the Nuclear Arms Control Technology (NACT) program. Through FY 2014, funding also supported the development of collaborative CWMD analysis capabilities between the Department of Defense and key interagency and international partners through a globally accessible net-centric framework in the form of the Integrated Weapons of Mass Destruction Toolset.

B. Program Change Summary (\$ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	7.156	4.568	9.092	-	9.092
Current President's Budget	7.156	4.568	6.241	-	6.241
Total Adjustments	0.000	0.000	-2.851	-	-2.851
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Realignments	-	-	-2.851	-	-2.851

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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> FY 2018 Defense Threat Reduction Agency	<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide / BA 5: System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development
<b>Change Summary Explanation</b> The decrease in FY 2018 from the previous President's Budget submission is due to realignment of RDT&E to O&M in support of station operations for NACT and a realignment of funds from DTRA to the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD (AT&L)) for support services necessary to meet oversight responsibilities.	

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development				Project (Number/Name) **RF / Forensics Technologies				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
**RF: Forensics Technologies	13.534	7.156	4.568	6.241	-	6.241	6.216	4.864	5.388	5.652	Continuing	Continuing	
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-	

**Note**

\*Project RF-Detection and Forensics Technologies subdivides into projects RD-Detection Technologies and RF-Forensics Technologies beginning in FY 2016.

**A. Mission Description and Budget Item Justification**

This project supports the development of verification and monitoring capabilities for the Defense Threat Reduction Agency (DTRA) to counter proliferation and weapons of mass destruction (WMD). DTRA's Nuclear Arms Control Technologies (NACT) program performs Research, Development, Test, and Evaluation (RDT&E) to improve the sustainability, reliability, and effectiveness of capabilities related to its operational mission to install, operate, maintain, and sustain the waveform and radionuclide nuclear detonation detection stations comprising the U.S. portion of the International Monitoring System (IMS). This delivers data to the U.S. monitoring and verification community and enables U.S. compliance with the Comprehensive Nuclear Test Ban Treaty (CTBT) in support of U.S. and Department of Defense (DoD) nonproliferation objectives.

The project addresses WMD monitoring, implementation of, and compliance with arms control agreement requirements validated by the Office of the Under Secretary of Defense, Acquisition, Technology, and Logistics. This project conforms to the administration's research and development priorities related to WMD arms control and disablement. Technical assessments are made against CTBT implementation requirements and U.S. objectives to provide the basis for sound project development, evaluate existing programs, provide data required to inform compliance assessments, and support U.S. monitoring policy, decision-makers, and negotiation teams.

The primary RDT&E program emphasis is on improvements that enable the installation of treaty-specific stations, which reduce costs and increase the reliability in diverse and often harsh environments; improve efficiency, performance, reliability, and sustainability of existing stations and treaty-specified verification capabilities; and improve capabilities to detect, characterize, and enable discrimination of, nuclear weapons tests. The NACT program directly supports U.S. and allied warfighter and national technical monitoring requirements and provides vital data used by the treaty monitoring community, warfighter planners, DoD, other U.S. Government agencies, and international agencies.

The decrease from FY 2016 to FY 2017 is due to re-phasing of program activities to FY 2018 and FY 2019. The increase from FY 2017 to FY 2018 is due to the net effect of re-phasing of program activities from FY 2017, a realignment of RDT&E to O&M in support of station operations for NACT, and a realignment of funds from DTRA to the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD (AT&L)) for support services necessary to meet Congressional oversight responsibilities.

**B. Accomplishments/Planned Programs (\$ in Millions)**

Title: RF - Forensics Technologies	FY 2016	FY 2017	FY 2018
	7.156	4.568	6.241

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency			Date: May 2017	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development	Project (Number/Name) **RF / Forensics Technologies		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		FY 2016	FY 2017	FY 2018
<p><b>Description:</b> Project RF supports the NACT Program, conducting RDT&amp;E to meet IMS technology requirements in support of CTBT implementation, compliance, monitoring, inspection, and other emerging nuclear arms control activities.</p>				
<p><b>FY 2016 Accomplishments:</b></p> <ul style="list-style-type: none"><li>- Completed installation of additional infrasound elements, seismic elements, and wind noise reduction systems at the Facility for Acceptance, Calibration, and Testing at Sandia Labs (SNL). These systems support the testing and verification/validation of nuclear-explosion monitoring equipment before integration into the U.S. IMS.</li><li>- Developed and implemented concepts to improve the reliability of the radionuclide stations and improve radionuclide and infrasound signal to noise ratios that will enhance strategic deterrence by lowering the U.S International Monitoring System nuclear-explosion detection thresholds and data availability for forensics analyses.</li><li>- Continued support of Office of the Secretary of Defense (OSD) Threat Reduction and Arms Control Treaty management objectives, providing regular IMS assessments, quarterly program management reviews, and supporting all OSD engagements with the Comprehensive Test Ban Treaty Organization Provisional Technical Secretariat.</li><li>- Continued development and implementation of IMS sensor and station calibration software and in-situ calibration concepts, to standardize calibration capability using novel algorithms and automated software.</li><li>- Developed and implemented U.S. IMS specific life-cycle management software to enable cost effective and efficient spare part replacement and long-range recapitalization.</li><li>- Sponsored and participated in CTBT technology development exchanges in order to discover emerging technologies that have the potential to optimize performance and cost effectiveness of the IMS.</li></ul>				
<p><b>FY 2017 Plans:</b></p> <ul style="list-style-type: none"><li>- Optimize IMS technology and operations to comply with CTBT language and evolving operational manual requirements and to increase cost efficiency.</li><li>- Validate alternative filter media against Provisional Technical Secretariat certification standards for U.S. IMS particulate radionuclide sensor to enhance aerosol collection efficiency for the Radionuclide Aerosol Sampler/Analyzer system.</li><li>- Conduct Analysis of Alternatives for Hydroacoustic monitoring.</li><li>- Annually, provide analysis of up to 800 additional International Atomic Energy Agency verification samples in support of the OSD, Nuclear, Chemical and Biological Threat Reduction Advisory Committee.</li><li>- Complete evaluation of U.S. IMS operational options determined from life-cycle modeling and simulation to determine most cost-effective operational models.</li><li>- Evaluate alternative backup power options for arctic to improve reliability and performance in remote locations as defined by CTBT Operations Manuals.</li><li>- Participate in CTBT Organization Provisional Technical Secretariat sponsored technology development exchanges.</li></ul>				

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017
<b>Appropriation/Budget Activity</b> 0400 / 5				<b>R-1 Program Element (Number/Name)</b> PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development						<b>Project (Number/Name)</b> **RF / Forensics Technologies	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>									<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>
<ul style="list-style-type: none"> <li>- Finalize testing for Provisional Technical Secretariat qualification of alternative infrasound waveform sensor that improves efficiency, reliability, or cost effectiveness at equal or greater data quality objectives.</li> <li>- Run models and simulations to improve understanding of CTBT IMS network viability/limitations.</li> </ul>											
<b>FY 2018 Plans:</b> <ul style="list-style-type: none"> <li>- Continue the optimization of IMS technology and operations to comply with CTBT language and evolving operational manual requirements in order to increase efficiencies, sustainability and cost effectiveness.</li> <li>- Conduct testing of waveform station components and systems at the Facility for Acceptance, Calibration, and Testing Site as a demonstration in a relevant environment.</li> <li>- Continue development of improved state of health monitoring software for use on radionuclide stations to provide a predictive indication of pending failures and required maintenance.</li> <li>- Establish a Radionuclide Test-bed capability for rapid resolution system faults.</li> <li>- Continue to participate in CTBT Organization Provisional Technical Secretariat sponsored technology development exchanges to provide synergy for R&amp;D activities.</li> <li>- Continue to conduct field testing on High Reliability Power Sources for arctic operational environments.</li> <li>- Conduct Entry-into-Force Readiness, Rapid Response risk assessment, and Operational Tabletop Exercises in order to quantify risks and the costs of mitigation.</li> <li>- Advance the state of health monitoring capability for waveform and radionuclide stations to increase reliability, sustainability, and cost effectiveness.</li> <li>- Evaluate self-calibrating infrasound sensors for use at IMS stations.</li> <li>- Evaluate the implementation of a standard configuration for the Central Recording Facility for use at IMS stations.</li> <li>- Continue the sustainment of the Radionuclide Lab (RL16) at Pacific Northwest National Laboratory in support of the CTBT.</li> </ul>											
<b>Accomplishments/Planned Programs Subtotals</b>											7.156      4.568      6.241
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018 Base</b>	<b>FY 2018 OCO</b>	<b>FY 2018 Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	10.525	10.008	10.274	-	10.274	10.345	10.500	10.771	10.991	Continuing	Continuing
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	40.373	38.540	40.286	-	40.286	42.580	40.925	42.144	43.124	Continuing	Continuing

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency								Date: May 2017			
Appropriation/Budget Activity 0400 / 5		R-1 Program Element (Number/Name) PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development			Project (Number/Name) **RF / Forensics Technologies						
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
<b>Remarks</b>											
<b>D. Acquisition Strategy</b>											
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 the Department of Energy National Laboratories.											
<b>E. Performance Metrics</b>											
The goal of the NACT RDT&E program is to enable full compliance of all emerging data quality requirements and other requirements as documented in CTBT treaty language, CTBT-issued Radionuclide and Waveform Operations Manuals, other CTBT Organization communications, and DoD Treaty Implementation Manager directives. RDT&E is conducted in support of NACT's operational mission to operate, maintain, and sustain the Provisional Technical Secretariat certified waveform and radionuclide CTBT monitoring stations and radionuclide laboratory in accordance with CTBT requirements. CTBT IMS data availability/timeliness performance specifications are currently 98% data availability for IMS waveform and 95% for IMS radionuclide systems. Data quality metrics continue to evolve as the entire CTBT IMS capability is exercised and tested.											

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development				Project (Number/Name) RL / Nuclear & Radiological Effects				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RL: Nuclear & Radiological Effects	64.199	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	64.199	
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

Efforts in this project were completed in FY 2014. Under Project RL, the Net-Centric Architecture program integrated legacy capabilities and facilitated data sharing through a net-centric framework. It provided near-real time collaborative analysis capabilities between the Department of Defense (DoD) and key interagency and international partners through a globally accessible net-centric framework known as the Integrated Weapons of Mass Destruction Toolset. This toolset migrated the Defense Threat Reduction Agency's (DTRA's) chemical, biological, radiological, and nuclear (CBRN) modeling and simulation codes to provide an integrated suite of Countering Weapons of Mass Destruction (CWMD) decision support capabilities. The framework was the only operational chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE) framework in the world that provided capabilities through web applications, net-centric web services, and stand-alone mobile deployments which are validated and accredited for operational use by international, national, state, and local authorities.

The decrease in FY 2015 is due to the completion of Integrated Weapons of Mass Destruction Toolset investments.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<b>Title:</b> RL: Nuclear & Radiological Effects	0.000	-	-
<b>Description:</b> Project RL develops and provides a real-time globally accessible net-centric framework which migrates the DTRA CBRNE modeling and simulation codes to provide an integrated suite of CWMD decision support capabilities.			
<b>FY 2016 Accomplishments:</b> NA			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	-	-

**C. Other Program Funding Summary (\$ in Millions)**

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research	28.333	28.668	29.228	-	29.228	29.640	30.324	30.999	31.695	Continuing	Continuing

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017
<b>Appropriation/Budget Activity</b> 0400 / 5				<b>R-1 Program Element (Number/Name)</b> PE 0605000BR / *Counter Weapons of Mass Destruction Systems Development						<b>Project (Number/Name)</b> RL / Nuclear & Radiological Effects
<b>C. Other Program Funding Summary (\$ in Millions)</b>										
<u>Line Item</u>	<u>FY 2016</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2018</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>Cost To Complete</u>
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development	0.000	3.528	3.500	-	3.500	3.456	3.457	3.455	3.455	Continuing
<b>Remarks</b>										
<b>D. Acquisition Strategy</b> The program for Integrated Weapons of Mass Destruction Toolset was executed through a competed cost plus fixed-fee contract. This contract was a 3-year effort for software development, test, and integration.										
<b>E. Performance Metrics</b> Demonstrate and provide over 80% of the customer-required CBRN modeling and simulation capabilities over networks, e.g., DoD Global Information Grid. Integrate mission-required legacy DTRA CBRNE codes into a net-centric architecture through a process-controlled verification, validation, and accreditation standards-based method necessary to promote the National Strategy for Countering Biological Threats.										

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Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: <i>RDT&amp;E Management Support</i>					PE 0605502BR / Small Business Innovation Research							
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	38.612	10.473	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
RA: <i>Information Sciences and Applications</i>	38.612	10.473	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
<b>Note</b>												
Funding for this program element is not allocated until the year of execution. Program Element 0605502BR "Small Business Innovative Research" is used in reporting year-end actual expenses only.												
<b>A. Mission Description and Budget Item Justification</b>												
The Small Business Innovative Research (SBIR) and the Small Business Technology Transfer (STTR) programs provide the means for stimulating technological innovation in the private sector, strengthens the role of small business in meeting the Department of Defense (DoD) research and development needs; fosters and encourages participation of minority and disadvantaged businesses in technological innovation; and increases the commercial application of the DoD supported research and development results. These efforts are responsive to Public Law 106-554.												
B. Program Change Summary (\$ in Millions)		FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total						
Previous President's Budget		0.000	0.000	0.000	-	0.000						
Current President's Budget		10.473	0.000	0.000	-	0.000						
Total Adjustments		10.473	0.000	0.000	-	0.000						
• Congressional General Reductions		-	-									
• Congressional Directed Reductions		-	-									
• Congressional Rescissions		-	-									
• Congressional Adds		-	-									
• Congressional Directed Transfers		-	-									
• Reprogrammings		-	-									
• SBIR/STTR Transfer		10.473	-									
<b>Change Summary Explanation</b>												
Funding for the SBIR Program is consolidated in this Program Element during the year of execution.												

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency											Date: May 2017		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605502BR / Small Business Innovation Research				Project (Number/Name) RA / Information Sciences and Applications				
COST (\$ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost	
RA: <i>Information Sciences and Applications</i>	38.612	10.473	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing	
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-	

**Note**  
 \*Funding is not allocated until the year of execution. Program Element 0605502BR "Small Business Innovative Research (SBIR)" is used in reporting year-end actual expenses only.

**A. Mission Description and Budget Item Justification**  
 This project provides the means for stimulating technological innovation in the private sector, strengthens the role of small business in meeting the Department of Defense (DoD) research and development needs; fosters and encourages participation of minority and disadvantaged businesses in technological innovation; and increases the commercial application of the DoD supported research and development results. These efforts are responsive to Public Law 106-554.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2016	FY 2017	FY 2018
<b>Title:</b> RA: Information Sciences and Applications <b>Description:</b> This project provides the means for stimulating technological innovation in the private sector, strengthens the role of small business in meeting the DoD research and development needs; fosters and encourages participation of minority and disadvantaged businesses in technological innovation; and increases the commercial application of the DoD supported research and development results. These efforts are responsive to Public Law 106-554. <b>FY 2016 Accomplishments:</b> - Manufactured, tested, and modeled bulk metal glass high speed projectiles ballistic performance for potential WMD target defeat applications.  Phase I contract awards from qualified proposals: SBIR 14.3 solicitation: 8 awards SBIR 15.2 solicitation: 22 awards STTR 16.A solicitation: 8 awards  Phase II contract awards from qualified proposals: SBIR 13.3 solicitation: 2 awards	10.473	-	-

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Exhibit R-2A, RDT&E Project Justification: FY 2018 Defense Threat Reduction Agency										<b>Date:</b> May 2017					
<b>Appropriation/Budget Activity</b> 0400 / 6				<b>R-1 Program Element (Number/Name)</b> PE 0605502BR / Small Business Innovation Research				<b>Project (Number/Name)</b> RA / Information Sciences and Applications							
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>					
SBIR 12.1 solicitation: 1 award															
<b>C. Other Program Funding Summary (\$ in Millions)</b>															
<b>Line Item</b>		<b>FY 2016</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>Base</b>	<b>FY 2018</b>	<b>OCO</b>	<b>FY 2018</b>	<b>Total</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• 20/0602718BR: Counter Weapons of Mass Destruction Applied Research		29.133	29.127	30.270	-	30.270		32.325	32.325	28.286	29.083	30.077	Continuing	Continuing	
• 26/0603160BR: Counter Weapons of Mass Destruction Advanced Technology Development		11.494	11.422	10.229	-	10.229		11.983	11.983	12.183	12.468	12.733	Continuing	Continuing	
<b>Remarks</b>															
<b>D. Acquisition Strategy</b>															
N/A															
<b>E. Performance Metrics</b>															
N/A															

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