Five-Year Research and Development Plan

Fiscal Years 2008-2013

August 2008

Homeland Security

Science and Technology

Department of Homeland Security
Science and Technology Directorate

Five-Year Research and Development Plan

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U.S. DEPARTMENT OF
HOMELAND SECURITY

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Introduction

The mission of the Science and Technology Directorate (S&T) is to deliver improved homeland security capabilities to operating components of the Department of Homeland Security (DHS) and State, local and tribal entities charged with supporting the homeland security mission. As the Department's science and technology arm, S&T advises the Secretary on research and development (R&D) priorities and efforts to support the homeland security mission. S&T works closely with other government agencies (both domestic and foreign), the private sector, national laboratories, and universities to deliver capabilities and technologies that facilitate the effective protection of our homeland from terrorist threats or natural disasters. Through a managed process of basic research to product delivery, S&T works with its customers to identify capability gaps and develop appropriate and cost-effective technologies to improve operational effectiveness and efficiency in supporting the homeland security mission.

S&T identifies and delivers capabilities that will meet customers' needs to support their homeland security mission. Through the customer-led Capstone Integrated Product Teams (IPTs), S&T works with its customers to identify these functional capability requirements. S&T identifies the highest priority needs and allocates resources to support science and technology programs that will effectively meet their customers' capability gaps. The Capstone IPT process ensures that product development and transition align to customer mission requirements.

To that end S&T Programs, Projects, and Activities (PPAs) are aligned to the Secretary's top priorities:

1. Continue to Protect our Nation from Dangerous People.
2. Continue to Protect our Nation from Dangerous Goods.
3. Protect Critical Infrastructure.
4. Build a Nimble, Effective Emergency Response Capability and a Culture of Preparedness.
5. Strengthen and Unify DHS Operations and Management.

Additionally, each PPA technology program is mapped to the customers' performance metrics to ensure that S&T is developing appropriate technologies to meet the most recent capability requirements.

S&T's Five-Year R&D Plan lays out the blueprint for its investment portfolio, and outlines S&T's research emphasis, programs, and key milestones for the next 5 years (FY 2008- FY 2013). S&T executes its science and technology efforts through the following PPAs:

- Border and Maritime Security
- Chemical and Biological
- Command, Control, and Interoperability
- Explosives
- Human Factors
- Infrastructure and Geophysical
- Innovation
- Laboratories Facilities
- Test & Evaluation and Standards
- Transition
- University Programs

Below is a table that provides an overview of planned spending in each program:

PPA	Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Borders and Maritime	Border Watch	Border Officer Tools and Safety	0	3,851	6,224	4,104	2,600	1,800
		Maritime Technologies	0	5,000	7,050	7,101	7,152	7,203
		Border Technologies	14,543	9,741	7,352	9,840	10,204	11,244
	Cargo Security	Cargo & Conveyance Security	10,299	15,825	15,627	17,932	20,834	17,084
	Border/Maritime Total		25,479	35,300	37,181	39,975	41,835	38,302
Chemical and Biological	Agriculture	Foreign Animal Diseases	17,382	23,670	24,237	28,511	28,627	27,233
	Biological	Forensics	24,002	28,370	28,348	29,265	29,932	31,020
		Response and Restoration	5,171	6,467	6,849	6,960	2,056	2,097
		Surveillance and Detection - Operations	5,800	0	0	0	0	0
		System Studies and Decision Tools	6,754	9,001	7,306	7,594	7,723	7,687
		Threat Awareness	33,061	39,860	40,062	41,048	41,818	42,603
		Surveillance & Detection - R&D	62,496	35,099	36,529	43,920	45,861	53,819
	Chemical	Analysis	14,431	16,212	15,737	14,264	16,692	16,985
		Detection	23,217	17,021	18,992	18,253	23,196	20,783
		Response and Recovery	10,504	19,698	18,695	12,400	10,697	7,593
	Chem/Bio Total		208,020	200,408	201,800	207,400	211,900	215,200
Command, Control & Interoperability	Communications, Interoperability and Compatibility	IFSL Information Sharing	2,674	0	0	0	0	0
		OIC	10,290	11,084	8,270	6,477	4,671	7,144
	Cyber Security	Cyber Security Research Tools and Techniques	7,160	6,971	6,000	6,400	7,000	7,200
		Information Infrastructure Security	9,880	11,181	8,577	8,573	6,152	7,012
		Next Generation Technologies	2,841	0	700	800	2,975	3,134
	Basic Future Research	Visual Analytics and Physics-based Simulation	4,235	4,536	4,744	4,813	5,028	5,142
	Knowledge Management Tools	Collaborative Information Sharing	0	9,133	7,854	6,161	6,522	6,563
		Knowledge Frameworks	9,555	13,425	11,750	13,850	15,500	15,550
	Surveillance, Reconnaissance & Investigative Technologies	USSS Support	1,155	0	0	0	0	0
	Threat Assessment	Emerging Threats	7,766	3,900	1,836	1,873	1,910	1,948
		Intelligence, Surveillance, & Reconnaissance (ISR)	0	0	1,377	1,405	1,433	1,461
		Risk Sciences	0	600	1,377	1,405	1,433	1,461
	Command, Control & Interoperability Total		56,980	62,390	54,000	53,300	54,200	58,200

RE - Revised Enacted
PB - President's Budget
SBIR - Small Business Innovation Research (shown as consolidated budget)

Introduction

PPA	Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Explosives	Counter-MANPADS	DIRCM	1,500	0	0	0	0	0
	Explosive Detection	Cargo	2,306	3,450	3,450	2,700	6,200	7,700
		Checked Baggage	6,000	0	0	0	0	0
		CheckPoint	16,407	11,653	8,150	7,250	6,385	7,063
		HomeMade Explosives	9,000	7,000	5,300	3,600	3,000	2,200
		VBIED/SBIED	0	0	0	0	0	0
		Manhattan II	14,000	12,641	12,630	4,445	2,815	1,537
	Mitigation	Conveyance Protection	3,200	1,500	2,200	2,200	1,600	1,500
		Air Cargo Blast Mitigation	0	0	0	0	0	0
	Research	Algorithm	0	0	0	0	0	0
		Chemical	0	0	0	0	0	0
		Materials	0	0	0	0	0	0
		Physical	0	0	0	0	0	0
		Explosives Research	4,175	8,423	8,717	9,113	9,334	9,553
	Counter IED	Basic Research	14,625	34,125	34,125	34,125	34,125	34,125
		Transition	4,500	14,953	28,334	33,153	28,929	28,920
	Explosives Total		77,654	96,149	105,436	99,151	94,986	95,230
Human Factors	Human Research & Engineering	Personal Identification Systems	2,842	3,400	3,200	3,635	3,809	4,497
		Technology Acceptance and Integration	350	350	350	350	350	450
		Transportation Technology and Human Integration	1,438	0	0	0	0	0
		Human Systems Optimization	0	228	1,567	1,508	1,756	1,701
	Social-Behavioral Threat Analysis	Community Preparedness, Response, and Recovery	917	725	1,200	1,766	1,746	1,478
		Motivation & Intent	576	3,029	2,015	2,131	1,700	925
		Suspicious Behavior Detection	416	4,417	6,365	4,378	4,743	5,460
		Institute for Homeland Security	7,313	0	0	0	0	0
	Human Factors Total		14,206	12,460	15,087	14,136	14,484	14,909

PPA	Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Infrastructure and Geophysical	Critical Infrastructure Protection	Advanced Surveillance and Detection Systems	0	3,986	4,734	5,202	2,892	1,986
		Community Based CIP Institute	10,725	0	0	0	0	0
		National CIP R&D Plan	1,000	634	640	635	634	636
		Protective Technologies	0	8,367	8,169	9,002	9,728	10,267
		Response and Recovery Technologies	0	4,521	6,040	3,701	3,576	4,625
		Risk Reduction Technologies	5,250	0	0	0	0	0
		Modeling, Simulation & Analysis	2,677	2,731	3,510	3,565	5,943	5,789
	Geophysical	Southeast Regional Research Initiative	26,325	0	0	0	0	0
	Prepareness and Response	Incident Management Enterprise	5,000	10,292	8,511	11,355	11,144	9,147
		Integrated Modeling, Mapping, & Simulation	0	2,438	2,294	3,586	3,608	4,504
		Preparedness & Response Advance Concepts and Systems	1,500	0	0	0	0	0
		Preparedness & Response Technologies	1,000	0	0	0	0	0
		Regional Technology Integration	9,410	0	0	0	0	0
		First Responder Technologies	0	3,901	5,979	6,049	5,959	5,653
	Infrastructure/Geophysical Total		64,500	37,816	40,900	44,200	44,600	43,700
Innovation	High Impact Technology Solutions (HITS)	High Impact Technology Solutions (HITS)	4,500	17,070	11,000	9,500	8,000	5,000
	Homeland Innovative Prototypical Solutions (HIPS)	Homeland Innovative Prototypical Solutions (HIPS)	28,500	27,930	37,860	39,889	41,830	45,293
	Innovation Total		33,000	45,000	48,860	49,389	49,830	50,293

Introduction

PPA	Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Laboratory Facilities	Construction	NBAF Construction	11,000	35,600	183,749	170,688	0	0
		Plum Island Animal Disease Center (PIADC) Upgrades	17,319	0	0	0	0	0
		Plum Island Animal Disease Center D&D	0	0	0	0	0	61,457
		PNNL 300	15,000	10,000	0	0	0	0
	Operations	CSAC Operations	225	500	510	520	530	550
		EML	2,700	7,700	1,250	1,350	1,400	1,450
		NBACC Operations	16,770	32,940	28,202	28,947	29,593	31,000
		NBAF Operations	0	0	0	0	0	0
		Plum Island Animal Disease Center (PIADC) Operations	27,030	30,700	33,186	34,743	35,883	38,089
		TSL Operations	13,770	15,500	16,250	17,037	17,467	18,826
		Federal Salaries at the Labs	0	14,000	14,501	15,020	15,558	16,239
	Laboratory Facilities Total		103,814	146,940	277,648	268,306	100,431	167,611
T&E and Standards	Standards	Borders/Maritime	904	1,250	1,000	1,100	1,100	1,100
		CCI	798	900	1,001	1,150	1,150	1,255
		Chem/Bio	3,085	3,239	3,372	3,525	3,703	3,810
		Explosives	3,511	3,000	3,300	3,400	3,600	3,750
		Human Factors	2,074	2,162	2,200	2,300	2,400	2,400
		Infrastructure - Geophysical	6,729	5,974	5,350	5,350	5,350	5,350
		Standards Development	1,905	1,050	1,700	1,700	1,700	1,700
		Peer Review	2,925	0	0	0	0	0
		Platforms	2,128	2,000	2,000	2,000	2,000	2,000
	Testing & Evaluation	Plans and Policy	479	700	500	450	450	500
		T&E Infrastructure	612	700	477	475	475	475
		Test Area/Capability	2,658	3,082	2,500	2,150	1,872	1,750
	T&E/Standards Total		28,520	24,674	24,100	24,300	24,500	24,800
Transition	SAFETY Act	SAFETY Act	4,297	8,500	8,680	8,864	9,052	9,242
	Transition	International & Interagency Programs	3,501	3,571	3,642	3,715	3,790	3,865
		Program Transition	7,210	4,463	1,066	1,572	1,682	1,900
		Tech SHARE	9,500	9,500	9,000	9,000	9,200	9,300
	HSI	HSI	5,000	5,000	7,103	7,311	7,454	7,649
	Transition Total		30,265	31,830	30,134	31,117	31,846	32,637
University Programs	DHS Centers	Multi-Center Priority Projects	1,000	0	0	0	0	0
		Center for Advancing Microbial Risk Assessment (CAMRA)	0	0	0	0	0	0

PPA	Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
University Programs	DHS Centers, continued	Center Of Excellence for Risk & Economic Analysis of Terrorism Events (CREATE)	0	0	3,060	3,141	3,200	3,255
		Institute For Discrete Sciences (IDS) University Affiliate Centers	0	0	0	0	0	0
		Center of Excellence for Command, Control and Interoperability	2,000	3,580	3,060	3,141	3,200	3,255
		Center of Excellence for Maritime Island & Extreme/Remote Environmental Security	3,500	3,580	3,060	3,141	3,200	3,255
		Center of Excellence for Explosives Detection, Mitigation, and Response	3,490	3,580	3,060	3,141	3,200	3,255
		Center of Excellence for Border Security and Immigration	3,500	3,580	3,060	3,141	3,200	3,255
		Center of Excellence for Biological, Chemical and Agricultural Security	0	0	3,060	3,141	3,200	3,255
		Center of Excellence for Foreign Animal & Zoonotic Disease Defense (FAZD)	4,750	3,580	0	0	0	0
		Center of Excellence for Food Protection & Defense (NCFPD)	4,750	3,580	0	0	0	0
		Center of Excellence for National Consortium for the Study of Terrorism and Responses to Terrorism (START)	3,640	3,580	3,060	3,141	3,200	3,255
		Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management	3,500	3,580	3,060	3,141	3,200	3,255
		Center of Excellence for the Study of Preparedness and Catastrophic Event Response (PACER)	0	0	3,060	3,141	3,200	3,255
		Center of Excellence for Transportation Security	4,000	3,580	0	0	0	0
	Educational Programs	Educational Programs	9,685	6,555	6,243	6,180	6,421	6,624
	Minority Serving Institutions	Minority Serving Institutions	4,250	3,900	3,300	3,400	3,450	3,600
	University Programs Total		49,297	43,770	38,034	38,816	39,663	40,535
	SBIR		13,875	13,622	13,725	14,091	14,373	14,462
Directorate Total			**691,735**	**736,737**	**873,180**	**870,090**	**708,275**	**781,417**

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Border and Maritime Security

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Border Watch	Border Officer Tools and Safety	-	3,851	6,224	4,104	2,600	1,800
	Maritime Technologies	-	5,000	7,050	7,101	7,152	7,203
	Border Technologies	14,543	9,741	7,352	9,840	10,204	11,244
Cargo Security	Cargo & Conveyance Security	10,299	15,825	15,627	17,932	20,834	17,084
SBIR	SBIR	637	883	928	998	1,045	971
Border/Maritime Total		25,479	35,300	37,181	39,975	41,835	38,302

Overview

The Border and Maritime Security Division (BMD) develops and transitions tools and technologies that improve the security of our Nation's borders and waterways without impeding the flow of commerce and travelers. This division focuses on delivering capabilities and technologies to operating components such as Customs and Border Protection (CBP), U.S. Coast Guard (USCG), Immigration Customs Enforcement (ICE), U.S. Customs and Immigration Services, (USCIS), and the Transportation Security Administration (TSA) to better secure our borders from dangerous people and dangerous goods. BMD works closely with these operational customers to identify and generate the best technologies to mitigate the risk of terrorists, illegal immigration, illegal contraband, and weapons of mass destruction (WMD) from entering the United States.

BMD's science and technology efforts support the following DHS strategic goals:

Goal 1: Protect the Nation from Dangerous People

1.1 Control our borders and protect our interior

1.l.1 Deploy a mix of infrastructure, technology, and personnel on the Southwest border to ensure all illegal activity along the border is detected and result in interdiction and apprehensions. Support a comprehensive plan and deployment strategy to address security along the Northern border and Great Lakes.

1.1.2 Deploy maritime and air awareness capabilities and regulatory programs to identify, track, and intercept, if necessary, vessels and airplanes capable of bringing a catastrophic threat device across U.S. borders

1.1.4 Ensure interoperability and information/data sharing between DHS and other Federal law enforcement components and screening and credentialing programs

Goal 2: Protect the Nation from Dangerous Goods

2.4 Prohibit the introduction of illicit contraband

2.4.1 Continue to build an international cargo screening capability including a risk assessment program integrating commercial data, merchant information, and foreign and domestic radiation detection results.

The Border and Maritime PPA supports the following performance metrics:

Performance Metric 1:

- Improve the effectiveness of sensors along the land and maritime borders by: reducing false alarm rates from 50-percent to 10-percent; correctly detecting and classifying objects within the sensors' fields of view as vehicle, vessel, human, or animal 90-percent of the time; and adding the capability to identifying non-cooperating (non-reporting) vessels. This performance metric supports CBP, USCG, and ICE's measures:
    - Percent of apprehensions at Border Patrol checkpoints
    - Percent of narcotic seizures at Border Patrol checkpoints

Border and Maritime Security

- Border Miles with increased situational awareness aimed at preventing illegal entries per year.
- Land Border apprehension rate for major violations
- Percent of undocumented migrants who attempt to enter the United States via maritime routes that are interdicted

Performance Metric 2:

- Provide less-lethal capabilities for disabling personnel, vehicles, and vessels to law enforcement agents (CBP, ICE, and USCG). Improve the range and effectiveness of handheld detection equipment by 25 percent. This performance metric supports CBP's, USCG's, and ICE's measures:
  - Percent of apprehensions at Border Patrol checkpoints
  - Percent of narcotic seizures at Border Patrol checkpoints
  - Number of pest interceptions at ports of entry
  - Land Border apprehension rate for major violations
  - Percent of undocumented migrants who attempt to enter the United States via maritime routes that are interdicted

Performance Metric 3:

- Improve detection and notification of physical breaches, sensor alerting and tracking across all modes of transport. Develop a non-intrusive method to improve the capability to scan and/or alert for WMD materials, stowaways and contraband in cargo. This performance metric supports CBP's and Policy's measures:
  - Number of foreign cargo examinations resolved in cooperation with the Container Security Initiative
  - Percent of worldwide U.S.-destined containers processed through Container Security Initiative (CSI) ports
  - Percent of sea containers screened for contraband and concealed people
  - Percent of truck and rail containers screened for contraband and concealed people

The division carries out its R&D and technology transition efforts through two thrust areas: Border Watch and Cargo Security.

Border Watch Thrust Area – develops and applies technologies and tools that:

- increase detection of illegal border activity while requiring less manpower;
- reduce agent response time and increase officer safety;
- provide connectivity to law enforcement officers working in remote locations where it currently does not exist; and
- provide real-time, relevant information to different levels of law enforcement.

Border Watch focuses on developing a network of advanced sensor and communication technologies that will provide law enforcement officers critical information about illegal activities along the U.S. border. Currently, border operations, both at and between ports-of-entry, depend highly on a professional's institutional knowledge and aging technology. Border Watch aims to deliver advanced detection, classification and localization technologies that will enhance law enforcement officers' ability to efficiently and effectively secure the borders.

Activities in the Border Watch thrust area support the Secure Border Initiative (SBI), a comprehensive multi-year plan to secure America's borders and reduce illegal immigration, and Command 21, an initiative to enhance command-and-control capabilities for USCG.

Border and Maritime Security

The Border Watch thrust area consists of three programs that address different aspects of the border security mission: Border Officer Tools and Safety, Maritime Technologies, and Border Technologies.

Border Officer Tools and Safety Program – provides tools and technologies to enable border security law enforcement to perform their mission more efficiently and effectively with a higher level of safety. This program will leverage technologies from other government agencies that can potentially be adapted to fit the operational environment and functions of DHS border security components.

Boarding/Border Officer Tools – expands on the legacy of Boarding Officer Tools to include land and maritime law enforcement efforts. The Border Officer Tools project will improve Border Agents' and USCG boarding teams' effectiveness and enhance agent/officer safety while searching vehicles/vessels. Many of these tools will leverage technology currently under development by DHS or DOD for other purposes. These tools support secure communications (i.e., voice and data) between field operators and their command centers. The project will deliver intrusive (i.e., requires contact) as well as non-intrusive, non-destructive technologies to aid in the identification of contraband.

Milestones and Deliverables

FY 2008:

- Finalize boarding teams (BT) pre-production repeater specification.
- Finalize BT requirements study and complete alternative technologies analysis report.
- Begin initial testing of team-to-ship, line-of-sight reach-back capabilities for USCG BT.

FY 2009:

- Conduct technology survey to identify documentation resolution versus bandwidth solutions for providing 24-hour Real Time Image Transmission of high-definition images and documents.

FY 2010:

- Evaluate man-portable chemical, explosives, and drug detectors.

FY 2011:

- Transition man-portable chemical, explosives, and drug detectors.
- Investigate current and emerging counter surveillance technologies.
- Demonstrate Real Time Image Transmission.

Border Officer Safety – integrates technologies that will enable border security law enforcement agents to more safely perform their mission. These technologies include, but are not limited to:

- Enhanced Ballistic Protection – a lighter weight, more durable and higher strength materials and equipment that will increase the level of a field agent's ballistic protection while reducing their equipment load;
- Automatic Facial Recognition – captures images of individuals and compares them to law enforcement databases;
- Hidden Compartment Inspection Device – allows for agents to non-intrusively detect from greater stand-off ranges the presence of humans and contraband hidden behind walls and other barriers; and

Pursuit Termination-Vehicle/Vessel Stopping – a user-safe, non-lethal means of stopping uncooperative vehicles and vessels attempting to evade apprehension.

Milestones and Deliverables

FY 2009:

- Develop and document ballistic vest performance requirements for the border application, and evaluate equipment and technologies.

Border and Maritime Security

- Conduct a covert transmission market survey to identify viable solutions.
- Investigate facial recognition requirements and solutions.
- Develop gunfire location requirements for law enforcement officers.

FY 2010:

- Complete gunfire location specification and transition to CBP.
- Upgrade the hidden compartment inspection device design for vessels and vehicles.
- Investigate electromagnetic pulse approaches for stopping vehicles and vessels.
- Demonstrate prototype of Covert Officer Safety Transmission System project.

FY 2011:

- Transition ballistics protection prototype.
- Transition under-vehicle inspection device.
- Deliver technology performance and capability of hidden compartment inspection device.
- Develop and evaluate less-lethal compliance prototype.
- Develop and evaluate covert transmission technologies.

FY 2012:

- Transition less-lethal compliance measures for law enforcement personnel.
- Perform operational test for Project Hostile Intent in the border environment.

FY 2013:

- Demonstrate Pursuit Termination for Vehicle and Vessel Stopping project.
- Demonstrate projected prototype of Project Hostile Intent.

Maritime Technologies Program – develops advanced detection, identification, apprehension and enforcement capabilities along the maritime borders by delivering technologies that support a framework for rapid, coordinated responses to maritime anomalies and threats.

Sensors and Surveillance Project – provides the platform to assess, document, and demonstrate visual and non-visual technologies for monitoring the maritime border.

Milestones and Deliverables

FY 2009:

- Perform technology assessment for small boat harbor surveillance study.
- Conduct radar evaluation and provide technology feed to Command 21.

FY 2010:

- Conduct testing and evaluation of integrated Inland Waterway Maritime Security System technologies or prototypes in operating environment.

FY 2011:

- Develop and demonstrate to CBP and USCG multi-sensor track fusion capability of the Advanced Fusion Technologies project.
- Develop Small Boat Harbor Surveillance Technology System.
- Demonstrate Underwater Swimmer Diver Detection System.
- Demonstrate Wide Area Surveillance technologies.

FY 2012:

- Build and implement prototype of Small Boat Harbor Surveillance.
- Pilot test Camera/Radio Frequency Identification (RFID) buoy for Inland Water Vessel Tracking.

FY 2013:

- Provide technology feed to Secure Ports Initiative of Port and Coastal RADAR Improvement project.

- Conduct pilot of offshore deepwater buoy and vessel tracking program and complete final report.

Situational Awareness and Information Management Project – enhances the ability of law enforcement agents to quickly detect threats and anomalies and provide decision support information to decision makers and security forces. Activities in this area combine personnel, technology, infrastructure, and response platforms to provide the border enforcement community with an accurate assessment of the operational environment. With enhanced situational awareness and information management, enforcement agents can have the required information to respond appropriately to secure the Nation's borders and waterways.

Milestones and Deliverables

FY 2009:

- Transition line-of-sight prototype boarding team communications capability.

FY 2010:

- Develop prototype OTH system and associated specifications for Boarding Team Communications project.
- Demonstrate and transition to CBP and USCG initial Automated Scene Understanding (ASU) maritime capability based on cameras, radar, and Automatic Identification System (AIS).

FY 2011:

- Select CICT prototype solutions for development and testing.

FY 2012:

- Demonstrate and transition to USCG updated ASU maritime capability that includes information from wide area surveillance assets.

FY 2013:

- Transition to CBP automated course of action capability of Advance Situational Awareness and Collaboration Tools project.

Border Technologies Program – delivers technologies to provide advanced detection, identification, apprehension and enforcement capabilities along land and maritime borders by developing:

- detection, classification, and localization sensor technologies to monitor illegal border activity with a wider range and greater accuracy than present-day technologies;
- command and control systems that can enhance the quality of information to provide better situational awareness of the borders to different levels of law enforcement; and
- communications systems that provide connectivity to law enforcement officers working in remote locations.

These technologies and systems will help ensure that border security assets are used efficiently and effectively and enable law enforcement to have access to robust and reliable information to effectively respond to border incursions. The associated efforts in this area include:

Border Detection Grid – provides a grid of advanced sensors and detection, classification, and localization technologies to detect and classify cross-border movement (e.g., friends or foes, animals, weather, or illegal activity).

Milestones and Deliverables

FY 2008:

- Conduct an integrated concept test along the Southern Border.
- Develop design and implementation plan for Unattended Ground Sensor (UGS).

Border and Maritime Security

FY 2009:
- Support a test bed on UGS.
- Pilot a tripwire capability that can locate activity many miles along the border.

FY 2010:
- Commercialize and transition pre-production of UGS prototypes and performance specification.

BorderTech – delivers technologies to provide advanced detection, identification, apprehension and enforcement capabilities along land and maritime borders. Specifically, this project develops sensor technologies and their integration and testing in an operational environment by providing in-the-field capabilities to improve mission effectiveness and agent safety. It will develop, demonstrate and test unproven technologies as a risk reduction activity for the Secure Border Initiative Network (SBInet). The project will support a test platform for the evaluation of technologies in an operating environment to enhance the development of agent training and tactics. BorderTech encompasses the following activities:
- Northeast Test Bed (NET-B) – a test platform for evaluating technologies in an operational environment, enabling agent training and tactics development;
- Tunnel Detection – an integrated systems approach combining land-mobile systems, airborne sensors, drilling and high resolution listening devices to detect, identify and confirm illegal and clandestine underground border structures and activities;
- Advanced Sensor Technologies – technologies and methodologies for improving operational performance of unattended ground sensors, Electro-Optical/Infrared devices and associated sensor signal processing; and
- Advanced Ground Surveillance Radar – active/passive technologies and demonstrate a system for detecting and tracking humans.

Milestones and Deliverables

FY 2009:
- Conduct technology demonstration and insertion into SBInet.

FY 2010:
- Begin the development of Advanced Sensor Technologies.
- Develop source selection recommendation for Advanced Ground Surveillance Radar.
- Conduct operational evaluation of land border tripwires.

FY 2011:
- Evaluate Ground Surveillance Radar technology.
- Conduct initial round of testing on Advanced Sensor Technologies.
- Conduct test and evaluation of Advanced Ground Surveillance Radar.

FY 2012:
- Initiate urban tunnel detection project requirements.
- Conduct camera evaluation and transition effort to CBP.

FY 2013:
- Refine and deliver multiple Advanced Sensor Technologies.
- Develop Spiral 1.0 of tunnel detection capability.
- Conduct independent government analysis of Advanced Ground Surveillance results and provide final report.

BorderNet – connects law enforcement officers in the field to real-time tactical scene awareness information via a wireless data network, BorderNet information will provide border enforcement agents geographic features, sensor data, and agent location data and access to other law enforcement databases.

Milestones and Deliverables

FY 2008:

- Conduct a Northern Border test bed demonstration in a northeast Border Patrol sector that will transition technology and lessons learned into SBInet. The test bed will include:
  - o multi-sensor fusion;
  - o field-level scene awareness; and
  - o law enforcement database query.
- Deploy 10-fingerprint mobile capability to enroll detainees into immigration databases.

FY 2009:

- Transition applicable technologies into SBInet.

Secure Border Initiative (SBI) Systems Engineering and Modeling and Simulation – systems engineering tools and models that help border enforcement agencies make informed improvements in immigration and border security policy and operations. This project also invests in modeling technology, complex systems, and infrastructure.

Milestones and Deliverables

FY 2008:

- Complete the Northern and Coastal borders analysis for the SBI transportation program management office and deliver final detailed report with recommendations for future actions.
- Incorporate DHS's U.S. Customs and Immigration Services (USCIS) requirements into a systems model.

FY 2009:

- Review the System of Systems model and ensure it correctly addresses SBI requirements.

FY 2010:

- Demonstrate an expanded model to include smuggling activity, USCIS and SBI requirements.

Sensors/Data Fusion and Decisions Aids – develops systems to enable law enforcement officers and commanders to have full situational awareness, enabling effective decision making and response in a complex and dynamic operational environment. Current operations rely mostly on verbal coordination for real-time operational knowledge and situational awareness. Sensor/Data Fusion and Decision Aids combine information from different types of sensors (sensor fusion) and systems to provide critical information that will promote reliable detection and tracking capabilities. This project will:

- provide the capability to fuse tactical information from multiple data sources such as sensors and databases (both law enforcement and commercial databases);
- provide real-time situational awareness;
- eliminate scene clutter;
- automatically identify and automatically track high-risk targets (people/vehicles/vessels);
- provide decision aids; and
- facilitate multi-agency coordination for rapid response.

Milestones and Deliverables

FY 2008:

- Initiate an Inland Waterway Maritime Security System validation plan.
- Conduct an operational assessment of ASU.
- Conduct prototype demonstration of Visualization Tools in Miami and deliver final report.

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FY 2009:
- Conduct operational assessment of the ASU prototype.

FY 2010:
- Initiate development of Advanced Fusion Technologies (AFT).
- Demonstrate and transition to CBP and USCG initial ASU maritime capability based on cameras, radar, and AIS.

FY 2011:
- Perform AFT development testing in an operational environment.
- Conduct analysis of alternatives for Advanced Situational Awareness and Collaboration Tools.
- Demonstrate and transition to CBP initial ASU land capability based on cameras and radar.

FY 2012:
- Demonstrate predictive analysis capability of Pattern Discovery and Prediction project for CBP.
- Develop and demonstrate to CBP and USCG multi-sensor track fusion capability.

FY 2013:
- Transition to CBP updated ASU land capability that includes information from UGS and license plate readers.
- Conduct operational test of Pattern Discovery and Prediction.

Cargo Security Thrust Area – develops technologies to ensure the integrity and security of cargo shipments traveling through the supply chain (from the manufacturer to the receivers). The vast numbers of shipping containers that flow through our borders each year present a significant threat to our Nation's borders since the majority of the cargo enters without physical inspection. This thrust area will deliver technological capabilities that:

- improve targeting, interdiction and overall risk assessment of cargo across supply chain;
- enhance screening and examination of cargo through non-intrusive inspections with increased penetration, resolution and throughput;
- improve supply chain visibility of cargo in transit to the United States; and
- increase and automate detection of breaches, WMD or human smuggling in containerized cargo.

The programs in this thrust area will develop technologies to track the location of containers, identify contents and ensure the integrity of the cargo as it moves through the supply chain. Technology efforts will work toward building capabilities that can provide relevant information to government inspection officials and shippers to confirm the integrity of the cargo. This thrust area conducts its activities through the Cargo and Conveyance Security Program.

Cargo and Conveyance Security Program – improves supply chain security and practices to secure the Nation's borders and cargo by reducing illegal immigration and preventing the transport of illegal drugs, contraband, and weapons of mass destruction into the United States. Using a system-of-systems approach, the program develops advanced sensor and communication technologies within a security architecture that encompasses the world's supply chain. Some technologies developed in this program will enable CBP officers to identify tampering events and their location, track shipping containers, and ensure that alarm data is communicated reliably and securely. Most of these technologies will be transitioned to the commercial sector, purchased by industry and adopted as an international standard that will meet DHS's core security requirements.

Advanced Container Security Device (ACSD) - develops an advanced sensor system for monitoring the container's integrity. The ACSD is a small unit that attaches to the inside of a container to monitor all six sides of the container, reporting any intrusion or door opening. It will also detect the

presence of human cargo in the container. If ACSD detects a breach, door opening or human cargo, it will transmit this alarm information through the Marine Asset Tag and Tracking System (MATTS) to CBP. The ACSD will also build in a standard plug-and-play interface capability so that when other security or commercial sensors (e.g., radiological/nuclear, chemical/biological) are developed, they can be easily integrated through a standard interface. The ACSD must be able to withstand the harsh environmental conditions of global shipping and be economical for shippers to use.

Milestones and Deliverables

FY 2008:
- Deliver 40 ACSD prototypes for test and evaluation.
- Deliver prototype test report.

FY 2009:
- Complete field testing of the ACSD prototypes and develop report.
- Conduct large-scale operational test and develop report.

FY 2010:
- Develop initial draft of ACSD technical requirements for industry.

FY 2011:
- Vet technical requirements throughout industry following internal DHS review.
- Evaluate ACSD solution to meet technical requirements.

FY 2012:
- Transition ACSD to CBP and USCG.

Marine Asset Tag Tracking System (MATTS) – establishes a remote global communications and tracking network to be used in conjunction with the ACSD. The MATTS is designed to communicate world-wide and also work when containers are stacked in a yard. The densely-packed metallic environment of these cargo stacks can cause communication blockage. S&T is developing MATTS technology to overcome these issues and to ensure that container alarms are reliably communicated to CBP. Aside from the security benefit to CBP Officers being able to make more informed decisions in targeting and inspecting high-risk containers, industry can know the status and track their cargo as it moves through the supply chain.

Milestones and Deliverables

FY 2008:
- Integrate MATTS into ACSD development programs
- Initiate testing and evaluation of MATTS tag with an integrate M-lock.

FY 2009:
- Vet MATTS technical requirements for industry review and make it available for production.

FY 2010:
- Publish MATTS technical requirements.

Advanced Screening and Targeting (ASAT) – provides the next-generation risk assessment and targeting tools, such as automated anomaly detection and pattern discovery algorithms for determining high-risk cargo. Advanced Screening and Targeting (ASAT) develops computer algorithms and software that will automatically collect, combine, analyze, and find suspicious patterns in the shipping information of containers. S&T will incrementally transition ASAT to DHS targeting systems and will significantly improve targeting of containers for inspection. This phase of the project will end in FY 2007- FY 2008. The next phase of the project, starting in FY 2009, will allow CBP and TSA to identify and prioritize which containers to search and provide dynamic targeting patterns that adjust to changes in cargo movement patterns over time.

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Milestones and Deliverables

FY 2008:
- Complete design reviews and beta test of desktop anomaly detection software.

FY 2009:
- Conduct requirements analysis for improved algorithms and architecture interoperability for CBP and TSA.

FY 2010:
- Evaluate developmental pattern analysis tools for other government agencies.

FY 2011:
- Develop real-time anomaly detection capability for CBP and TSA.
- Beta test the advanced analytic software.

Supply Chain Security Architecture (SCSA) – maps out the international supply chain, as well as networks of the air cargo supply chain including:
- all the various nodes (e.g., point of stuffing, ports of entry);
- participants (e.g., shippers, CBP, foreign Customs); and
- information flow (e.g. container manifest is provided to CBP 24 hours before the container is loaded on a ship).

This security architecture provides the framework within which DHS will incorporate their near-term CSD and future container security technologies such as ACSD into global supply chain operations. Alarm or exception information generated from within this architecture will be transmitted to CBP through associated information systems. The architecture defines the technology standards that vendors must comply with to ensure this information is communicated securely and reliably. These standards can lead to the development of information managements systems that will support improved data collection and risk assessment. The project also defines data requirements for future TSA air cargo security technologies to ensure security and tracking information is communicated reliably and securely to TSA.

Milestones and Deliverables

FY 2008:
- Complete technology proof-of-concept pilot to demonstrate the architecture's utility and generate feedback for further refinement.
- Define requirements and architecture for passing data to TSA networks.

FY 2009:
- Transition requirements and architectures to end-user.

Composite Container – develops a potential next-generation International Organization for Standardization (ISO) shipping container with embedded security sensors to detect intrusions. The container will be constructed from composite materials with embedded sensors. Composites are stronger than steel and are 40 percent lighter than current shipping containers. Shippers can benefit from weight savings by allowing them to load more goods into each container. Additionally, composite materials are easier to repair and therefore, decrease their overall life cycle costs over existing steel containers.

Milestones and Deliverables

FY 2009:
- ISO-certify the composite container.
- Conduct commercially viable demonstration.
- Develop 20-ft hybrid composite container prototype.

- Develop system design document update.

FY 2010:

- Conduct critical design review.
- Complete structural system design and weight optimization.
- Deliver final system design document.
- Deliver assessment of the manufacturability of a potential new type of shipping container with security features built directly into all six sides of the container.

FY 2012:

- Transition and deliver hybrid composite container final performance requirements.

Container Security Device (CSD) – develops a device with sensors that can detect the opening of container doors. CSD will be used as a temporary security solution to monitor the status of container doors until ACSD is available. The CSD is a small, low-cost device, mounted on or inside a container. It detects the opening or removal of a container door and reports to CBP if a breach has occurred. CBP Officers can provide appropriate response if they determine that it poses a security threat. In addition, S&T in coordination with DHS Policy and CBP is developing CSD technical requirements that will ensure interoperability with DHS targeting systems and facilitate integration with commercial systems.

Milestones and Deliverables

FY 2008:

- Delivery of 20 CSD prototypes.
- Initiate testing and evaluation of prototype testing.
- Evaluate CSD solutions submitted to meet CSD requirements.

FY 2009 – FY 2011:

- Evaluate CSD solutions submitted to meet CSD requirements.
- Conduct operational field testing of CSDs.
- Transition CSD solutions to CBP and industry.

CanScan – develops capability enhancements to existing secondary non-intrusive inspection (NII) systems to detect or identify terrorist contraband items (e.g., drugs, money, illegal firearms) or human cargo. These system enhancements will provide increases in penetration, resolution, and throughput when compared to existing NII systems. Future Automatic Target Recognition (ATR) capability will be integrated into the CanScan system. This project addresses the Cargo Security IPT highest capability gap to enhance cargo screening and examination systems through advanced non-intrusive inspection. Additionally, the capabilities developed will have applicability to air cargo security. This project aligns with the Secretary's Secure Freight Initiative to deploy next-generation tools and integrated systems to scan maritime container cargo and gather imagery data.

Milestones and Deliverables

FY 2009:

- Develop requirements analysis reports for non-intrusive system capability enhancements.

FY 2010:

- Conduct CanScan concept selection and initiate system design.

FY 2011:

- Develop system approach to existing non-intrusive inspection systems.

FY 2012:

- Deliver CanScan system prototype for testing.

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FY 2013:

- Demonstrate CanScan system prototype and transition and deliver final performance requirements.

Secure Carton – leverages and further develops an S&T Small Business Innovative Research (SBIR) project to develop a shipping carton with embedded security sensors that detects tampering/opening of the carton once it has been closed and secured. The carton will communicate to an RFID reader any tampering of the internal cargo, such as the insertion of a WMD. This project provides improved supply chain visibility and security closer to the point of manufacture or packing. It is scalable and can be applied across various shipping modes to include maritime, surface and air cargo.

Milestones and Deliverables

FY 2009:

- Conduct prototype field testing.
- Perform testing in an air cargo environment.

FY 2010:

- Perform testing in an air and maritime cargo environment.

FY 2011:

- Transition and deliver final Secure Carton performance requirements.

Air Cargo Composite Container – expands the composite material developed in the Composite Container project to determine whether it can be used to develop an Air Cargo Composite Container that will be able to detect tampering or intrusion with potential blast-resistant capability. The project's success depends on ensuring lightweight comparability to existing aluminum containers and interoperability with existing aircraft loading infrastructure.

Milestones and Deliverables

FY 2009:

- Conduct requirements and critical design reviews with the air cargo community.
- Complete security sensor system development.
- Complete structural system design and weight optimization.

FY 2010:

- Develop Air Cargo Composite container prototypes.
- Conduct prototype field experiment and perform testing in an air cargo environment.
- Transition to industry.

FY 2011:

- Transition and deliver final Air Cargo Composite Container performance requirements.

Automatic Target Recognition (ATR) – develops an automated imagery detection capability for anomalous content (e.g. persons, hidden compartments, and contrabands) for use in existing and future NII systems. This ATR capability is applicable to scanning and imaging systems used by CBP and TSA by applying an operator-assisted decision aid that provides target discrimination within low-resolution images. This project aligns with the Secretary's Secure Freight Initiative to deploy next-generation tools and integrated systems to scan maritime container cargo and gather imagery data.

Milestones and Deliverables

FY 2010:

- Develop requirements analysis report for ATR capability.

FY 2011:
- Develop system design.

FY 2013:
- Conduct pilot test for maritime and air cargo NII systems.

Secure Wrap – further develops an SBIR project to advance a more flexible and secure tamper-indicative wrapping material for palletized cargo shipped through the international supply chain across various shipping modes (e.g. air, maritime, land). Secure wrapping material will have the capability to detect tampering by visual indication revealed by the material and will be deployable with little to no change or impact to current supply chain logistics and processes.

Milestones and Deliverables

FY 2010:
- Conduct field testing with palletized air and maritime cargo.
- Deliver Secure Wrap working prototypes.

FY 2011:
- Conduct testing of Secure Wrap prototypes.

FY 2012:
- Transition and deliver final Secure Wrap performance requirements.

Chemical and Biological

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Agriculture	Foreign Animal Diseases	17,382	23,670	24,237	28,511	28,627	27,233
Biological	Forensics	24,002	28,370	28,348	29,265	29,932	31,020
	Response and Restoration	5,171	6,467	6,849	6,960	2,056	2,097
	Surveillance and Detection - Operations	5,800	-	-	-	-	-
	System Studies and Decision Tools	6,754	9,001	7,306	7,594	7,723	7,687
	Threat Awareness	33,061	39,860	40,062	41,048	41,818	42,603
	Surveillance & Detection - R&D	62,496	35,099	36,529	43,920	45,861	53,819
Chemical	Analysis	14,431	16,212	15,737	14,264	16,692	16,985
	Detection	23,217	17,021	18,992	18,253	23,196	20,783
	Response and Recovery	10,504	19,698	18,695	12,400	10,697	7,593
SBIR	SBIR	5,202	5,010	5,045	5,185	5,298	5,380
Chem/Bio Total		208,020	200,408	201,800	207,400	211,900	215,200

Overview

The Chemical and Biological Division (CBD) increases the Nation's preparedness against chemical and biological threats through improved threat awareness and advanced surveillance, detection, and protective countermeasures. The division works with the Department of Homeland Security (DHS) Office of Infrastructure Protection (OIP), DHS Chief Medical Office (CMO), and the Office of Health Affairs (OHA) to increase public and governmental security awareness of potential chemical and biological threats and to strengthen the Nation's response against these threats.

CBD science and technology efforts support the following DHS strategic goals:

Goal 2: Protect Our Nation from Dangerous Goods

2.2 Prevent, detect, and respond to biological attacks

2.2.1 Align DHS Biodefense-related research, development, planning, surveillance, preparedness, capabilities, and intelligence collection priorities with the biennial Bioterrorism and integrated Chemical, Biological, Radiological and Nuclear (CBRN) Risk Assessments.

2.2.2 Develop and apply national security screening and background checks to prevent unauthorized access to select agents either directly or through synthetic technology.

2.2.4 Develop and deploy decontamination methodologies to restore critical infrastructure within 100 days of a bioterrorist attack.

2.2.5 Deploy in all major US cities an automated BioWatch Detection device reducing operating costs per site by more than 50 percent and warning time to less than six hours with increased sensitivities.

2.2.6 Develop and operate the National Biosurveillance Information Center using diverse sources of data to provide early warning, detection, or recognition of biological attacks or pandemic events.

2.2.7 Recognize and characterize the dispersal of biological agents in human and animal populations, food, water, agriculture, and the environment within 48-72 hours of an event or sooner.

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2.2.8 Establish a fully functioning National Biodefense Analysis and Countermeasure Center as the lead Federal facility to provide threat characterization, conduct the technical forensic analysis and interpret materials recovered following a biological attack. Develop the DHS strain collection of biological samples to be the broadest in the world. Enable throughput operations at high quality within 24 hours or less. Reinforce the compliance mechanisms currently in place to ensure DHS fully complies with the Biological Weapons Convention at all times.

2.2.9 Build, maintain, and operate the necessary research infrastructure to allow for medical countermeasure research, testing, and evaluation of key agricultural threat agents to support the Department of Agriculture.

2.2.10 Complete biological event response doctrine including decision architecture for communicable and non-communicable outbreaks of catastrophic potential. DHS and HHS will develop performance measures by 2010.

2.3 Prevent, detect, and respond to chemical and explosive attacks

2.3.1 Guard against chemical and explosive attacks in the US. Reduce the risks to our citizens and infrastructure from hazardous chemical and explosive attacks and incidents.

The Chemical and Biological PPA supports the following performance metrics:

Performance Metric 1: Percent completion of an effective restoration capability to restore key infrastructure to normal operation after a chemical or biological attack.

Performance Metric 2: Percent of high-priority chemical and biological agents detectable in target operational scenarios

Performance Metric 3: Number of vaccines deployed to the National Veterinary Stockpile.

These metrics support the Office of Health Affairs metric OHA0001.01

- Number of agencies who have agreed to provide information to the National Biosurveillance Integration Center (NBIC).
- Number of biological monitoring units employed in high-risk indoor facilities within BioWatch jurisdictions.
- Percent of the population in BioWatch jurisdictions covered by outdoor biological monitoring units.
- Time between an outdoor monitoring unit exposure to a biological agent and the declaration of a confirmed positive result.
- Time between an indoor monitoring unit exposure to a biological agent and the declaration of a confirmed positive result.

The division carries out its activities through three thrust areas: Agriculture, Biological, and Chemical Countermeasures.

Agriculture Thrust Area – supports Homeland Security Presidential Directive 9 (HSPD-9) to protect the Nation's agriculture and food system against terrorist attacks, major disasters, and other emergencies. This thrust area enhances current agricultural countermeasures, develops new agricultural countermeasures and plans to provide safe, secure, state-of-the-art biocontainment laboratories for researching foreign and zoonotic diseases. The nature of our agricultural and food system is open and extensive and therefore, can be contaminated by

unintentionally introduced agents or deliberate acts of terrorism. Since 9/11 government and industry partners have feared that the agricultural sector can be used as a vehicle to contaminate our food system. As such this thrust area works to develop the best protection possible against attacks on the U.S. agricultural and food supply through R&D. This thrust area also supports work related to the operations and research conducted at the Plum Island Animal Disease Center (PIADC) as well as the conceptual planning of the soon-to-be constructed National Bio and Agrodefense Facility (NBAF). Additionally, this thrust area supports the Joint Agro-Defense Office (JADO), which is being established to coordinate, integrate, and oversee an interagency agrodefense R&D program.

Foreign Animal Diseases (FAD) Program – develops technologies to defend the Nation against the natural and intentional introduction of selected foreign animal diseases. In partnership with the U.S. Department of Agriculture (USDA), this program develops the next-generation veterinary vaccines and countermeasures. It also models the spread of FADs and their economic impact to evaluate strategies for controlling outbreaks. Program activities include:

FAD Modeling Near & Long Term – develops national-scale modeling to inform decision makers on the advantages and disadvantages of various outbreak control strategies, to guide the formulation of countermeasure requirements, and to support responders during an outbreak.

Milestones and Deliverables

FY 2008 – FY 2009:

- Develop and transition future iterations of the Multi-scale Epidemiological/Economic Simulation and Analysis (MESA) decision support tool.
- Support integration of Foreign Animal Zoonotic Disease (FAZD) national market and transportation models (FASTrans) into MESA.
- Establish Research and Policy for Infectious Disease Dynamics (RAPIDD) working groups with topics determined.
- Deliver first RAPIDD working group final report.
- Deliver Joint Modeling Operational Center (JMOC) initial requirements report.
- Select an institution to house the Center for the Interface of Mathematical and Biological Sciences (CIMBS).

FY 2010 – FY 2013:

- Extend Foot and Mouth Disease (FMD) model to other high priority FADs.
- Deploy second-generation FAD models to the JMOC.
- Delivery of additional RAPIDD working group final reports.
- Full operational capability of JMOC for use by partner agencies
- Development of response modeling capabilities

Near & Long Term –.FAD Vaccine and Diagnostics – researches and diagnoses FADs by developing more effective vaccines and biotherapeutics for FMD, the Nation's top priority animal pathogen. This research will result in more effective vaccines for FMD. This project develops 'trade friendly' Differentiating Infected from Vaccinated Animals (DIVA) vaccines. DIVA vaccines cause an animal to develop protective antibodies that can be differentiated from antibodies that are associated with the presence of disease or infection. Ultimately, DIVA vaccines will allow animals to be vaccinated against a disease without the fear that, once vaccinated, healthy animals will test positive for disease due to the presence of protective antibodies in their bloodstream. This project will additionally research vaccines for FADs. Currently no vaccine exists.

Chemical and Biological

Milestones and Deliverables

FY 2008 – FY 2013:

- Enhance characterization and efficacy of current-generation FMD vaccines.
- Pilot test next generation of FMD vaccines to include one new serotype every 18 months, e.g. A24, Asia, 01.
- Enhance characterization and efficacy (onset & duration of immunity) tests of current-generation inactivated FMD vaccines (multiple serotypes).
- Deliver proof-of-concept studies using different vaccine and biotherapeutic countermeasure platforms for other non-FMD and FADs.
- Obtain licensure for the next-generation FMD (DIVA) vaccine candidates and transition to the National Veterinary Stockpile (NVS).

FY 2012:

- Advance FAD biotherapeutic candidate to targeted advance development.

FY 2013:

- Test and identify lead vaccine (DIVA) candidates for other FADs, such as Rift Valley Fever, Classical Swine Fever, African Swine Fever, and other related foreign animal diseases.

Agrodefense Basic Research – performs fundamental basic research through the National Center for Foreign Animal and Zoonotic Disease (FAZD), in agriculture that directly impacts homeland security, specifically in areas of potential movement of pathogens and diseases in the Nation's complex agricultural system as well as the potential impact to public health.

Milestones and Deliverables

FY 2008 – FY 2013:

- Explore and develop rapid and accurate methods for the detection and diagnosis of select foreign animal and zoonotic diseases.
- Explore and develop novel means to increase resistance against threat diseases.
- Develop effective decision support systems to assess the biological, economic, and environmental consequences of all feasible options to prevent or curtail disease.

Joint Agro Defense Office (JADO) – provides coordination and oversight of an integrated R&D program for defending against foreign animal diseases. JADO is the S&T-led interagency office established by the National Science and Technology Council (NSTC). JADO enables better leveraging and integration of interagency agro-defense R&D and therefore, speeds the transition of FAD modeling, veterinary countermeasures and diagnostics to operational users. Initial efforts focused on defining and initiating an integrated modeling program.

Milestones and Deliverables

FY 2008:

- Establish integrated roadmap for vaccine and diagnostic efforts.
- Establish and oversee joint Operation and Research Modeling Centers.
- Establish a joint Research Modeling Center.

FY 2009:

- Develop integrated roadmap for decontamination and disposal.
- Initial JMOC response tools.

FY 2010:

- Develop integrated roadmap for basic research.

FY 2011:

- Deploy second generation FAD models to JMOC.

Ag Screening Tools – develops portable protocols and tools that provide minimally-trained users' assistance in sampling (e.g., maritime containers and unprocessed samples), rapid detection, and field identification of illegal product, high-consequence pathogens and toxins that threaten U.S. agriculture and the food industry.

Milestones and Deliverables

FY 2011:

- Identify and prioritize component needs for agriculture screening and inspection tools and protocols.
- Develop a strategy to address their needs, concept of operations (CONOPS), and provide prototype feasibility.

FY 2012:

- Develop protocols and tools for Ag Screening.

FY 2013:

- Pilot protocols and tools with users.

Biological Countermeasures Thrust Area – provides the understanding, technologies, and systems needed to protect against possible biological attacks on the Nation's population or infrastructure. The thrust area focuses primarily on those biological attacks that can potentially cause widespread catastrophic damage. These include, but are not limited to aerosolized anthrax and smallpox. Where appropriate, the program incorporates biodefense as part of an integrated chemical, biological, radiological, nuclear and explosive (CBRNE) defense across civil and military agencies. It also supports the *President's Biodefense Strategy for the 21st Century*, HSPD-10, which provides a comprehensive framework for our Nation's biodefense.

The thrust has six main programs:

- Forensics;
- Response and Restoration;
- Surveillance and detection operations;
- Systems studies and decision support tools;
- Threat awareness; and
- Surveillance and detection – R&D.

This work supports the development of BioWatch, a bio-aerosol monitoring system designed to provide cities the earliest possible detection of a biological attack. This program also supports the National Biodefense Analysis and Countermeasures Center (NBACC), which assesses, characterizes, and conducts forensic analysis of biological agents.

Forensics Program – operates the National BioForensics and Analysis Center (NBFAC) and conducts bioforensics research in support of criminal investigative cases, with the ultimate goal of attribution, apprehension, and prosecution of the perpetrator to fulfill the *President's Biodefense for the 21st Century* (HSPD-10). These activities provide tools and facilities that Federal law enforcement investigators need to analyze biological threat evidence recovered from crime scenes. The center analyzes a large number of samples for the Federal Bureau of Investigation (FBI) and other national security partners in secure, contamination free, biocontainment laboratories.

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BioForensics Operations (NBFAC) – As designated in HSPD-10, NBFAC is the Nation's lead facility for technical analysis of samples from potential bio-crimes or bio-terrorism.

Milestones and Deliverables

FY 2008 – FY 2013:

- Maintain continuous hub and spoke operations and conduct casework.

FY 2008:

- ISO validate an additional 20 assays for top bio-threat agents (BTAs) for operations.

FY 2009:

- Transition NBFAC operations to new NBACC facility.
- Validate assays for top 30 BTAs for operations.

FY 2010 – FY 2013:

- Transition bioforensic assays for enhanced and advanced threats to NBFAC.

Bioforensics R&D – Near Term & Long Term – develops improved methods for extracting genetic materials and proteins from samples for biological, chemical, and physical characterization. Provides scientific foundation for material attribution, develops protocols for characterization and identification of Biological Threat Agents (BTAs).

Milestones and Deliverables

FY 2008:

- Provide identification and drill down capabilities for the Category A agents (excluding viruses).
- Initiate bacterial population genetics study on a microbial clonal propagation, genetic dynamics, and implications for match criteria of samples.
- Transition assays supporting Category A biological threat agents to NBFAC.

FY 2009:

- Provide identification and drill down capabilities for the Category B agents (excluding viruses).
- Initiate improved genotyping schemes for Category A viral agents with emphasis on smallpox (variola major) and viral hemorrhagic fevers

FY 2010:

- Determine the pathway for transition of operational forensic assays for enhanced and advanced bio threats to NBFAC.
- Deliver a gap analysis report on future research needs in bioforensics.

FY 2010 – FY 2013:

- Incorporate new molecular markers/genotyping or whole genome sequencing methods to more rapidly identify enhanced and advanced threats
- Transition forensic methods for analyzing enhanced and advanced threats to NBFAC.

Response and Restoration Program – provides advance planning, develops concepts-of-operation, and funds exercises and training for responding and recovering from a large-scale biological attacks. As the lead agency in this area, the EPA, partners with S&T to provide a more rapid and less expensive post-attack cleanup or restoration in such catastrophic events. This program focuses on developing a systems approach for the restoration of citywide areas and of critical facilities, such as major transportation hubs, and not on developing specific decontamination technologies. Restoration demonstrations, which bring together Federal, State, and, local partners to develop, test, and then share the concepts-of-operations for key scenarios, are at the heart of this approach.

Operational Tools for Response and Restoration – develops a suite of new state-of-the-science indoor-outdoor predictive tools to characterize the extent and degree of contamination, incorporating the best-available deposition, degradation, and surface viability data. The result of this project will include validated interagency sampling plans and improved statistical sampling design to support characterization and decontamination planning.

Milestones and Deliverables

FY 2010:
- Develop sampling design/plan tools.
- Validate sampling plan design for anthrax.

FY 2011:
- Initiate extension of the validated sampling plan to other biological threat agents.

FY 2012 – FY 2013:
- Extend validated sampling plan to other agents.
- Validate Sampling plan for other agents.

Systems Approaches for Restoration – develops a coordinated systems approach to the restoration of wide urban areas, to include high traffic areas (transit/transportation facilities) and DOD infrastructures following the aerosol release of a biological agent.

Milestones and Deliverables

FY 2008:
- Develop technology readiness assessments.
- Complete Interim restoration plan and deliver to HSC.

FY 2008 – FY 2010:
- Conduct tabletops, field exercises, and workshops.

FY 2009:
- Exercise and demonstrate decontamination methods and restoration system tools.

FY 2010:
- Develop restoration plans and frameworks.
- Prepare final report preparation and close- out program.
- Conduct final demonstration of systems approaches to wide area restoration.

FY 2011:
- Validate wide-area restoration systems approach architecture with additional urban areas.
- Extend validated results of architecture nationally.

Surveillance and Detection Operations Program – develops tools to enhance the BioWatch monitoring system and the associated Biological Warning and Incident Characterization (BWIC) system.[1] The Department operates BioWatch in partnership with the Environmental Protection Agency (EPA), and Centers for Disease Control (CDC). In FY 2007, responsibility and associated funding requirements for operating these systems were transferred to OHA. Additional support to these activities, specifically the procurement of units for BioWatch Gen 3 for the OHA led operational test and evaluation (OT&E) will end in FY2009.

1 BWIC interprets warning signals from BioWatch, public health surveillance data, and incident characterization tools (plume and epidemiological models) to quickly determine the impacts a release may have. Together, the BioWatch and BWIC systems provide public health and emergency personnel with the information they need to respond effectively and initiate life-saving medical countermeasures.

Chemical and Biological

BioWatch Gen 3 Procurement – purchases the initial units for field tests and BioWatch Gen 3 pilot.

Milestones and Deliverables

FY 2009:

- Initiate acquisition of a limited number of prototype BioWatch Gen 3 units for the OHA led operational test and evaluation (OT&E).

Systems Studies and Decision Tools Program – provides the analysis and tools to generate requirements for program execution within the division. Activities include conducting system studies and net assessments that are used to identify effective measures for deterrence, detection, and mitigation of biological terrorism acts against the U.S. population and infrastructure. A portion of this work supports BioWatch system development. Additionally, Federal, State, and local emergency responders will use tools developed in this thrust area such as Biological Warning and Incident Characterization (BWIC) operational models.

Biodefense Net Assessments (BNA) – conducts net assessments of this Nation's overall biodefense strategy every 4 years as required by HSPD-10, to provide "recommendations for re-balancing and refining investments among the pillars of our overall biodefense policy." This project addresses the HSPD-10 requirement by developing a series of reports that analyze and provide new perspectives on the fundamental assumptions for the current national bio-defense strategy.

Milestones and Deliverables

FY 2008:

- Transition first BNA to Homeland Security Council (HSC).

FY 2012:

- Transition second BNA to HSC.

System Studies – uses reference scenarios to assess the capability of the Nation's current biodefense, identify critical gaps, and perform cost-benefit tradeoffs of different alternatives for addressing identified gaps. OHA and the Secretary of Homeland Security use the results of the system studies to help coordinate DHS-led biodefense for the Nation. For example, it supports the operation of the third-generation (Gen 3) BioWatch system, to meet homeland security bio-defense requirements.

Milestones and Deliverables

FY 2009:

- Continue simulation and refinements of concepts of operations (CONOPS) and Red-teaming for Gen 3 BioWatch operations.

FY 2010:

- Develop simulation and refinements of CONOPS and Red-teaming for Gen 4 BioWatch systems.
- Develop preliminary systems architecture for defending against enhanced and engineered threats.

FY 2012:

- Transition final systems architecture for defending against engineered threats to OHA.

Decision Support Tools – develops fully integrated operational tools for surveillance, detection, incident characterization, and response systems, including improved models of transportation systems and their associated response options and CONOPS for chemical and biological attacks.

Milestones and Deliverables

FY 2009:

- Transition tools and data to support architectures for chemical and biological detection/incident characterization systems to OHA and IMAAC.
- Provide data to support subway model validation.

FY 2010:

- Support upgrades to BWIC.

FY 2009 – FY 2011:

- Complete tool development for real-time detection systems.

FY 2012 – FY 2013:

- Continue tool development to support enhanced protection architectures.

Threat Awareness Program – characterizes threats posed by biological weapons, anticipates future threats, and conducts comprehensive threat and risk assessments to guide prioritization of the Nation's biodefense investments. The Project BioShield Act of 2004 launched an effort to develop modern, effective medical countermeasures to protect Americans against attacks by chemical, biological, radiological, or nuclear weapons. The Act designated DHS as the lead agency to conduct threat analyses to determine what constitutes a significant material threat to public health and national security. The primary deliverable is an intelligence-informed, scientific characterization and prioritization of bio-terrorist risks to the Nation. This deliverable is used by OHA, the HSC and other agencies such as the Department of Health and Human Services (DHHS), EPA, USDA, and the Intelligence community to support their efforts in enhancing the Nation's biodefense.

In FY 2008, the Threat Awareness Program will complete the second round of risk assessments required by the President's Biodefense for the 21st Century. These risk assessments will expand the range of agents to include: engineered agents and agro-threats; economic consequences; and public health consequences. These assessments will drive the prioritization of a broad range of national biodefense activities. The Threat Awareness Program carries out these activities through two main operational facilities that it sustains: the Biological Threat Characterization Center (BTCC) and the Biodefense Knowledge Center (BKC).

Biological Threat Characterization Center (BTCC) – conducts two major activities: (1) biennial systematic end-to-end risk assessments on both traditional and advanced biological agents; and (2) laboratory studies to close major scientific gaps that could significantly impact how the Nation structures its defenses. The biennial Bioterrorism Risk Assessments (BTRAs) required under HSPD-10 drives the focus of the analytical studies. The BTRA provides the basis for risk-informed investments for National strategic biodefense planning while identifying key knowledge gaps and critical vulnerabilities. Through thorough analyses, the BTRAs determine the likelihood and consequence of a biological attack. The process focuses on the acquisition and production of an agent, its dissemination in a broad range of scenarios, the human health and economic impacts of those attacks. Findings from the analyses are used to prioritize the risks posed by various agents, to identify vulnerabilities, and to identify associated major scientific knowledge gaps. The BTCC also conducts laboratory studies that help answer key knowledge gaps identified in the BTRAs and reduce uncertainties associated with biological agents of interest. OHA, HSC, and partnering agencies such the Department of Health and Human Services (DHHS), the Environmental Protection Agency (EPA), and the Intelligence community use the results these analyses to build their biodefense strategy.

Milestones and Deliverables

FY 2008:

- Deliver the second BTRA report and tool expanded to include enhanced threat agents, agricultural

agents and economic impact.
- Prepare laboratory study reports that close key knowledge gaps for traditional agents.
- Deliver first version of the integrated Chemical Biological Radiological Nuclear Risk Assessment (iCBRN RA) to HSC.

FY 2009 – FY 2010:
- Deliver the third BTRA report and tool expanded to include enhanced and advanced agents; prototype desktop tool.
- Perform laboratory studies to determine the approach for defending against enhanced and advanced threats.
- Develop approach for defending against engineered threats.
- Deliver second iCBRN RA including enhanced biological agents, additional chemical agents and improved R\N modeling.

FY 2008 – FY 2013:
- Reports on laboratory studies of traditional, enhanced, and advanced biological agents.

FY 2012:
- Deliver fourth BTRA report and tool with improved consequence modeling and intelligent adversary modeling.
- Deliver third version of iCBRN RA to HSC.

FY 2013:
- Integration of intelligent-adversary into iCBRN tool.

Biodefense Knowledge Center (BKC) – provides analysis and operational support including 24/7 S&T reach-back for DHS National Operations Center and tailored in-depth analysis of biodefense issues; knowledge discovery tools for data integration, analysis, and visualization; and software pilots to DHS users to analyze, characterize and understand biothreats.

Milestones and Deliverables

FY 2008 – FY 2013:
- Continue to provide 24/7 operational support, awareness bulletins, and technology assessments.

FY 2008:
- Deliver pilot web-based BKMS to OHA, I&A, and CBP.

FY 2009:
- Deliver improved BKMS with additional curated data sources and enhanced analysis capabilities to OHA, I&A, and CBP.

FY 2011:
- Support operational genomic data monitoring pilot.

FY 2013:
- Develop infectious disease outbreak tracking repository.

Food Defense Basic Research – performs fundamental basic research through the National Center for Food Protection and Defense (NCFPD) that addresses the important needs in the area of agent/matrix interactions and the resulting implications for contaminant viability, detection, decontamination, and disposal.

Milestones and Deliverables

FY 2008 – FY 2013:

- Enhance fundamental knowledge of select agent interaction in complex food matrices and expand capabilities in the areas of rapid detection and characterization.
- Explore and develop new concepts and approaches to prevent, respond to, or recover from the intentional contamination or disruption of the Nation's complex food system.

Surveillance and Detection R&D Program – develops next-generation detectors for biological threat agents including fully autonomous detection capabilities for the third generation (Gen 3) BioWatch system. These detectors will operate with lower costs and faster detection times, thus providing protection for a much larger percentage of the U.S. population. In addition, this program works to develop the assays (i.e., signatures or fingerprints of biological agents) needed by detectors to accurately recognize a biological agent. Another focus is on developing detect-to-protect systems specifically for use indoors as well as detection systems for protecting food products.

BioWatch Generation 3 Detection System – develops Gen 3 BioWatch detection system that includes development of:

- Bio-Agent Autonomous Networked Detector (BAND) - an automated, fully integrated "lab-in-a-box" that is capable of aerosol collection, molecular analysis and identification, and reporting of results with networking capability for real-time control of the entire sensor network; and
- Deployable Aerosol Collection Systems (DACS) – an automated sampler compatible with lab analysis, sealed for safe handling of potential positives, preservation of sample viability for 1-3 days; flexible, remotely programmable; and relatively low acquisition, operation and maintenance costs.

Milestones and Deliverables

FY 2008:

- Initiate commercialization phase of detection systems.

FY 2009:

- Transition BAND systems and initial assays to OHA for operational test and evaluation.

BioAssays – Near Term – develop the assays (fingerprint signatures of biological agents) that detectors use to recognize biological agents. This project develops bioassays for use in U.S. Government-deployed systems with the very high sensitivity and specificity needed to give government officials an extremely high confidence that the detection warrants further action and investigation.

Milestones and Deliverables

FY 2008:

- Develop and transition assays to detect 10 biological threat agents.
- Begin pilot evaluation of the Public Health Actionable Assay (PHAA)/Public Safety Actionable Assay (PSAA) Process.

FY 2009:

- Establish the initial operational capability for PHAA/PSAA process.

FY 2010:

- Transition additional Gen 3 BioWatch assays to OHA.

FY 2011:

- Develop functional assays for markers of virulence, drug resistance, viability, and emerging and genetically-engineered threats.

FY 2013:

- Develop assays for Gen 4 BioWatch.

Chemical and Biological

BioAssays – Next Generation – develops new approaches for detecting the broad range of possible future threats emphasizing basic biological building blocks, for example, mechanisms such as infectivity, virulence, and antibiotic resistance – and developing appropriate assays for them.

Milestones and Deliverables

FY 2009:

- Initiate a diversified portfolio of novel assay approaches.

FY 2011:

- Select most promising approach in concert with next Generation Detection System.

FY 2013:

- Develop assays for Gen 4 BioWatch.

Detect to Protect (DtP): Triggers and Confirmers – develops low cost bio-aerosol point triggers to detect biological agents within 1 minute (acting as reliable 'bio smoke alarms') for protection of high value facilities and their occupants. The goal is to provide commercially available detection systems that could enable transportation, entertainment, and other high-value facilities to monitor for airborne hazards and take low-regret precautions (e.g., turning off ventilation systems) to protect people by preventing mass exposure.

Milestones and Deliverables

FY 2008:

- Deliver advanced trigger prototypes suitable for extended field testing.

FY 2009:

- Conduct third round of prototype evaluation in operational environments for completed systems.

Food Biological Agent Detection Sensor (FBADS) – develops cost-effective detectors for use in central processing facilities for the food distribution system, with initial focus on liquid protein products. The FBADS detectors have very low false negative and false positive rates and can be used by personnel having only modest technical skills without slowing down current production processes.

Milestones and Deliverables

FY 2008:

- Complete FBADS Phase II including independent testing and evaluation and system flexibility demonstration.

National BioSurveillance Integration System (NBIS) – provides decision makers early identification of biological events of national significance such as disease outbreaks, the potential use of biological agents, and emerging biohazards. NBIS acquires, integrates, analyzes, and disseminates information from existing human disease, food, agriculture, water, meteorological, and environmental surveillance systems and, relevant threat and intelligence information. This project significantly improves information sharing and situational awareness for decision makers and provides a common operating picture for all participating agencies to enable a timely response to biological events. S&T will provide subject matter expertise and support development of modeling tools to support NBIS efforts.

Milestones and Deliverables

FY 2008 – FY 2009:

- Provide subject matter expert support in bioinformatics and information technology systems.

- Support development and deployment of food contamination model: Consequence Management System (CMS).

FY 2010 – FY 2013:

- Provide subject matter expert support to NBIS operations with other interagency partners.
- Develop enhanced model to support operational NBIS capability.

Next Gen Biological Detection – develops technologies and systems to identify enhanced and advanced biological threats. S&T will concentrate its efforts on universal detection technologies that require no prior knowledge of biological threat target. This project provides automated, fully integrated, end-to-end (collection, identification and reporting) systems capable of quantifying the amount of threat agent present and preserving samples for culturing and other confirmatory/forensics analysis.

Milestones and Deliverables

FY 2009:

- Solicit technology concepts and select performers.

FY 2010:

- Support technology feasibility demonstration of component analysis.

FY 2012:

- Demonstrate prototype.

FY 2013:

- Support critical design review.

Portable Bio Detector Project – develops hand-held biological detector/identifier in spiral development process, beginning with a target to classify unknown samples as potential biological threats (or not) and culminating in approaches that identify at species level across an array of known agents.

Milestones and Deliverables

FY 2009:

- Define concepts of use; solicit technology concepts.

FY 2011:

- Deliver capability to discriminate bio versus non-bio in 3 minutes.

FY 2012:

- Deliver capability to discriminate threat versus non-threat.

FY 2013:

- Demonstrate hand-held capability for species identification across wide spectrum of threats.

Viable Bioparticle Capture – develops an automated sampler compatible with lab analysis, sealed for safe handling of potential positives providing preservation of sample viability for one to three days.

Milestones and Deliverables

FY 2009:

- Solicit technology concepts and select performers.

FY 2010:

- Identify concepts for improvements to deployed aerosol collection system.

FY 2011:

- Demonstrate and characterize the ability to maintain viability of pathogens collected from aerosol sampling.

Chemical and Biological

Chemical Countermeasures Thrust Area – develops technology to reduce the Nation's vulnerability to chemical warfare agents (CWAs) and commonly used toxic industrial chemicals (TICs) and provides countermeasures to emerging non-traditional chemical threat agents (NTAs). The objectives of this thrust area are to:

- provide a comprehensive understanding and analyses of domestic chemical threats;
- develop pre-event assessment, discovery, and interdiction capabilities for chemical threats;
- develop warning, notification, and timely analysis of chemical attacks;
- optimize technologies and processes for recovery from chemical attacks; and
- enhance capability to identify chemical attack sources.

S&T actively coordinates with interagency partners such as DOD and the EPA to maximize resources and minimize duplication. While DOD's program focuses on the needs of the battlefield, the program actively seeks to incorporate DOD technologies that are applicable to domestic needs. DHS investments provide amplification to EPA's program to ensure that major operational gaps in domestic chemical and biological defense are addressed.

Analysis Program – develops a robust and enduring analytical capability in support of chemical countermeasures development. Activities focus on: (1) developing a fundamental understanding of toxic chemical threat properties and conducting risk and vulnerability assessments based on those properties; (2) developing and sustaining expert reach-back capabilities to provide rapid support in domestic emergencies; and (3) developing and validating forensic methodologies and analytical tools, such as chemical signatures, which are used to help identify the nature and origin of chemical threats used by terrorists and criminals. In addition, S&T maintains infrastructure, consisting of receiving, laboratory, and storage spaces to accommodate highly toxic chemicals and associated evidence, to provide a fully operational capability. This includes trained and fully certified scientific and technical staff available, to process this type of evidence. To ensure a cohesive effort to describe threats and countermeasures, the Chemical Security Analysis Center (CSAC) conducts key analytical assessments, such as Population Threat Assessments (PTAs). OIP, the Transportation Security Administration (TSA), and Office of Intelligence and Analysis (I&A) are the primary DHS customers for the CSAC.

CSAC – The CSAC is a national resource that develops and sustains expert reach-back capabilities to provide rapid support in domestic emergencies. The CSAC will be the centralized repository of chemical threat information (hazard and characterization data) for analysis of the Nation's vulnerabilities to chemical agent attacks. This will assist DHS and the interagency community with planning for responses to chemical threats. The CSAC researches the fundamental toxic chemical threat properties and assesses risk and consequence due to chemical attacks on population and infrastructure. The CSAC provides population threat assessments to Department of Health and Human Services in fulfillment of BioShield requirements.

Milestones and Deliverables

FY 2008:

- Deliver the first Chemical Terrorism Risk Assessment (CTRA) to HSC.
- Complete selected hazards papers related to specific chemical threats.

FY 2009 – FY 2011:

- Deliver end-to-end systems studies to the Office of Infrastructure Protection (OIP) and Transportation Security Administration (TSA).

FY 2009 – FY 2013:

- Deliver Capability Assessments to OIP and TSA.

FY 2010:
- Deliver Integrated Chemical Reactions Database to I&A.

FY 2010 – FY 2012:
- Deliver biennially updated CTRA to OHA.

Chemical Infrastructure Risk Assessment – develops tools to aid in the assessment process by identifying and quantifying infrastructure gaps and vulnerabilities, and key hazardous chemicals and processes.

Milestones and Deliverables

FY 2009:
- Complete assessment of chemical dispersion models and downstream impacts from infrastructure disruption.
- Assess potential for safer alternative processes that may reduce risk to a select subset of high-volume toxic chemicals.

FY 2010:
- Develop national position on relative merit of dispersion models.
- Develop objectives for improved models.

FY 2011 – FY 2013:
- Improvement of models and determination of potential benefits from safer chemical process alternatives.

Chemical Forensics and Attribution (FAP) – develops and maintains new chemical forensics and attribution analytical tools, techniques, and enduring technical capabilities for chemical threat agents and associated evidence.

Milestones and Deliverables

FY 2008:
- Complete studies of chemical agent signatures extracted from an initial set of common materials.
- Evaluate Chemical forensic analytical methodologies for H-series blister agents.

FY 2009:
- Validate forensic analytical methodologies for V-series nerve agents.
- Deliver additional chemical attribution signature studies.

FY 2010 – FY 2013:
- Validate analytical methods for emerging chemical threat agents and Non-Traditional Agents, prioritized by risk and intelligence.
- Studies on attribution signatures for additional TICs and Toxic Industrial Materials (TIMs) and NTAs.
- Reports on environmental effects on sampling and signatures analyses of various CTAs.

Large-Scale Chemical Transport Release Modeling – develops an improved understanding of the consequences of release of large volumes of hazardous materials in transport (e.g., rail tank cars or tankers).

Milestones and Deliverables

FY 2009:
- Report on critical assessment of applicable dispersion models and key physical parameters.

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FY 2010:
- Identify and execute improvements in models by comparison with existing data on releases.

FY 2011:
- Test improved models with tank car breach or release of hazardous materials.

Increase Safety of Hazardous Materials in Use – develops an understanding and identifies solutions to improve the safety of hazardous chemical formulations for their intended uses. The project will assess which, if any, of the most commonly used toxic and explosive chemical formulations can be modified to increase their safety while minimizing implications on cost and effectiveness toward intended purpose.

Milestones and Deliverables

FY 2010:
- Review current industry use of hazardous materials and formulations.
- Initiate study to identify hazardous materials with highest volume use whose formulations may be changed to increase safety without undermining value to industry and consumer.

FY 2011:
- Complete study to identify hazardous materials whose formulations are potentially amenable to change for improved safety.

FY 2012:
- Develop and apply model to assess impact of potential formulation changes on cost and effectiveness of altered materials.

FY 2013:
- Develop prioritized list of candidate hazardous materials formulations changes.

Increase Safety of Hazardous Materials in Transport – develops an understanding and scientific basis for alteration of changes in hazardous chemical formulations during transit to minimize overall risk due to accidents or intentional disruption of hazardous materials transport devices. The project will assess whether any of the most commonly used toxic and explosive chemicals can be modified to increase their safety during transport. This effort also looks to revert the chemical back to its original composition at the distribution phase.

Milestones and Deliverables

FY 2010:
- Initiate study to identify hazardous chemical products that can be modified during transport and permitting reversion back to original formulation when at point of distribution or use.

FY 2011:
- Complete study of hazardous chemicals whose formulations may be reversibly modified to improve safety during transport.

FY 2012:
- Model economic and other impacts on industry of potential changes to hazardous chemicals during transport.

FY 2013:
- Develop prioritized list of hazardous chemical products that can be reversibly modified for transport.

Chemical Sector Supply Chain Economic Study – develops a chemical infrastructure analytical

capability that will enable DHS to look at policy analysis of the chemical sector as a whole, consequence analysis of the impacts of natural and man-made events on the chemical industry and chemical-dependent sectors of the economy, and analysis of individual chemical assets.

Milestones and Deliverables

FY 2008:

Add chlorine to phase one analysis and gather data for the ammonia value chain that includes:

- Location and relative size of production domestic planes;
- Country of origin/destination and volume of imports/exports;
- Dependencies on other infrastructures; and
- Measure of Economic Resiliency.

FY 2009:

- Complete fundamental ammonia value chain and begin data gathering for remainder of inorganic sector that includes:
  - Location and relative size of production domestic planes;
  - Country of origin/destination and volume of imports/exports;
  - Dependencies on other infrastructures; and
  - Measure of Economic Resiliency.

Detection Program – develops technology to warn and notify of a chemical threat release. The program includes technologies responders need to survey potentially contaminated scenes, while limiting their exposure to chemical agents. This program aims to provide technologies that can, in a single package, sense chemical agents and more commonly monitored chemicals, at costs that will support dual-use application. Developing this capability requires a leap forward in technology for next-generation systems. Due to the various physical properties associated with detecting high-vapor pressure versus low-vapor pressure chemical threats, an array of technologies is required to ensure that the full spectrum of chemical hazards is adequately addressed. This program will develop the five detection systems described below.

Autonomous Rapid Facility Chemical Agent Monitor (ARFCAM) – develops a low-cost, fully autonomous, networkable chemical monitor that will "detect-to-warn" the presence of up to 20 CWAs and high-priority TICs simultaneously within a single device. This project will improve protection of facility occupants through its ability to detect a wide range of agents with increased reliability.

Milestones and Deliverables

FY 2008:

- Initiate test bed trials and independent test and evaluation (IT&E) of prototype detectors.

FY 2009:

- Complete test bed trials.

FY 2010:

- Complete IT&E and conduct critical design review.

FY 2011:

- Complete developmental field tests and final report.

Integrated CBRNE Detection System – develops an architecture that integrates reporting from disparate chemical, biological, radiological, and potentially nuclear and explosive (CBRNE) detection/collection systems. This system provides timely CBRNE detection, identification, and assessment of the threat and enables appropriate response actions by Federal, State, and, local officials. It will significantly improve the integration of alarm and response assets across multiple potential attack modes, resulting in

more rapid and informed decisions to deliver appropriate response during raised threat alert levels.

Milestones and Deliverables

FY 2009:
- Conduct two-city pilot of the chem/bio portions of the integrated CBRNE detection.

FY 2010:
- Expand the Integrated CBRNE pilot testing to include radiological and explosive detection. Upon successful pilot testing, conduct a full-scale demonstration.

FY 2011:
- Conclude Integrated CBRNE demonstration program with the preparation of a full technical data package. The system will be ready for commercialization in cities and regions not involved in the initial pilot demonstration.

Lightweight Autonomous Chemical Identification System (LACIS) – develops a networkable handheld detector for responders, capable of detection of up to 20 TICs and CWAs in a single sensor package.

Milestones and Deliverables

FY 2008:
- Initiate test bed trials and independent test and evaluation (IT&E) of prototype detectors.

FY 2009:
- Complete test bed trials.

FY 2010:
- Complete IT&E and conduct critical design review.

FY 2011:
- Complete developmental field tests and final report.

Low-Vapor Pressure Chemicals Detection Systems (LVPCDS) – investigates transportable technology to detect and identify persistent low vapor pressure chemical threats on surfaces.

Milestones and Deliverables

FY 2008:
- Test and evaluate laboratory prototypes.

FY 2009:
- Test and evaluate field prototypes in operational environment.

FY 2010:
- Deliver final Project Report.

Next Gen LVPCDS – provides autonomous facility monitoring, detecting and identifying the release of suspended or aerosolized toxic persistent compounds having very low vapor pressures.

Milestones and Deliverables

FY 2011:
- Initiate concept exploration.

FY 2013:
- Develop detailed design of laboratory prototype.

Next-Gen ARFCAM & LACIS – develops an autonomous, networked continuously running facility monitor that will quickly (<1 min) "detect-to-warn" of the presence of up to 40 high priority TICs and CWAs including conventional and non-traditional agents. Next Gen LACIS will develop a hand-portable, networked chemical detection system that will quickly (<1min.) detect and identify the presence of up to 40 TICs and CWAs.

Milestones and Deliverables

FY 2010:
- Initiate concept exploration.

FY 2011:
- Undergo an initial technology downselect.

FY 2013:
- Conduct independent lab testing of prototype concepts.

Non-Intrusive Container Monitor – investigates technology to rapidly and efficiently determine the contents of suspicious containers in cargo or passing through security portals.

Milestones and Deliverables

FY 2009:
- Initiate concept exploration, including a characterization of the potential range of hazards that can be interrogated through common package materials.

FY 2010:
- Initiate laboratory prototype development.

FY 2011:
- Report on mid-phase laboratory testing against potential hazards or their surrogates.

FY 2012:
- Deliver field prototypes.

FY 2013:
- Draft operational test/evaluation report.

Response and Recovery Program – provides technologies for returning a chemically contaminated area to a normal condition. This work primarily supports the development of technologies and guidelines for the analysis and decontamination of contaminated areas both before and after restoration processes. These efforts will substantially decrease the lengthy duration of cleanup efforts at key chemical facilities after attacks.

Activities include:
- development of a mobile laboratory;
- development of fixed-site chemical analysis laboratories for CWAs; and
- development and demonstration of facility restoration and decontamination technologies and guidelines.

Facility Restoration Demonstration – develops a systems approach to restoration and response (R&R) of critical transportation facilities following a chemical agent release. This project will develop efficient planning tools, identify decontamination methods, identify sampling methods, and develop analysis tools.

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Milestones and Deliverables

FY 2008:

- Complete site-specific final restoration plan and general restoration guidance document.

FY 2009:

- Complete table-top exercise to demonstrate restoration guidance.
- Complete operational demonstration and final restoration guidance document.

Fixed Laboratory Response Capability – develops prototype environmental laboratories and protocols to assist with the assessment and remediation of CWA contamination. Laboratories will have full EPA quality certification, standard methods for monitoring of CWA agents and standard reporting protocols. Laboratories will be located in high threat areas and be available to assist law enforcement with rapid identification of unknown chemical hazards. Optimized protocols will maximize throughput.

Milestones and Deliverables

FY 2008:

- Establish labs for prototyping in the West and Southeast regions.

FY 2009:

- Complete optimization of high-throughput analytical methods to be completed.

FY 2010:

- Establish proficiency testing process and transition to EPA.

Portable High-throughput Integrated Laboratory Identification System (PHILIS) – implements a mobile chemical lab system that can be rapidly deployed in the field to support high throughput analysis (several hundred samples per day) of environmental samples that may contain TICs and CWAs. Capability will enable analysis of primary chemicals and degradation products.

Milestones and Deliverables

FY 2008:

- Transition final prototype to the EPA.

Integrated Detection/Decontamination Demonstration – demonstrates newly evolving tools for detection of the release of chemical threats, mapping of contamination, and following decontamination through to facility clearance.

Milestones and Deliverables

FY 2009:

- Define and identify operational test environments.
- Perform market survey of detection/decontamination technologies.

FY 2010:

- Demonstrate and evaluate performance of surveyed technologies.

FY 2011:

- Conduct a large-scale demonstration and evaluate performance of selected technologies in an operational context.
- Develop operational CONOPS.

FY 2012:

- Transition of CONOPS to Federal and state and local response assets.

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NTA Mobile High-Throughput Laboratory – develops a mobile, rapidly deployable chemical laboratory system for analysis and identification of NTAs. High throughput analysis (several hundred samples per day) is a major goal to enable rapid contamination mapping and support recovery of contaminated areas.

Milestones and Deliverables

FY 2009:

- Complete initial conceptual designs.

FY 2010:

- Validate analytical assay performance across multiple matrices, optimize sample preparation methods to maximize agent recovery/detection, and complete a system design.
- Initiate mobile lab construction.

FY 2011:

- Complete lab construction, demo, and transition.

Chemical Decontamination R&D – develops and tests technologies that decontaminate NTAs, CWAs, and persistent TICs.

Milestones and Deliverables

FY 2008 – FY 2009:

- Continue fundamental studies of stability properties of NTAs and of decontamination reagents.

FY 2010 – FY 2013:

- Select most promising new approaches for use in proof-of-concept demonstrations against NTAs and traditional agents.

Integrated Consortium of Laboratory Networks (ICLN) – consists of a U.S. homeland security infrastructure with a coordinated and operational system of laboratory networks that provide timely, high quality, and interpretable results for early detection and effective consequence management of acts of terrorism and other events requiring an integrated laboratory response.

Milestones and Deliverables

FY 2008:

- Complete second round of Anthrax Sampling Validation tests.

FY 2009:

- Develop interagency plan for validation of sampling methods for chemical and radiological contamination.

FY 2010:

- Integrate lab response networks with NBIS.

FY 2011:

- Validate chemical and radiological sampling strategies and methods.

FY 2012:

- Develop uniform information management architecture.

FY 2013:

- Transition operations to OHA.

POLICE

Command, Control, and Interoperability

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Communications, Interoperability and Compatibility	IFSL Information Sharing	2,674	-	-	-	-	-
	OIC	10,290	11,084	8,270	6,477	4,671	7,144
Cyber Security	Cyber Security Research Tools and Techniques	7,160	6,971	6,000	6,400	7,000	7,200
	Information Infrastructure Security	9,880	11,181	8,577	8,573	6,152	7,012
	Next Generation Technologies	2,841	-	700	800	2,975	3,134
Basic Future Research	Visual Analytics and Physics-based Simulation	4,235	4,536	4,744	4,813	5,028	5,142
Knowledge Management Tools	Collaborative Information Sharing	-	9,133	7,854	6,161	6,522	6,563
	Knowledge Frameworks	9,555	13,425	11,750	13,850	15,500	15,550
Surveillance, Reconnaissance & Investigative Technologies	USSS Support	1,155	-	-	-	-	-
Threat Assessment	Emerging Threats	7,766	3,900	1,836	1,873	1,910	1,948
	Intelligence, Surveillance, & Reconnaissance (ISR)	-	-	1,377	1,405	1,433	1,461
	Risk Sciences	-	600	1,377	1,405	1,433	1,461
SBIR	SBIR	1,425	1,560	1,515	1,544	1,577	1,584
Command, Control & Interoperability Total		56,980	62,390	54,000	53,300	54,200	58,200

Overview

The Command, Control and Interoperability Division (CCI) creates and deploys technologies and information resources to enable seamless and secure interactions among Federal, State, local, and tribal stakeholders ensuring that they have comprehensive, real-time, and relevant information to create and maintain a secure and safe Nation. CCI's science and technology efforts work toward providing operational capabilities that ensure:

- Operability and interoperability of communication systems for emergency responders;
- Protection and integrity of cyber systems that are critical to homeland security; and
- Knowledge management tools and capabilities that can detect potential threats.

The division works closely with the first responder community, State agencies, Federal agencies, and private sectors to develop capabilities that will enhance their ability to effectively predict, detect, respond, and recover. Additionally, CCI supports private sector partners who operate, maintain, and utilize the Nation's key cyber infrastructure.

CCI's science and technology efforts support the following strategic goals:

DHS Strategic Objective/IPG Priority:
Goal 1: Protect our Nation from Dangerous People

1.1 Control our borders and protect our interior.

1.1.3 Build the capability to integrate surveillance assets of DHS components as well as the Department of

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Defense, Interior, US Geological Survey and other related Federal agencies to unify operational awareness with near real-time information sharing.

1.1.4 Ensure interoperability and information/data sharing between DHS and other federal law enforcement components and screening and credentialing programs.

Goal 3: Protect Critical Infrastructure

3.1 Protect and strengthen the resilience of the Nation's critical infrastructure and key resources.

3.1.3 Implement a secure, redundant national security communication and coordination infrastructure to support information sharing across diverse security domains including relevant federal, state, local, and tribal stakeholders.

3.1.4 Improve our cyber security response against cyber attacks to protect our communications systems and networks.

Goal 5: Strengthen and Unify DHS Operations & Management

5.2 Advance intelligence and information sharing.

5.2.1 Ensure all homeland security information and intelligence gathered by the Department is evaluated and analyzed, and resulting intelligence reports are distributed while fully complying with relevant statutes that protect civil rights, civil liberties, and trend analysis.

5.2.2 Process, exploit, and archive all information of intelligence value gathered by the Department to support future strategic, operational, and trend analysis.

5.2.3 Maintain a security quality assurance program for all National Security Systems to ensure full compliance with the relevant DHS and National Security Directives, to include the Director of National Intelligence policies and statues, and the Federal Information Security Management Act (FISMA) of 2002.

The CCI PPA supports the following performance metrics:

Performance Metric 1: Number of laboratories evaluated for compliance testing procedures.

Performance Metric 2: Number of Interoperability standards and/or forwarded for standards development organization (SDO) approval.

Performance Metric 3: Number of proof-of-concept technologies demonstrated for information sharing. This measure supports NPPDS measure:

- Number of cyber security information sharing products distributed to Cyber Security stakeholders.

Performance Metric 4: Total number of organizations using the cyber security experimental research test bed. The division carries out its activities through six thrust areas:

- Communication, Interoperability, and Compatibility;
- Cyber Security;
- Basic Future Research;
- Knowledge Management Tools;
- Surveillance, Reconnaissance, and Investigative Technologies; and
- Threat Assessment.

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Communications, Interoperability, and Compatibility Thrust Area – strengthens interoperable wireless communications and to improve effective information sharing at all levels of government. The thrust area coordinates interoperable emergency communications requirements for all voice and data communications systems and equipment purchased with DHS funding, develops, and evaluates cross-jurisdictional information sharing technologies, policies, and processes. CCI initiatives impact end users that include more than 60,000 emergency response agencies nationwide, state homeland security officials, and policy makers at the local, tribal, State, and Federal levels. The thrust area contains the following programs:

- Integrated Federal, State, and Local (IFSL) Information Sharing Program; and
- Office for Interoperability and Compatibility (OIC) Program.

Integrated Federal, State, and Local (IFSL) Information Sharing Program – develops technologies, techniques, and processes to discover new and secure methods for disseminating threat information among Federal, State, local, and tribal government entities. The program activities include rapid prototyping, experimentation, and operational demonstrations of new processes and applications being developed by DHS and other government agencies (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Evaluate the federated query capabilities (use of a single query to access multiple, different databases, when possible using handheld wireless devices) in up to nine participating states. New capabilities enable a mobile law enforcement official in a remote location to produce a single query that simultaneously accesses multiple databases across jurisdictions.
- Deploy integrated capabilities with a secure information sharing capability, which enables information to be securely managed and shared among the Federal, State, and local jurisdictions.

OIC Program – strengthens and integrates interoperability and compatibility activities to improve preparedness and response among Federal, State, local, and tribal governments. In addition, OIC conducts research, development, testing, evaluation (RDT&E) and standards-related activities under the SAFECOM program. OIC promotes and achieves both near- and long-term interoperability by developing technologies, best practices, and methodologies that close explicit gaps within DHS components. This program includes the following projects:

- Technology Demonstration Pilots;
- Public Safety Architecture Framework (PSAF);
- Statement of Requirements (SOR);
- Standards and Modeling;
- Compliance Assessment;
- Outreach;
- Emergency Data Exchange Language (EDXL) Data Standards;
- Internet Protocol (IP) Backbone Test & Evaluation;
- P25 Interfaces;
- Unified Communications Device (UCD) Development; and
- Wireless Broadband Productization.

Technology Demonstration Pilots – conducts pilot programs across the Nation that will test and demonstrate communication technologies in real-world environments including data and video (funding ends in FY 2008).

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Milestones and Deliverables

FY 2008:

- Assess and demonstrate data and video technologies in real-world environments.

Public Safety Architecture Framework (PSAF) – assists emergency response agencies map system requirements and identify interoperability gaps (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Provide guidance, tools, and frameworks for each State to create its own architecture.

Statement of Requirements (SOR) – publishes a comprehensive set of emergency response communications requirements (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Release SOR Volume III, which will be an automated data-entry tool to help emergency response agencies map system requirements and identify gaps.
- Set network specifications for public safety communication applications listed in a new revision of the SOR.

Standards and Modeling – develops P25 standards, data messaging standards, and develops complementary testing procedures (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Test and model broadband standards.

FY 2009:

- Expand messaging standards to work seamlessly with the health industry in emergency related exchanges.
- Develop a certification process to ensure industry implementation of standards.

Compliance Assessment – evaluates existing and emerging technology to ensure operational effectiveness and conformance to standards (no funding in FY 2010 and 2011).

Milestones and Deliverables

FY 2009:

- Launch a demonstration to show interconnection between radios and cell phones using Voice over Internet Protocol (VoIP) to create more robust communications networks.
- Initiate VoIP testing and start data messaging verification.

FY 2010:

- Complete VoIP testing and start data messaging verification.
- Conduct gap analysis on bridging devices utilizing VoIP.

FY 2012:

- Launch a VoIP compliance assessment process.

FY 2013:

- Transition the operations of P25 CAP to DHS components.

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Outreach – provides guidance, tools, templates, publications, and media updates on communications-related issue (funding ends in FY 2008). Outreach activities are part of each project in OIC's portfolio in FY 2009.

Milestones and Deliverables

FY 2008:

- Develop and distribute *Interoperability Technology Today,* OIC's quarterly newsletter, to first responders and other key stake holders.
- Sponsor the "10th Annual Technologies for Critical Incident Preparedness Conference and Exposition," which focuses on prevention, preparedness, response, and recovery and will highlight technology and training tools available to the emergency response community.
- Continue Project 25 (P25) Standards Outreach activities.

Emergency Data Exchange Language (EDXL) Data Standards – facilitates the RDT&E of practitioner-driven information-sharing standards and encourages their implementation into software, systems, and devices.

Milestones and Deliverables

FY 2009:

- Develop and pilot data messaging standards for the emergency response community.
- Develop a compliance certification process to ensure industry implementation of standards.
- Develop Emergency Data Exchange Language (EDXL) standards to share critical information (e.g., hospital bed availability, resource information, and situation reports).

FY 2010:

- Expand standards to work seamlessly with health field in emergency related exchanges.
- Develop and pilot additional data messaging standards for the emergency response community.
- Update current data standard development strategy to align with gap analysis report of FY 2009.

FY 2011:

- Develop and pilot additional data messaging standards for the emergency response community.

FY 2012:

- Conduct a gap analysis of new, improved emergency response communications technologies.

FY 2013:

- Launch a dictionary of all data messages and elements currently in use by the emergency response community.

IP Backbone Test & Evaluation – researches IP enabled backbones and evaluates promising technologies.

Milestones and Deliverables

FY 2009:

- Initiate testing and evaluation of IP solutions.
- Prepare test and evaluation report as multiple VoIP Bridging solutions are piloted in a regional configuration to ensure potential barriers have been identified and addressed.
- Complete Public Safety prioritized VoIP Release standards profile for environment.

FY 2010:

- Transition a profile of standards for an operational environment that will be prioritized by public safety and confirmed by industry.

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FY 2011:
- Complete the first draft of next implementation profile based on prioritization.

FY 2012:
- Begin testing of implementation profile.

FY 2013:
- Publish a VoIP compendium detailing the emergency response community's requirements for the use of VoIP in communications systems.

P25 Interfaces – accelerates emergency response interoperable communications through the development of national voluntary consensus standards (funding ends in FY 2011).

Milestones and Deliverables

FY 2009:
- Launch a demonstration version of VoIP Gateways to P25.

FY 2010:
- Complete development of network management interface standards for P25 to improve management of communications systems.

FY 2011:
- Complete the development of network management interfaces.

Unified Communications Device Development – develops a novel voice and tactile communications device that would bridge disparate networks minimizing the number of devices first responders would have to use.

Milestones and Deliverables

FY 2013:
- Develop Unified Communications Device prototype.

Wireless Broadband Productization – tests and evaluates technologies on commercially available and emergent wireless broadband data (funding ends in FY 2011).

Milestones and Deliverables

FY 2009:
- Develop a strategy for effective emergency response use of and migration to the 700 MHz band.

FY 2010:
- Pilot cutting-edge emergency response communications technologies (e.g., wireless broadband prototypes).

FY 2011:
- Document findings and implement recommendations to transition wireless broadband solutions.

Cyber Security Thrust Area – leads cyber security research, development, testing, and evaluation to secure the Nation's current and future critical cyber infrastructure. Cyber attacks are increasing in frequency and impact. As outlined in the President's *National Strategy to Secure Cyberspace* (NSSC), our Nation's economy and national security depend on information technology and the information infrastructure. Information networks directly support the operations of the 17 Critical Infrastructure and Key Resources sectors in our economy that include:

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- Agriculture and Food;
- Banking and Finance;
- Chemical;
- Commercial Facilities;
- Communications;
- Defense Industrial Base;
- Emergency Services;
- Energy;
- Government Services;
- Information Technology;
- National Monuments and Icons;
- Nuclear Reactors, Materials and Waste
- Postal and Shipping;
- Public Health and Healthcare;
- Transportation Systems; and
- Water.

Computer networks also control electrical transformers, pipeline pumps, chemical vats, radars, and other critical systems. Cyber attacks can have serious impact on our daily operations including the disruption of critical systems, loss of revenue and intellectual property, and loss of life.

Activities in this thrust area are carried out in three programs:

- Research Tools and Techniques;
- Information Infrastructure Security; and
- Next Generation Technologies.

Cyber Security Research Tools and Techniques (RTT) Program – provides secure facilities and methods for testing cyber security technologies under real-life conditions. Neither existing research network infrastructures nor the operational Internet provide adequate means for testing defense technologies. Over the last decade, the network security research community has been unable to test their research prototypes and prove the utility of their research in large-scale network environments. To accelerate research, development, and deployment of effective defenses for U.S.-based computer networks, CCI is developing a cyber security-testing infrastructure that allows researchers, developers, and operators from government, industry, and academia to experiment with potential cyber security technologies. CCI will produce scientifically rigorous testing frameworks and methodologies to support national-scale experimentation. The program has four main projects:

- Experimental Research ;
- Research Data Repository;
- Experiments and Exercises; and
- Internet Route Monitoring.

The end-users for these research tools and techniques include cyber security researchers, developers, and operators.

Experimental Research Test Bed – provides a cyber security test bed to evaluate defense mechanisms against attacks on the infrastructure and support mitigation of attacks.

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Milestones and Deliverables

FY 2008:

- Increase capacity to over 800 systems, allowing large-scale malicious-code experiments.
- Increase the number of test bed users to 85 organizations and large-scale data sets applications to 150.

FY 2009 – FY 2013:

- Test five new technologies each year that may include the following: worm defense, routing security, distributed denial of service defense, malware detection, and domain name system security.

Research Data Repository – creates and maintains a large-scale data set repository of real network and system traffic for use by the cyber security research community to accelerate design, production, and evaluation of next-generation cyber security solutions, including commercial products.

Milestones and Deliverables

FY 2008:

- Build Protected Repository for the Defense of Infrastructure against Cyber Threats (PREDICT) datasets.

FY 2009:

- Increase the large-scale data sets applications to 200.

FY 2010 – FY 2013:

- Add 50 Cyber Security Data Sets to the Research Data Repository each year to allow users to more effectively test technologies using a wider sample of data.

Experiments and Exercises – addresses cyber security requirements from internal Department customers in support of the DHS operational missions in critical infrastructure protection (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Complete the first round of LOGIIC consortium projects and demonstrate the results at numerous oil and gas venues.
- Transition results and findings to PCS projects.

Information Infrastructure Security (IIS) Program – leverages the collective resources of private companies and technology vendors to identify and demonstrate new technologies to help protect the nation's infrastructure. Through the IIS program, S&T engages with industry, government, and academia to ensure that the core functions of the Internet continue to develop securely and benefit all owners, operators, and users, including Internet Operations Organizations. In addition, the IIS program addresses economic assessment, risk analysis, and modeling requirements on implementation and deployment of cyber security technologies that support internal DHS customers and external partners. This program includes the following projects:

- Secure Protocols;
- Process Control Systems;
- Cyber Security Assessment;
- Cyber Infrastructure and Emerging Threats; and
- Insider Threats.

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Secure Protocols – engages private sector Internet owners, operators, and government agencies to develop more secure protocols for Internet communications. In FY 2009, this project will combine with Domain Name Security System Security (DNSSEC) to address routing infrastructure for Internet.

Milestones and Deliverables

FY 2008:

- Complete the modification of end-user applications such as web browsers and e-mail clients to provide end-to-end security to assure authenticity and integrity of information.
- Provide step-by-step operator guidance documentation for various operating environments, along with training, procedural, and development documentation, as well as executable software, patches, commented source code files, and packaging requirements.
- Develop and deploy a Public Key Infrastructure (PKI) with the American Registry for Internet Numbers (ARIN), which controls and allocates IP addresses for North America.
- Cleanup the ARIN database in order to eliminate many routing errors and vulnerabilities to cyber attacks that are caused by inaccurate information in the database.

FY 2009:

- Increase deployment of the DNSSEC protocol, gather operational query data, and initialize deployment within government networks with the goals of further analyzing DNS security.
- Gather operational DNSSEC query data, with the goals of further analyzing DNS security, and initializing transition from sparse to dense deployment.
- Deploy the routing PKI with global registries to enable effective and efficient connections between Universal Resource Links (URLs).

FY 2010:

- Conclude PKI deployment activities with global registries to enable effective and efficient connections between URLs.
- Develop and deploy standards for secure routing.
- DNSSEC project will query data for testing purposes.
- Gather operational DNSSEC query data to further analyze DNS security, and accelerate deployment of DNSSEC policies and technology.

FY 2011:

- Develop a document consisting of draft secure routing protocols.
- Continue DNSSEC deployment into government and private sector environments.
- Conclude standards activities to develop new secure routing protocols to help secure the Nation's cyber infrastructure.

FY 2012:

- Initiate development and deployment associated with the new secure routing protocols.

FY 2013:

- Conclude development and deployment of secure routing protocols project.

Process Control Systems (PCS) – improves security for PCS. A PCS is a statistics and engineering discipline that deals with architectures, mechanisms, and algorithms for controlling the output of a specific process. PCSs control water supply, electrical power, gas and oil pipelines, and other distributed processes. Project deliverables will include advances in interoperability with existing PCS systems. This interoperability will allow PCS systems to easily integrate new products into existing systems and enhance information sharing within the critical infrastructure sectors using PCS.

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Milestones and Deliverables

FY 2009:

- Initiate activities in the area of PCS Security to support improved security for process control systems used across multiple critical infrastructure sectors.
- Develop PCS model applications to Oil and Gas Sector(s) to ultimately better secure those infrastructures.

FY 2010 – FY 2013:

- Award contracts for new PCS projects. Milestones will be established once contracts are finalized.

Cyber Security Assessment – addresses economic assessment, risk analysis, and modeling requirements that focus on current issues related to the implementation and deployment of cyber security technologies (funding ends in FY 2009).

Milestones and Deliverables

FY 2008:

- Develop a national research agenda to provide a framework for dealing with cyber conflict.

FY 2009:

- Conduct a Systems Integrator Forum and IT Security Entrepreneurs Forum.

Cyber Infrastructure and Emerging Threats – addresses flaws in the computerized systems that control generators, switching stations, and electrical substations as well as other emerging threats to infrastructure critical to the U.S. economy.

Milestones and Deliverables

FY 2008:

- Award the Distributed Environment for Critical Infrastructure Decision-Making Exercises (DECIDE) contract.

FY 2009:

- Develop Software Requirements Specification, Software Project Management Plan, System Design Document, Functional Design Document, including draft system architecture, and Concept of Operations Document will be completed and the Alpha Version (including Source Code, Test Plan, Test Results, and Updated Design Documents) will be delivered.

Insider Threats – addresses advanced methods of document control and management in order to provide an unalterable accounting of document access and dissemination. Ultimately, this project will ensure that appropriate control requirements are translated into a security policy that can be implemented, and is applied to documents and preserved from cradle to grave.

Milestones and Deliverables

FY 2009:

- Develop and evaluate Graph-based Approach (GBAD) representation for Insider Threat
- Design, Prototype and Analyze Document-based Management, Access Control and Security (DocuMACS)
- Evaluation of performance of advanced GBAD system and identify capability gaps
- Implementation and evaluation of DocuMACS V1.0

FY 2010:

- Develop and implementation GBAD performance enhancements

- DocuMACS Pilot Deployment
- Deliver the GBAD system
- Delivery of Source Code/Executables and DocuMACS Computer Based Training (CBT) Guide

FY 2011 – 1014

- Continue to foster partnerships to accelerate transition of new technology for Insider Threats into commercial cyber security products and services
- Issue Broad Agency Announcement(s)
- Award Contract(s)

Next-Generation Technologies (NGT) Program – addresses next-generation cyber security R&D needs in support of DHS components' mission requirements. It will define technical areas of interest, based on customer requirements, and allow university and private sector researchers to submit their best and most innovative ideas to S&T. This program will accelerate transition of new cyber security technologies into commercial products and services. End-users for these technologies include first responders, critical infrastructure owners, the banking and finance sector, private industry, and government.

In FY 2008, the program will develop technology and infrastructure to allow secure government data and video communication and coordination using hand-held devices. DHS users will be able to ensure secure communications wherever they are located. By the end of FY 2008, tools and techniques to defend against identity theft attacks and other financial system attacks should be available to the commercial marketplace, business and financial sectors, DHS and other government infrastructures. In FY 2009, S&T plans to continue to foster partnerships to accelerate transition of new technology into commercial cyber security products and services.

Internet Route Monitoring – identifies critical internet infrastructure, incorporating an understanding of geographic and topological mapping of internet hosts and routers (Moves from the Cyber Security Research Tools and Techniques Program in FY 2010).

Milestones and Deliverables

FY 2009:

- Hold public release of open source software Prefix Hijack Alert System (PHAS).

FY 2010:

- Complete Geographic router level maps.

FY 2011:

- Complete and deliver mapping and analysis tools to the National Response Team.

FY 2012:

- Develop datasets correlation tools.

FY 2013:

- Transition stability tools to National Response Team.

Basic/Futures Research Thrust Area – addresses the increasing difficulties associated with discovering, processing, synthesizing, understanding, and communicating information on potential terrorist threats and natural or manmade disasters. Customers include the various first responder, law enforcement, public safety, and public health officials and organizations throughout the Federal, State, local, and tribal homeland security community. This thrust area promotes effective homeland security risk management based on comprehensive, real time situational awareness and informed decision-making. Receiving real-time and accurate information is critical to effectively to preventing and responding to natural disasters and terrorist incidents or threats.

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Visual Analytics and Physics-Based Simulation Research Program – addresses problems associated with discovering, synthesizing, and communicating information and deriving insight from massive, dynamic, ambiguous, and diffuse data sets. The ultimate objective is to create Precision Information Environments (PIEs) that are tailored for diverse users in a broad range of situations. Such environments, when available to the myriad local, tribal, state, and Federal organizations or individuals engaged in homeland security, are critical to accurately understanding threats, quickly assessing consequences, proactively determining responses, and then establishing effective remediation activities.

Research programs support CCI efforts in threat assessment, data communications and sharing, interoperability, knowledge management and analysis, surveillance and investigative support, cyber security, and disaster management. The program will change in FY 2010 to Precision Information Environments, comprises two projects:

- Visual Analytics and Physics-Based Simulation; and
- Data-Intensive Computing, Privacy, and Forensics.

Visual Analytics and Physics-based Simulation – addresses analytics techniques for such multiple modes as audio, images, video, and instrumentation and other data as well as unstructured text. The objectives are to create a single, common analytical framework for all data types; to provide a truly scalable capability, which maintains its real-time nature as the amount and variety of data increases; and to develop application-specific interfaces and analytical capabilities for systems ranging from handheld, mobile devices to single analyst computers to command center installations suitable for wide-area situation-awareness operations. Technologies and techniques for visually based analytical processes and reality-based simulations, methods for interacting with, understanding, and sharing heterogeneous data from diverse, diffuse, and distributed sources in real time, and visually driven decision-making techniques for proactive threat assessment and effective disaster or incident response. In FY 2010, the project name will change to Visual Analytics, Reality-based Simulation.

Milestones and Deliverables

FY 2008:

- Deliver algorithms and capabilities to KTAP for research evaluation.
- Develop and install extensive enhancements for common knowledge management architecture, which include interactive full-text analytical visualization capabilities for large document sets.
- Establish Cooperative Activity Agreement on Research in Visual
- Analytics with Defense Research and Development Canada.
- Establish joint 3-year DHS-NSF Visualization Research Program.

FY 2009:

- Develop a multi-modal common visual analytics framework.
- Integrate the new CCI Center of Excellence with the National Visualization and Analytics Center (NVAC).
- Federal, State, and Local Visual Analytics Pilot at Port Authority of New York and New Jersey (PANYNJ).
- Expand NVAC Industry Consortium to 35 members.

FY 2010:

- Prototype Precision Information Environment.
- Initiate collaboration with German BMBF on Visual Analytics Projects.
- Implement 2010 Olympics Common Operating Picture.
- Implement 2010 Olympics Visual Analytics Center.

FY 2011:
- Develop Multi-modal Common Visual Analytics Framework.
- Develop Incident-scale Precision Information Environment Capability.
- Conduct Scalability Testing of Environment.

FY 2012:
- Establish Second DHS-NSF Program.
- Develop Mobile Visual Analytics Design.
- Enhance Text, Audio, Video, And Imagery Visual Analytics.

FY 2013:
- Develop Regional-scale Precision Information Environment.
- Develop Mobile Visual Analytics Capability.
- Complete Multimodal Visual Analytics Capability.

Data-Intensive Computing, Privacy, and Forensics – facilitates discovery and identification of potential terrorist attacks or catastrophic events, real-time forensics analysis capabilities for critical infrastructure and cyber infrastructure protection, privacy-ensuring capabilities for automated information management systems (funding starts in FY 2009). The initiatives seek novel algorithms and methods that will fundamentally advance the theory and practice of transforming discrete data into new scalable representations suitable for computer manipulation and visualizations that faithfully represent the content of the underlying data and synthesize information of different types and from different sources into a unified data representation. Research in computing and the discrete sciences will provide the basis for the use of the visually based analytical capabilities and the implementation of the precision information environments described above. Furthermore, it will enable the development of new, effective privacy-ensuring capabilities that can be intrinsic (or built-in) to automated information management systems as well as effective and efficient computer forensics capabilities. In FY 2010, the project name will change to Discrete-Element Computing, Privacy, and Forensics.

Milestones and Deliverables

FY 2009:
- Design parameters for data-intensive computing.
- Design data-intensive software architecture.

FY 2010:
- Create Discrete-Element Computing Environment.
- Create Discrete-Element Computing Hardware Architecture.

FY 2011:
- Develop Privacy-ensuring Computing Architecture.
- Develop Privacy-ensuring Data Elements.
- Create Common Discrete-Element Hardware-Software Architecture.

FY 2012:
- Conduct Scalability Testing Environment.
- Deliver Computer Forensics Design.
- Discrete-Element Computing for Visual Analytics.
- Databased Privacy.

FY 2013:
- Real-time Computer Forensics.
- Visual Analytics Discrete-Element Computing Prescription.
- Common data-intensive computing architecture for reality-based simulations.

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Knowledge Management Tools Thrust Area – reduces the risk of terrorist attacks and to prepare for and respond to natural and man-made disasters. The thrust area is developing new capabilities for the DHS Office of Intelligence and Analysis (I&A), Immigration and Customs Enforcement (ICE), U.S. Secret Service (USSS), Federal Emergency Management Agency (FEMA), National Protection Programs Directorate (NPPD), U.S. Coast Guard (USCG), State/Local/Tribal DHS partners and the DHS information enterprise, which is a gateway for users to retrieve information, services or resources across the Homeland Security enterprise. This includes tools and methods to handle massive amounts of information that is widely dispersed in a great variety of forms. The best way to save lives is to identify pertinent information, understand its meaning, and then use it to assess an actual threat, and determine the level of risk before an attack or incident occurs. Work in this thrust area is collaborative and complements efforts in the intelligence, law enforcement, and homeland security communities. In addition, the thrust area focuses on applied R&D in visualization and information analytics, as they are critical to the usability and effectiveness of converting raw data into useful information. This thrust area conducts its work through the following programs:

- Collaborative Information Sharing;
- Knowledge Frameworks;

Collaborative Information Sharing Program – develops and deploys advanced technologies to support inter-organizational and multi-level dissemination of information and intelligence products. This includes:

- Pattern recognition and correlation technologies for creating broad threat awareness;
- Operational support capabilities for protecting infrastructure, guarding against threats, and providing relevant, actionable intelligence to operators;
- Strategic analysis capabilities to recognize, track, and accurately assess the significance of patterns and trends in suspicious activity reports; and
- Advanced encryption and redaction tools, digital rights management technologies, and automated destruction capabilities to increase the multi-level security of distributed products.

Specific projects within the Collaborative Information Sharing Program include:

- Data Privacy Protection Technology;
- Secure Multi-Level Information Dissemination;
- Suspicious Activity Reporting; and
- Threat Dissemination Standards.

Data Privacy Protection Technologies – develops technologies to enable lawful use of U.S. persons' data for counter terrorism intelligence analysis, including the automatic identification of US persons information using National Information Exchange Model (NIEM) or other markup languages, and advanced data integrity techniques to automatically purge or anonymize and protect the privacy of data that cannot be otherwise legally retained. This activity enables the retention of key attributes to support lawful decoding and recovery of encrypted U.S. persons' data if probable cause is established (funding ends in FY 2009).

Milestones and Deliverables

FY 2009:

- Review Privacy Act rules and integrate these with intelligence oversight requirements.
- Perform Privacy Act and DHS intelligence policy assessments for use of data requiring privacy safeguards.

Secure Multi-Level Information Dissemination – disseminates intelligence products to State, local, and private sector security partners. This project focuses advanced encryption and redaction tools to

increase security of distributed products, digital rights management, and automated destruction capabilities. Accelerates integration of multi-level information dissemination technologies into DHS finished intelligence product databases.

Milestones and Deliverables

FY 2009:
- Phase in comparative scenario-based exercise to evaluate implementation of the Controlled Unclassified Information (CUI) framework.

FY 2010:
- Assess and document requirements for external intelligence product dissemination and evaluate relevant multi-level security technologies.

FY 2011:
- Perform multi-level dissemination technology pilots.

FY 2012 – FY 2013:
- Conduct DHS system integration tests and evaluations for DHS operational components.

Suspicious Activity Reporting (SAR) – assists with the technical development of a cross agency suspicious activity reporting tool/system to track, in real-time, all encounters with individuals on government watch lists, including outcomes and adjudication statuses and while protecting privacy. Builds and sustains a strategic analysis capability to recognize, track, and accurately access the significance of patterns/trends in suspicious activity reports.

Milestones and Deliverables

FY 2009:
- Provide mission-based reports and requirements for improving each DHS component's SAR capabilities while developing recommendations for an integrated approach to SAR analytics that is based on best practices and knowledge of common analytic tools and techniques.
- Develop a Capability Proof of Concept and Evolution Roadmap.

FY 2010:
- Perform technology assessments, system interface specifications, and software development for SAR.

FY 2011:
- Provide critical information on the mission, analytic capabilities, and technical segments of the component enterprise to inform integration and collaboration planning.

FY 2012:
- Execute DHS system integration tests and evaluations for SAR.

FY 2013:
- Provide enterprise requirements for an integrated DHS intelligence and law enforcement SAR capability that supports a range of Departmental information fusion and analysis options.

Threat Dissemination Standards – develops information sharing technical standards and protocols for rapidly sharing terrorism information within and between homeland security sectors with common vulnerabilities or mission needs. The project accelerates integration of information sharing standards and protocols into DHS' new and legacy cross sector threat assessment and mitigation systems.

Milestones and Deliverables

FY 2009:
- Define open standards and policy assessments for data exchange with government and industry partners.

- Develop NIEM Tools Requirement Analysis for DHS.

FY 2010:

- Design technology specifications for threat assessment and mitigation exchange standards.

FY 2011:

- Pilot information exchange standards and protocols in development environments.
- Pilot the applicability of NIEM exchanges in geospatial applications, such as the use of NIEM for Google Maps or Google Earth in Fusion Centers.

FY 2012:

- Conduct Impact Study on current NIEM model and recommend a development strategy for element level tagging (in-depth security study).

FY 2013:

- Study the applicability of the Maritime Information Exchange Model (MIEM) assertion language into NIEM.
- Support the development of systems that allow for the controlled distribution of threat reports and information throughout the community, enabling authorities who have received threat information to rapidly request additional amplifying information about the threat to make tactical decisions.

Knowledge Frameworks Program – develops and tests technologies that can rapidly integrate threat information and provide targeted and actionable information to the various operational entities within DHS and those Federal, State, and local agencies that support homeland security missions. The program also provides the ability to process structured and unstructured data from a variety of sources and in a variety of formats. The program conducts its activities through the following projects:

- Architecture and Framework;
- Interagency Center for Applied Homeland Security Technology (ICAHST);
- Collective Situational Awareness;
- Common Operating Picture (COP) Data Fusion Technologies;
- Integrated Data Processing and Analysis;
- Law Enforcement and Intelligence Sensor Fusion;
- Network Identity Management; and
- Real-Time Data Processing and Visualization;

Architecture and Framework – develops and deploys technologies to analyze masses of data (funding ends in FY 2009).

Milestones and Deliverables

FY 2008:

- Deliver upgrades to the information architecture with technical support for installation and training of analysts.

FY 2009:

- Transition 24/7 operational capability (unattended) for Architecture and Framework systems.

Interagency Center for Applied Homeland Security Technology (ICAHST) – provides rapid assessments of high priority technologies, systems, networks, and algorithms (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Evaluate the five highest priority technology needs identified in the community research agenda

(produced by S&T and the Office of the Director of National Intelligence Science and Technology Office).
- Conduct DHS system integration tests and evaluations.

Collective Situational Awareness – researches and develops technologies for accessing and exchanging situational awareness information among the USCG, its maritime, law enforcement, and intelligence partners. The project establishes information sharing protocols to enable the exchange of information across disparate National System security networks. In FY 2010, the project name will change to Maritime and Law Enforcement Information Sharing Protocols.

Milestones and Deliverables

FY 2009:
- Deliver Low Bandwidth Data Transfer for USCG.

FY 2010:
- Develop Service Oriented Architecture (SOA) compliant Track Correlation Service for USCG (Spiral 1).
- Issue Broad Agency Announcement for follow on Track Correlation Service.

FY 2011 – FY 2013:
- Conduct cross-domain situational awareness spiral technology pilots.

Common Operating Picture (COP) Data Fusion Technologies – develops sensor integration technologies to fuse massive volumes of potential hostile surveillance activity information from government agency and private sector sensor systems. Rapidly analyzes the nature, composition, and pattern of the threat in support of a common operating/intelligence picture. In FY 2010, the project name will change to Data Fusion Technologies.

Milestones and Deliverables

FY 2009:
- Develop Automated Continuing Evaluation System (ACES) for DHS Office of Security.

FY 2010:
- Design Fused Analytic Desktop Environment (FADE) for United States Coast Guard Maritime Intelligence Fusion Center, Pacific.

FY 2011 – FY 2013:
- Conduct data fusion technology pilots for DHS operational components.

Integrated Data Processing and Analysis – develops scalable technologies for the integrated analysis of free text, database records, audio, video, imagery, transactional data, geographical data, and sensor information. Establishes and validates reliable performance metrics for integrated data processing and analysis.

Milestones and Deliverables

FY 2009:
- Launch Integrated Text Analytics for ICE Office of Intelligence.

FY 2010:
- Conduct Virtual Support Team Mission Platform (VSTMP) for ICE Office of Intelligence.

FY 2011:
- Support Factweave Visual Analytics for ICE Office of Intelligence (Spiral 1-2).

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FY 2012 – FY 2013:

- Conduct integrated data processing and analysis technology demonstrations for DHS operational components.

Law Enforcement and Intelligence Sensor Fusion – develops comprehensive sensor fusion standards and protocols for sharing sensor information between traditional law enforcement organizations and intelligence partners. It also accelerates integration of sensor fusion standards and protocols into DHS' cross-domain threat assessment and mitigation systems to support common operating picture.

Milestones and Deliverables

FY 2009:

- Support Geospatial Information System (GIS) Data Exchange Pilot for NPPD.
- Conduct pilot test to deploy the Critical Infrastructure Inspection Management System (CIIMS) to the LAPD ARCHANGEL program to be integrated into the patrol, assessment, prevention, response, and after action process of critical infrastructure protection.

FY 2010:

- Design specifications for sensor fusion standards and exchange protocols.
- Conduct pilot test to deploy CIIMS to the LAPD ARCHANGEL program to be integrated into the patrol, assessment, prevention, response, and after action process of critical infrastructure protection.

FY 2011 – FY 2013:

- Pilot sensor fusion standards and protocols in spiral development environments.

Network Identity Management – develops technologies for managing identities, rights, and authorities used within and external to an organization's networks. The project also establishes interoperability with multiple external identity adjudication support systems to enable timely, complete evaluation of an individual's status and eligibility for access.

Milestones and Deliverables

FY 2009:

- Define an initial set of User Attributes to represent DHS Users to an external community.
- Test and evaluate the applicability of the DHS Attribute Set by establishing a DHS Identity Provider that will present DHS Users to an external community.

Real-Time Data Processing and Visualization – develops technologies for dynamic, real-time processing and visualization of information in multiple forms and from diverse, distributed sources. The project automates the selection, ranking, and correlation of relevant information for purpose-driven decision-making.

Milestones and Deliverables

FY 2009:

- Develop Generalized Data Driven Analysis and Integration for ICE Office of Investigations.
- Develop Scalable Exploration of Network Flows for the U.S. Computer Emergency Readiness Team (US-CERT).
- Develop Sea, Lake, And Overland Surge for Hurricanes (SLOSH) for FEMA.

FY 2010:

- Develop an ICE Office of Investigations infrastructure capable of supporting enterprise-wide data fusion and web-based visualization of queries across data cubes and GIS systems.

FY 2011:
- Prototype anomalous spatial clustering and geospatial trend analysis visualizations for ICE Office of Investigations.

FY 2012:
- Launch alpha release of automatic mapping heuristics for ICE data.

FY 2013 – FY 2013:
- Deploy web-based tailored knowledge products with temporal data visualizations and analysis to ICE Office of Investigations.

Surveillance, Reconnaissance, and Investigative Technologies (RSIT) Thrust Area – develops technologies that aid in the discovery, investigation, and prosecution of terrorists and criminals, with a major emphasis on support to Department of Homeland Security (DHS) Law Enforcement (LE) components.

RSIT Program (formerly USSS Support Program) – builds upon the projects developed in the USSS Support Program and broadens the customer base beyond the USSS by including the entire DHS law enforcement community (Federal Air Marshal Service (FAMS), Immigration and Customs Enforcement (ICE), Customs and Border Protection (CBP), and Federal Protective Services). This program provides law enforcement officers, investigators, analysts, and examiners with technology solutions that provide new capabilities and enhance operational efficiency in criminal and terrorist investigations. Funding for all efforts associated with this program ends in FY 2008.

The program will develop technologies to address all criminal and terrorist activity investigated by DHS law enforcement personnel with a particular focus on the following project areas:
- Law Enforcement Support Systems (LESS);
- Forensic Analysis Tools; and
- Tagging, Tracking, and Locating Technologies.

Law Enforcement Support Systems (LESS) Project – develops technology platforms that will enable the collection and display of information to support the requirements of the LE community (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:
- Transition operational Advanced Route Evaluation System (ARES) to FAMS customer that will allow for real-time on-route risk assessments for aircraft that will assist in planning and assessing priority flights.
- Complete software system that will have the capability to augment images of suspects from less than optimal angles and digitally reconstruct them so that the image may be analyzed for use in FAMS operations.

FY 2009:
- Deliver a suite of distributed networking, password decryption, and file searching tools to aid the USSS in the recovery of information on computer hard drives recovered during casework.
- Develop a set of software tools, to be used by USSS investigators that will accurately reproduce crime scenes and model activity by converting data into easily interpreted computer models for use by juries and decision makers.

FY 2010:

- Transition final software system that will allow USSS investigators to unlock encryption protected files stored on computers.
- Develop a distributed sensor network that will be used in homeland security and infrastructure applications.

Forensic Analysis Tool Project – develops forensic technologies to offer new analytical capabilities for the LE investigator community (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Digitalize USSS ink library's 9,000 writing ink samples

FY 2009:

- Complete software development that includes a database management system, GUI interface and a software search and matching feature for the USSS Ink Library (writing inks such as ballpoints etc.).
- Launch full range of software tools to improve speaker recognition including dialectical classification and the reduction of background noise interference, which will allow USSS investigators to carry out detailed forensic examination of voice evidence.
- Conduct specification study that will determine whether items in video images can be matched to three-dimensional clothing items accurately and reliably. The study will be a reference to properly handle forensic video comparison requests in courtroom settings for use by the entire DHS law enforcement community.
- Collect 450 specimens of toners and inkjet inks for experimentation for use by the ICE Forensic Document Laboratory. This is the first step toward fully characterizing documents such as passports from both fraudulent documents and corresponding genuine exemplars and creating a fully searchable library of printing (inkjet, toner) media to conduct comparisons of questioned documents with genuine specimens such as passports and associated identity documentation produced by printers.
- Develop a reagent for USSS investigators that is composed of nano-particles that bind amino acids in fingerprint samples resulting in improved visualization in casework where traditional fingerprint ID is not possible.

FY 2010:

- Draft report benefiting the entire DHS law enforcement community by validating the methodologies utilized by, the ImageXpert digital imaging system for questioned documents produced by inkjet printers.

Tagging, Tracking and Locating Technologies Project – develops reliable and discrete means of tracking, tagging and locating persons or objects of interest to LE investigators (funding ends in FY 2008).

Milestones and Deliverables

FY 2008:

- Develop a software controller system and antennas capable of tracking cell phone signals to assist USSS investigators.

FY 2009:

- Develop a clear UV reflective tape that may be covertly applied to a surface and be nearly undetectable by visual means, but will allow tracking of targets of interest when a UV illuminator excites the tape.
- Transition completed suite of software that will allow the USSS customer to conduct automatic

direction finding of UMTS cell phones.

Threat Assessments Thrust Area – provides DHS, the science and technology divisions within the Intelligence Community (S&T IC), and other government agencies programmatic and technical expertise in Emerging Threats and Risk Sciences and other applicable areas that are sensitive, classified, or deserving of extraordinary security protection.

Emerging Threats Program – identifies over-the-horizon technologies by ascertaining potential future threats. In addition, the program determines potential emerging threats through commissioned and interagency threat assessments, through the expertise brought by the customers through the IPT process, and through an assessment of existing counter-measure availability and capabilities. Individual activities under the project areas including deliverables, technology capabilities, customer, performer, and/or overall program focus maybe classified.

Identification and Assessment Project – anticipates and defines potential threats emerging from new scientific and technological advances, and evaluating terrorist innovative or novel use of existing technologies.

Milestones and Deliverables

FY 2009:

- Complete additional future studies on topics identified during FY 2008, as relevant to S&T requirements.
- An annual Emerging Tactics Assessment will be delivered to the customer.
- Final reports/products collected during the Tri-Lateral Core Group (sponsored by Defense Intelligence Agency (DIA) conference.
- Threat Assessment in the areas of novel concealment of explosive devices, and identification of non-conventional threats.
- Provide intelligence based threat assessments to S&T customers and support personnel during the IPT process.

FY 2010:

- Complete Threat Assessment of Hydrogen Fuel Cells.
- Provide two to four threat assessments on over the horizon technologies.
- Provide intelligence based threat assessments to S&T customer and support personnel during the IPT process.

FY 2011 – FY 2013:

- Identify assessments to be conducted on over the horizon threats.
- Provide intelligence based threat assessments to S&T customer and support personnel during the IPT process.

Countermeasures Development Project – develops capabilities in response to Threat Assessments that will counter emergent threats for which countermeasure capabilities do not yet exist. It addresses mission support technology development, mitigation of vulnerabilities, and defense against new and emergent threats.

Milestones and Deliverables

FY 2009:

- Assess the current state of countermeasures capabilities and initiate countermeasures development for those high-priority emerging threats identified in FY 2008.
- Deliver a fully developed prototype of SWITCHBLADE to the customer. The SWITCHBLADE prototype can detect undeclared electronics, whether the equipment is powered on or off.

- Deliver a fully developed prototype of SNOOPY to the customer. The SNOOPY prototype can detect any foreign objects in solid masses.
- Establish a proof of concept on a novel defeat mechanism for cloudbursts of bio-agents.

FY 2010:

- Continue Novel Defeat Countermeasure project.
- Identify threats using information collected in FY 2009 threat assessments that do not have a countermeasure already established.

FY 2011 – FY 2013:

- Identify threats using information collected in FY 2010 and beyond threat assessments; that do not have a countermeasure already established.

Future Capabilities Research and Development – conducts high-risk, high-payoff basic technology in areas relevant to emerging threats in homeland security. Activities could include research collaboration with external agencies and international partners.

Milestones and Deliverables

FY 2009:

- Threat validation reports (subjects classified).

FY 2010:

- Develop library of nano-sensors tuned to compounds of human odors. This project was multi-agency sponsored.
- Develop a pathogen-specific algorithm at the crop (field) scale using high-resolution satellite imagery to differentiate the presence (or absence) of threatening plant pathogens from endemic pathogens that are present within crops.

FY 2011 – FY 2013:

- Determine the proof of principle and development of a rapid, tagging-free, DNA-sequencing technique that utilizes solid-state nano-pores to analyze single DNA and RNA molecules.
- Identify research and development projects that would be cohesive to previous threat assessments.

Intelligence, Surveillance, and Reconnaissance (ISR) Program/Project – supports basic research activities to improve the collection and dissemination of intelligence information using satellites, radars, sensors, and unmanned platforms in support of DHS components and Northern Command. All information in this project (project deliverables, technology capabilities, customer, performer, and/or overall program focus) is classified.

Milestones and Deliverables

FY 2009:

- Complete a National Integration Report on Multi Phased Array Radar.
- Complete a report on Airspace Modeling Situations for the FAA.

FY 20010:

- Provide support to the National Applications Office addressing identified technological capability gaps.
- Provide support to OI&A addressing identified technological capability gaps.
- Integration Assessments on additional identified future ISR technology.

FY 2012 – FY 2013:

- Deliver Integration Assessments on additional identified future ISR technology.
- Provide support to technological capability gaps identified by DHS components in the ISR arena.

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Risk Sciences Program – fosters systematic, transparent, and goal-focused application of risk concepts and tools to provide better support to strategic, operational, and tactical decision-makers across the national homeland security enterprise. In addition, this program provides for informed decision-making across government, and particularly in DHS.

Risk and Decision Support Project – conducts research and developmental efforts aimed at advancing the state of the art in the risk and decision support sciences (risk analysis, risk communications, performance metrics, etc.) helping those who hold primary responsibility for risk assessments and other risk-related functions (i.e., risk communications, and evaluation of alternative courses of action, etc.) to conduct their work in a conceptually sound and analytically rigorous

Milestones and Deliverables

FY 2009:

- Produce a Risk and Intelligence Communities Integration Study (Phase II).
- Provide support to NPPD Office of Risk Management and Analysis (i.e., risk lexicon project, cross-agency/cross-scenario risk assessment efforts, etc.).
- Co-sponsor 2009 Santa Fe Homeland Security Risk Conference with Los Alamos National Lab.

FY 2010:

- Co-sponsor 2010 El Paso Homeland Security Risk Conference with Los Alamos National Lab.

FY 2011 – FY 2013:

- Co-sponsor annual El Paso Homeland Security Risk Conference with Los Alamos National Lab.
- Provide support to risk analytic efforts conducted by DHS components; including S&T.

Comparative Studies Project – conducts research and analytic studies (e.g., historical, competitive strategies, net assessment, etc.) to examine the past and potential future evolution of the terrorist vs. security force competition over time. The objective is to generate information and insights that will useful to decision-makers in developing future strategies that will avoid repetition of past mistakes and future "failures of imagination."

Milestones and Deliverables

FY 2009:

- Conduct a workshop series and report on Comparative US and Foreign Approaches to Domestic Security and Intelligence Operations.
- Conduct a workshop and report on "Consequences of Worldwide Immigration" study conducted in FY 2008 on behalf of DHS Office of Policy.
- Deliver a report on "China and the Cyber Threat" (conducted in support of Office of Policy DHS "net assessment" effort).

FY 2010:

- Conduct a workshop and report on "China and the Cyber Threat" study conducted in FY 2009 on behalf of DHS Office of Policy.
- Conduct one or more comparative studies and/or net assessments as directed in support of Office of Policy DHS "net assessment" effort – topics to be determined.

FY 2011 – FY 2013:

- Conduct comparative studies, net assessments, and/or strategic futures workshops with topics to be determined based on future developments.

Explosives

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Counter-MANPADS	DIRCM	1,500	-	-	-	-	-
Explosive Detection	Cargo	2,306	3,450	3,450	2,700	6,200	7,700
	Checked Baggage	6,000	-	-	-	-	-
	CheckPoint	16,407	11,653	8,150	7,250	6,385	7,063
	HomeMade Explosives	9,000	7,000	5,300	3,600	3,000	2,200
	VBIED/SBIED	-	-	-	-	-	-
	Manhattan II	14,000	12,641	12,630	4,445	2,815	1,537
Mitigation	Conveyance Protection	3,200	1,500	2,200	2,200	1,600	1,500
	Air Cargo Blast Mitigation	-	-	-	-	-	-
Research	Algorithm	-	-	-	-	-	-
	Chemical	-	-	-	-	-	-
	Materials	-	-	-	-	-	-
	Physical	-	-	-	-	-	-
	Explosives Research	4,175	8,423	8,717	9,113	9,334	9,553
Counter IED	Basic Research	14,625	34,125	34,125	34,125	34,125	34,125
	Transition	4,500	14,953	28,334	33,153	28,929	28,920
SBIR	SBIR	1,941	2,404	2,530	2,565	2,598	2,632
Explosives Total		77,654	96,149	105,436	99,151	94,986	95,230

Overview

The Explosives Division develops the technical capabilities to detect, interdict, and lessen the impact of non-nuclear explosives used in terrorist attacks against mass transit, civil aviation, and critical infrastructure. This includes:

- passenger-, baggage- and cargo-screening technologies;
- blast-resistant aircraft construction; and
- integrated protective systems for high-value facilities.

The division's primary Federal customers include the Transportation Security Administration (TSA), the U.S. Secret Service (USSS), and the U.S. Coast Guard (USCG). Other end-users include the aviation industry and Federal, State, and local first responders.

The division actively supports the successful transition of technologies that support the following DHS strategic goals:

Goal 2: Protect Our Nation from Dangerous Goods

2.3 Prevent, detect, and respond to explosive attacks.

2.3.1 Guard against explosive attacks in the United States. Reduce the risks to our citizens and infrastructure from explosive attacks and incidents.

2.3.2 Improve airport security against explosive attacks and develop means to detect and counter

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improvised explosive devices.

The Explosives PPA supports the following performance metrics:

Performance Metric 1: Provide, for all mass transportation venues, a non-intrusive checkpoint inspection system to detect weapons and explosives on personnel before they are admitted to a controlled area, using either a portal or a proximity system, and enabling detection within a range of 1-5 meters, throughput of 200-250 persons per hour, and automatic detection, with probabilities of detect (Pd) and false alarm (Pfa) set by the customer by FY 2013.
Supports TSA's Checkpoint Support Metric: Level of machine efficiency

Performance Metric 2: Quantify the ability of existing checked baggage screening systems to screen low, medium, and high-density air cargo and assess the results by FY 2010.
Supports TSA's EDS/ETD Systems Metric: Level of machine effectiveness/reliability

Performance Metric 3: Deliver an automatic explosive detection system for checkpoint/checked baggage (to serve as dual-use in small airports) at technology readiness level (TRL) 6 that includes the capability to detect liquid explosives and is available for certification readiness testing in FY 2010.

The Explosives Division carries out its activities through five thrust areas:

- Counter-Man-Portable-Air-Defense-Systems (Counter-MANPADS);
- Explosive Detection;
- Mitigation;
- Research; and
- Counter Improvised Explosive Devices (C-IED).

Counter-MANPADS Thrust Area – develops countermeasures to detect and divert incoming MANPADS to protect the host aircraft from hits. This thrust area examines the viability of equipping commercial transport aircraft with defense systems for mitigating shoulder-fired, surface-to-air missile attacks. This thrust area contributes to the division goals by:

- preventing terrorist attacks with MANPADS; and
- protecting airliners from MANPADS attacks.

Counter-MANPADS Directed Infrared Countermeasures (DIRCM) Program – examines the feasibility of equipping commercial transport aircraft with defense systems for countering MANPADS attacks. This program evaluates technology concepts and tests available technologies in three major areas:

- system performance;
- system suitability; and
- cost.

The DIRCM program applies a systems engineering approach to identify, test, evaluate, and integrate countermeasures for commercial aircraft in three phases:

- development of two Counter-MANPADS prototypes (JETEYE™ and GUARDIAN™);
- systems analysis and flight tests; and
- development of a plan to permit modifications of commercial aircraft with the least disruption and out-of-service costs to the airline industry.

JETEYE™ Countermeasure – develops a laser-based directed infrared countermeasure (IRCM) designed to be installed on commercial transport aircraft to protect the host aircraft from surface to air missiles attacks. The stand-alone autonomous system is derived from the Army's advanced Tactical IRCM Program.

Milestones and Deliverables

FY 2008:

- Provide a report to Congress upon the completion of the program, identifying key factors and data from which decisions will be made regarding the transition of the Counter-MANPADS systems to production and deployment.
- Complete the system development and demonstration program.

GUARDIAN™ Countermeasure – develops a laser-based directed IRCM designed to be installed on commercial transport aircraft to protect the host aircraft from surface to air missiles attacks. The stand alone autonomous system is derived from the Air Force's Large Aircraft IRCM Program.

Milestones and Deliverables

FY 2008:

- Provide a report to Congress upon the completion of the program, identifying key factors and data from which decisions will be made regarding the transition of the Counter-MANPADS systems to production and deployment.
- Complete the system development and demonstration program.

Explosives Detection Thrust Area – develops advanced technologies to detect explosive threats to the Nation's aviation, rail and maritime transportation systems. Activities in this thrust area include:

- Improving existing explosive detection methods;
- Developing new detection methods for screening people, baggage and cargo; and
- Ensuring freedom-of-movement for people and commerce.

The Explosives Detection Thrust Area includes the following programs: Checked Baggage; Cargo; Check Point; Home Made Explosives; and Manhattan II.

Cargo Program – identifies and develops the next generation of air cargo screening systems to mitigate the threat of explosives placed in air cargo containers. The program develops technologies that will enable screening of 100 percent of air cargo while reducing operating costs and achieving a low rate of false alarms.

To address DHS customer capability gaps developed during S&T's Capstone IPT process, the Explosives Division plans to optimize canine explosive detection performance to enable DHS canine user agencies such as TSA, Customs Border Protection (CBP), USSS, and NPPD to meet new threats and increased demand for canine inspections. The program will also conduct RDT&E of the next generation of air cargo screening systems. Activities include:

Air Cargo – identifies and develops the next generation of air cargo screening systems to mitigate the threat of explosives placed in air cargo containers. Activities include developing technologies to enable 100-percent air cargo screening (including break-bulk screening) with a low false-alarm rate and reduced operational costs.

Milestones and Deliverables

FY 2008:

- Develop technology to detect metallic IEDs components and disable intact IEDs in cargo.

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FY 2009:
- Complete technology demonstrations and transition the project to TSA.
- Deliver valid, reliable, and fair screener selection and qualification tests at TRL 6.

FY 2010:
- Deliver validated air cargo screener training based on procedures and equipment at TRL 6.
- Assess state-of-the-art, commercial-off-the-shelf technology (COTS) and near COTS equipment to screen break bulk, palletized and containerized air cargo.

FY 2011:
- Deliver non-contact trace screening component prototypes for high-density cargo commodities at TRL 5.

Canine Explosives Detection – optimizes canine explosive detection to enable DHS canine user agencies such as TSA, CBP, USSS, and NPPD to select and breed the best canines for detecting explosives. This project will improve canine deployment strategies and create a predictive canine success database based on traits and genetics.

Milestones and Deliverables

FY 2009:
- Deliver a canine training-aid field demonstration.
- Develop a sensor system to be embedded in a jacket designed to be worn by a trained canine to provide a link from the canine to a remote monitoring system.

FY 2010:
- Integrate additional canine remote monitoring system sensor capabilities.

FY 2011:
- Provide status reports on improved canine deployment strategies.
- Transition early detection protocol for musculoskeletal anomalies for use with fielded canines.
- Transition to users a sensor system embedded in a jacket to be worn by a canine trained for off leash guidance.

FY 2012:
- Develop a process to implement Zn nano particles to enhance olfactory response in fielded canines.

FY 2013:
- Transition predictive canine success database based on physical and behavioral traits and genetics.

Checked Baggage Program – supports continuous improvements toward 100-percent screening of aviation checked baggage. The program reduces the rate of false alarms and lowers operating costs, while minimizing the impact on the flow of people and commerce. TSA is the primary customer for this program; end users are the aviation industry and the traveling public. Activities include:

Improvements to Deployed Check Baggage Technology – qualifies operational systems in accordance with customer-established verification of usability, reliability, maintainability, and operability metrics. This project examines the root cause of false-alarm rates in Explosive Detection Systems (EDS) to reduce the number that occur. The program certifies EDS for reduced threat mass to detect smaller amounts of explosives based on aircraft vulnerability.

Milestones and Deliverables

FY 2008:

- Complete EDS certification for reduced threat mass.
- Transition systems to TSA for deployment.

Check Point Program – develops advanced capabilities to detect explosives and concealed weapons, including:

- Home made explosives (HMEs) that could be detonated in passenger cabins; and
- Weapons that could be used in the hostile takeover of mass transit systems.

The program is designing a next generation checkpoint that will enable passengers to travel seamlessly from public areas to secure areas via a high-tech corridor that will automatically identify threats. The check point corridor will implement an integrated system of detectors (sensors, biometrics, radio frequency identification technologies) networked with command control operations to effectively meet TSA's requirements for automation, efficiency, and cost reduction. Program activities include:

Automated Carry-On Detection – develops advanced capabilities to detect explosives and concealed weapons (including HMEs that could be detonated in passenger cabins and weapons that could be used in the hostile takeover of mass transit systems). This project will introduce new standalone technologies or adjunct technologies to Computed Tomography (CT) technology to continue improving detection performance and the detection of novel explosives.

Milestones and Deliverables

FY 2009:

- Award a development contract to allow for the detection of novel explosives in the next generation checkpoint detection system.
- Complete certification for the detection of novel explosives in the next generation checkpoint detection system.

FY 2010:

- Develop visual search performance aids that reduce bag-search rates for faster checkpoint throughput.

FY 2011:

- Complete Qualification Readiness Testing.

FY 2012:

- Transition a next generation checkpoint detection system to TSA for Qualification Testing.

Next Generation Carry-On Detection – develops automated carry-on bag detection system demonstration, system requirements, and performance goals to allow for test and evaluation. This program enhances security by automating the detection of weapons and explosives at airports and other mass transit facilities. This project identifies new emerging threats and integrates them into a complete system including the wide variety of liquid- and gel-based explosives.

Milestones and Deliverables

FY 2008:

- Complete new technology demonstrations and produce a final report for TSA.

FY 2009:

- Transition Dual-Use Technology for Qualification Testing and begin Liquid Explosive Qualification Readiness Testing.

FY 2010:

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- Transition Liquid Explosive for Qualification Testing.

Next Generation Passenger Checkpoint – develops the next generation detection system to screen passengers at mass transit portals for explosives. This work involves initial concept framing, to include setting the parameters of domain and operations, and developing policies to ensure the identification of streamlined, innovative, risk-based solutions. This project studies new emerging threats and integrates them into a complete system including the wide variety of liquid- and gel-based explosives.

Milestones and Deliverables

FY 2008:
- Conduct a technology demonstration of the passenger checkpoint system.

FY 2009:
- Deliver a fully functional laboratory breadboard portal to improve passenger checkpoint throughput using real time sampling of the passenger's wake while walking through the portal (no stopping required).
- Transition a dual-energy checkpoint detection system to identify potential threats based on atomic number, mass, and other physical characteristics to TSA.

FY 2010
- Deliver a Whole Body Imager at TRL 7.

FY 2011:
- Transition a Whole Body Imager to TSA for field trials.
- Develop an Automatic Detection Capability.

FY 2012:
- Demonstrate a Whole Body Imager at three mass transit demonstrations.
- Develop advanced systems for mass transit.

Explosive Trace Detection – develops advanced capabilities to detect explosives through trace residue technologies to include HMEs. This project is developing a fully functional laboratory breadboard Portal for Aerodynamic Wake Sampling to improve throughput by real time sampling of the passenger's wake while walking through the portal.

Milestones and Deliverables

FY 2009:
- Complete a fully functional laboratory breadboard portal for aerodynamic wake sampling.

FY 2010:
- Conduct demonstration of a Benchtop non-contact trace detection system.

FY 2011:
- Complete a study and produce a report on contamination and Explosive Trace Portal systems.
- Transition non-contact trace diction system.

Home Made Explosives (HME) Program – supports the ongoing effort to counter the novel, liquid, and HME threat. This program investigates all potential detection technologies capable of detecting and distinguishing explosives and flammable liquids from benign liquids (e.g. drinks, lotions, hygiene products, contact lens solution). Program activities include:

Home Made Explosives Characterization – determines the impact, friction, and electrostatic discharge sensitivities of HME threats. The project provides a better understanding of the potential

damage of HMEs and their impact on aircraft. This works enables the division to determine the necessary technologies to counter this threat. This data will also facilitate the safe handling and storage of volatile materials for S&T researchers involved with developing explosive detection systems, as well as their customers.

Milestones and Deliverables

FY 2008:
- Conduct detonation assessment tests and real-effects testing for the first group of HME formulas and analyze results for test report.
- Conduct phenomenological testing of the first group of HME threats.
- Address a prioritized list of HME formulas.

FY 2009:
- Conduct detonation assessment tests for the second group of HME formulas and analyze the results for test report.
- Conduct phenomenological testing of the second group of HME threats.
- Address a prioritized list of HME formulas.

FY 2010:
- Conduct detonation assessment tests for the third group of HME formulas and analyze results for a test report.
- Conduct phenomenological testing of the third group of HME threats.
- Address a prioritized list of HME formulas.

FY 2011:
- Conduct detonation assessment tests for the fourth group of HME formulas and analyze the results for a test report.
- Conduct phenomenological testing of the fourth group of HME threats.
- Address a prioritized list of HME formulas.

FY 2012 – FY 2013:
- Address a prioritized list of HME formulas.

Home Made Explosives – examines all potential detection technologies capable of detecting and distinguishing explosives and flammable liquids from benign liquids (e.g. drinks, lotions, hygiene products, contact lens solution). This project includes: improving products and systems capable of detecting HMEs; supporting the research and development of next generation, novel technologies, algorithms or prototypes for the detection of HMEs; and addressing potential operational venues, including airport and mass transit checkpoints for passengers and carry-on baggage.

Milestones and Deliverables

FY 2008:
- Complete COTS technology demonstrations and produce a final report for TSA.

FY 2009:
- Complete new technology test and evaluation and provide information to TSA.

Home Made Explosives Technology Integration – integrates detection capability for HME or novel explosives by improving future generation screening systems. Due to the urgency of the threat, detection capability will be provided by spiral upgrades to screening systems that are able to detect an increasing number of HME threats.

Explosives

Milestones and Deliverables

FY 2011 – FY 2012:

- Complete detection assessments for the first group of HME formulas and produce a technical report for TSA.
- Complete spiral upgrades to screening systems for the first group of HME formulas.

FY 2013:

- Complete detection assessments for the second group of HME formulas and produce a technical report for TSA.
- Complete spiral upgrades to screening systems for the second group of HME formulas.

Home Made Explosives Standalone Detection – provides a standalone detection capability for HME or novel explosive by improving COTS systems. Due to the urgency of the threat, detection capability will be provided by spiral upgrades to COTS equipment that are able to detect an increasing number of HME threats.

Milestones and Deliverables

FY 2008:

- Complete COTS detection assessments for the first group of HME formulas and produce a technical report for TSA.
- Complete spiral upgrades to COTS equipment for the first group of HME formulas.

FY 2009:

- Complete spiral upgrades to COTS systems for HME detection.
- Complete COTS detection assessments for the first group of HME threats and produce a technical report for TSA.

FY 2010:

- Complete characterization testing and predictive modeling for the second group of HME threats.
- Complete follow-on spiral upgrades to COTS equipment for HME detection.

FY 2011:

- Complete COTS detection assessments for the second group of HME threats and produce a technical report for TSA.

FY 2012:

- Complete HME trace signature studies and provide technical report to TSA that specify detection requirements.
- Complete characterization testing and predictive modeling for the third group of HME threats.

FY 2013:

- Complete collection and analysis of CT image data from various commercial EDS of HME threats identified by TSA and provide industry partners with feedback for improved algorithms.
- Complete COTS detection assessments for the third group of HME threats and produce a technical report for TSA.

Manhattan II Program – stimulates commercial development of next generation systems that provide the best value combination of performance and affordability for screening checked baggage. Testing and evaluation of these systems will focus on probability of detection, level of false alarms, and throughput. The project will also measure affordability by assessing initial purchasing cost, operating costs, maintainability, and other elements of the full life-cycle costs.

Manhattan II – supports system development and integration of the Manhattan-II checked baggage

program. The project also completes the preliminary system architecture test and evaluation and conducts detection-technology test and evaluation. This project will begin the development of system networking and multiplexing to increase efficiency of security screening and decrease screener manpower requirements.

Milestones and Deliverables

FY 2008:
- Complete architecture gathering, image database.
- Produce final report for TSA.

FY 2009:
- Complete detection technology demonstrations and produce final report for TSA.

FY 2010:
- Complete system performance analysis and metrics for Performance Standard for future acquisition programs in coordination with TSA.

FY 2011:
- Complete hardware and software optimization and system integration.

FY 2012:
- Transition new integrated system to TSA for Operational Test and Evaluation.

FY 2013:
- Integrate enhancements to both hardware and software in accordance with the results of Operational Test and Evaluation.

Mitigation Thrust Area – reduces the impact of bombs that cannot be detected or be rendered safe through available means. This thrust area hardens conveyances against threats (e.g., blast-resistant cargo containers) and enhances the protection of high-value targets such as prominent buildings, key bridges, and tunnels by incorporating blast-resistant materials into these structures.

Conveyance Protection Program – supports efforts to assess risks and mitigate consequences of an intentional assault on air, surface, and maritime conveyances. The overall objectives of these programs are to:
- Assess the vulnerability and survivability of commercial vehicles to high energy explosives;
- Develop materials, technologies, and techniques to decrease vulnerability and improve survivability of commercial vehicles;
- Develop domain awareness systems and other information technology that help security organizations thwart intentional assault; and
- Develop information systems that allow first responders to respond in the most effective way to terrorist attack, other intentional assault, natural disaster, and other catastrophes.

TSA, the aviation industry, and the traveling public are the primary customers for this program. Current program activities focus on aircraft hardening and preventing the catastrophic loss of passenger aircraft from IEDs detonated in passenger cabins or cargo holds. Activities include:

Aircraft Hardening – addresses the risk of catastrophic loss of passenger aircraft due to explosives detonated in the passenger cabin or cargo hold. This project will develop measures to harden the passenger cabin and cargo hold against blasts. These measures will be incorporated into aircraft design and airline employee standard operating procedures. Deliverables under this project include ready-for-production designs and will be provided to the TSA to develop policy decisions for the Federal Aviation Administration (FAA) to mandate and implement.

Explosives

Milestones and Deliverables

FY 2008:

- Complete enhanced version of composite materials database and user manual to assess the vulnerability of aircraft to various quantities and types of explosives at different locations of the vessel.

FY 2009:

- Complete analysis models and data for identified threat scenarios related to rail chlorine tank car.
- Complete Blast Dam modeling tool for Aircraft Vulnerability Assessment.

Aircraft Vulnerability Tests – conducts vulnerability assessments of narrow and wide-body aircraft subject to detonation of HMEs, standard explosives, and novel explosives threats at various locations within the passenger cabin and cargo hold. These vulnerability assessments will analyze blast and damage effects of these explosives, determine the minimum quantities of HMEs required causing catastrophic damage to various aircraft types, and identifying the detection limits necessary for detection systems.

Milestones and Deliverables

FY 2008:

- Perform aircraft vulnerability assessments, focusing on narrow-body aircraft and blast testing of the fuselage liners.
- Validate modeling efforts.

FY 2009:

- Conduct vulnerability assessments of narrow- and wide-body aircraft subject to detonation of HME threats at various locations within the passenger cabin and cargo hold. Provide detailed knowledge necessary to understand the damage effects of this threat, the minimum quantities of HMEs needed to cause catastrophic damage to various aircraft types, and determine the detection limits necessary for detection systems.
- Deliver computational models that predict aircraft vulnerability to internal detonation of HME threats at various locations within the passenger cabin and cargo hold.

FY 2010:

- Test full-scale effects of aircraft vulnerability on the following:narrow-body overhead bins; wide-body and narrow-body window-belts; and wide-body and narrow-body lavatories.

FY 2011 – FY 2013:

- Continue to conduct testing of HME blast effects on different types of aircraft and in different scenarios.
- Continue to create and validate computational models to predict aircraft vulnerability to internal detonation of HME.

Research Thrust Area – develops basic research program objectives and investment strategies that support an integrated approach to the execution of the division's resources. To minimize the programmatic planning risks for development of various next generation screening systems, the division developed this basic research plan independent of the Explosives Prevention Capstone Integrated Product Team (IPT), chaired by TSA, which has identified several high priority capability gaps. While the S&T Basic Research Thrust is not directly linked to those customer capability gaps, the overall focus of the research investments are intended to support future customer needs in the area of explosive detection.

Algorithm and Analysis of Raw Images – collects and consolidates images from commercial

vendors to coordinate purchase of additional images and data from CT, EDS, Trace, and new emerging devices to include novel explosives and other technologies of future interest. S&T will work to develop a non-proprietary database of images that will be provided to all detection program participants. The evaluation of images will determine the relationships between image quality and false alarm rate, detection quality and Image Resolution, detection quality and Image Resolution and Detection over multiple types of fielded and new scanning systems.

Milestones and Deliverables

FY 2008:

- Collect and consolidate images from commercial vendors, and other sources of additional images from various devices and systems, to include novel explosives and other technologies.
- Complete multi-year integrated research plan with objectives for image collection and analysis.

FY 2009:

- Complete preliminary research and data analysis with identification of potential application to customer capability gaps and detection programs.

FY 2010:

- Complete research, image data analysis, and produce report.

FY 2011 – FY 2013:

- Continue to explore new avenues for research and image data analysis that can address customer capability gaps.

Liquid and Home Made Explosives Chemical Characterization – qualifies and quantifies the physical and chemical properties of HME threats. The project will identify density, CT number, dielectric constant, chemical composition of products, molecular structure, thermal decomposition rates, etc.

Milestones and Deliverables

FY 2008 – FY 2013:

- **Complete** data collection and analysis for the second group of HME physical and chemical properties and provide test results report to the user community.

Detection Technology and Material Science – employs the latest advances in high performance materials development to enhance aircraft survivability in the event of an on-board blast. The project will study blast resistant materials, and develop and implement advanced materials to be used within aircraft to reduce the effects of an explosive detonation, including the attenuation of the explosive shock wave and containment of blast fragmentation (shrapnel).

Milestones and Deliverables

FY 2008:

- Develop strategies for blast resistant and blast mitigating building materials to reduce casualties from explosive threats.
- Develop technology investment roadmaps for basic research that hold promise for transformative breakthrough in mitigating explosive blast effects.

FY 2009:

- Develop a multi-year integrated research plan with objectives and potential customer transition opportunities.

FY 2010:

- Conduct assessments and complete testing of new construction materials for suspension bridges and subway transit tunnels.

Explosives

FY 2011 – FY 2013:

- Continue to pursue strategies for blast resistant and blast mitigating building materials to reduce casualties from explosive threats.
- Continue to develop and pursue technology investment roadmaps for basic research that hold promise for transformative breakthrough in mitigating explosive blast effects.

Explosives Research Program – improves explosives detection capabilities by performing multi-disciplinary research and development in images, particle physics, chemistry, and algorithm development. These Explosive Research R&D efforts should result in the deployment of an enhanced detection capability and lead to next generation detection systems. Activities include:

Fundamental Particle Physics – improves the comprehension of the energy barriers involved in the adhesion, desorption, and transport of particles. The project studies how technology can be used to best exploit particle behavior and properties. Advances made in the fundamental understanding of particle behavior will lay the groundwork for the next generation of sampling technologies and improvements to currently used devices.

Milestones and Deliverables

FY 2008:

- Complete multi-year integrated research plan with objectives and potential customer transition opportunities.
- Determine the strengths and weaknesses of current sampling technologies and correlate these with the fundamental knowledge of particle behavior.

FY 2009:

- Complete preliminary research and data analysis with identification of potential application to customer capability gaps in advanced signature analysis and advanced detection concepts.

FY 2010:

- Continue to conduct research and data analysis with identification of potential application to customer capability gaps.
- Complete research and data analysis where possible and produce report for potential customer transition.

FY 2011 – FY 2013:

- Continue to conduct research and data analysis with identification of potential application to customer capability gaps.
- Complete laboratory proof-of-concept testing and produce test data and analyze results for potential customer transition.

Counter Improvised Explosive Devices (C-IED) Thrust Area – supports Homeland Security HSPD-19 and its resulting National Strategy for Improvised Explosive Devices, which calls for "the prevention and detection of, protection against, and response to terrorist use of explosives in the United States." Beginning in FY 2008, the Explosives Division will include the C-IED Thrust Area in their PPA.

C-IED will develop technologies that will counter the threat of explosive attacks in our homeland. S&T will accelerate R&D and transition efforts to deliver critical counter IED technologies and products. In addition to leveraging existing multi-agency counter–IED investments from DOD, NPPD's Office of Bombing Prevention, USSS, TSA, and CBP, C-IED will also incorporate related projects from the Explosives, Human Factors, Infrastructure and Geophysical, and T&E/Standards Divisions to advance their efforts in this area.

Beginning in FY 2008, the division will be developing a strategic plan and roadmap to guide the investments in the C-IED Thrust Area. The recommendations from the Capstone IPT will drive technology investments in FY 2008 and FY 2009. Building on the IPT identified knowledge and technology gaps and recommendations from the National Science and Technology Council Subcommittee on Domestic IEDs, C-IED will continue to map its programmatic priorities to address capability gaps in this area.

The C-IED Thrust Area will carry out its activities through five programs (Deter, Predict, Detect, Respond/Defeat, and Mitigate). The technology investments will be divided into Basic Research and Transition portfolios. C-IED will specifically address: person-borne IEDs (formerly suicide bombers), vehicle-borne IEDs, leave-behind IEDs, and devices targeting valuable infrastructure and civilian populations.

Basic Research – Deter and Predict Programs

The following programs support Basic Research in the Deter and Predict programs. The Human Factors Division will identify and prioritize science and technology requirements to address threat identification and deterrence and people screening. The Deter and Predict programs address threat identification/deterrence and people screening.

Deter Program – conducts social and behavioral science research to promote advance detection and effective response to potential IED threats. Activities in this program will:

- Identify the pathways to radicalization as well as the role of the community in supporting or preventing the use of terrorist violence.
- Evaluate effective interventions to reduce the intent of persons and groups to carry out IED attacks against the United States homeland.
- Integrate social and behavioral indicators into existing indication and warning systems.
- Apply advanced computational modeling, simulation, and visualization technologies to test scenarios and present findings that are acceptable to future end-users.

This program will include two projects that address different aspects of IED deterrence: Actionable Indicators and Tested Countermeasures.

Actionable Indicators – uncovers actionable indicators to aid the intelligence and law enforcement communities in identifying and deterring actors that pose significant IED threats in the United States. It will provide practical tools through the synthesis of state-of-the-art social and behavioral science databases, case studies, surveys, and fieldwork and advanced computational modeling, simulation, and visualization technologies.

Milestones and Deliverables

FY 2009:

- Analyze trends in support of Jihadi terrorism in the United States and characteristics of groups that use IEDs

FY 2010:

- Identify characteristics that distinguish the rhetoric of violent and non-violent Jihadi terrorist groups.

FY 2011:

- Conduct quantitative case studies to identify indicators of actors moving towards the use of IED and points of intervention by law enforcement and intelligence communities.

FY 2012:
- Pilot index developed to assess the level of radicalization within specific geographic regions.

FY 2013:
- Develop integrated framework for individual-, group-, and community-level indicators of radicalization.

Tested Countermeasures – provides policymakers with scientifically tested strategies to deter radicalization and IED attacks before they occur. It will examine how social and behavioral science principles can improve the efficacy of counter-radicalization messages and use advanced computational modeling, simulation, and visualization technologies to test scenarios and present findings of relevance to end-users.

Milestones and Deliverables

FY 2009:
- Deliver report on de-radicalization initiatives in five countries and their applicability to the U.S. context.

FY 2010:
- Analyze databases to assess the impact of intent-focused IED countermeasures outside the United States.

FY 2011:
- Field test communication strategies aimed at countering radicalization in the United States.

FY 2012:
- Develop quantitative criteria to measure the effectiveness of radicalization deterrence programs in the United States.

FY 2013:
- Analyze effectiveness of selected U.S. radicalization deterrence programs.

Predict Program – develops technologies to secure U.S. borders through the automatic identification, alert, and tracking of suspicious behaviors that precede a suicide bombing attack and automatic identification and prioritization of potential targets for this threat. These capabilities will improve people screening capabilities by reducing reliance on manual and subjective processes. This program will include two projects that address different aspects of IED prediction: Predictive Screening and Risk Prediction.

Predictive Screening Project – develops technologies to automatically identify, alert authorities, and track suspicious behaviors that precede suicide-bombing attacks. This project will leverage existing indicators of suspicious behavior that statistically relate to illegal-weapons and false-documents possession; video tracking algorithms; and maturing video-based behavior identification algorithms. S&T will test technologies at ports of entry, transit portals, and national special security events (NSSEs). Successful predictive screening technologies will increase the probability of identifying suicide-bombing behaviors before an attack occurs; will expand active surveillance within a target environment, and strengthen deterrence for travelers carrying illegal weapons and false documents.

Milestones and Deliverables

FY 2008:
- Begin testing of technologies at ports of entry, transit portals, and special events.

FY 2009:
- Transition behavioral indicators of suicide bombers to DHS operational customers and begin

operational testing.

FY 2010:
- Conduct operational test of semi-automated tracking of designated suspicious behavior.

FY 2011:
- Transition semi-automated tracking system of designated suspicious behavior.

FY 2012:
- Conduct operational test of automated tracking system of designated suspicious behavior.

FY 2013:
- Transition fully automated identification, alert, and tracking system.

Risk Prediction Project – develops technology to automatically and rapidly identify potential IED targets and staging areas within the United States. This project will leverage existing targeting pattern from overseas attacks and understanding of domestic infrastructure, terrorist tactics, and behavioral data, to identify vulnerabilities in the United States. The risk prediction research can promote support for interdiction and resource prioritization and allocation for preventive countermeasures, enhanced indicators and warning assessments, and training.

Milestones and Deliverables

FY 2008:
- Complete preliminary work to develop multicultural data sets related to IED use.

FY 2009:
- Develop multicultural data sets related to IED use and begin operational tests at customer sites.

FY 2010:
- Conduct operational test of automated pattern discovery and transfer algorithms.

FY 2011:
- Transition targeting patterns for major U.S. cities.

FY 2012:
- Transition staging area patterns for major U.S. cities.

FY 2013:
- Transition prototype software to identify U.S. IED target and staging areas.

Basic Research – Detect, Respond/Defeat, and Mitigate Programs

The following programs support the Basic Research portion of C-IED in the detection, response/defeat, and mitigation areas. The Explosives Division will identify and prioritize explosive prevention technology requirements through Detect, Respond/Defeat, and Mitigate programs. The following projects that address different aspects of the IED detection mission: Person-Borne Improvised Explosive Device Detection, Technology Demo/System Integration, Vehicle-Borne Improvised Explosive Device Detection, Canine Detection Research & Development, Standards, Tagging, Advanced Surveillance, and Inerting.

Detect Program – develops advanced technologies to detect explosives threats to the Nation's aviation, rail, and ship transportation systems. Activities in this program area aim to:
- Improve existing explosive detection methods;
- Develop new detection methods for screening people, baggage and cargo; and
- Ensure freedom-of-movement for people and commerce.

Explosives

Respond /Defeat Program – develops advanced technologies to defeat IEDs by manually disarming explosives threats or by means other than the current practice of detonation. S&T has multiple efforts associated with the defeat of explosives. This effort will encourage innovative approaches to actively cancel the detonation, disassemble the device, or destroy the explosive component. The program area is composed of the following projects that address different aspects of the Defeat Program Area mission: Electronic Countermeasures, Robotics, Render Safe/Diagnostics, and Directed Energy

Mitigate Program – reduces the effects of bombs that cannot be detected or cannot be rendered safe through practical and available means. Its primary focus is Conveyance Protection – typically the hardening of a vehicle against threats (for example, blast-resistant cargo containers) – or the protection of high-value or prominent buildings and infrastructure (for example, blast-resistant building materials, tunnels, and bridges). The program area is comprised of various projects that cover the mission area: Infrastructure Blast Mitigation, Conveyance Blast Mitigation, Marking, Tagging, Advanced Surveillance, and Inerting.

Basic Research – Infrastructure and Geophysical Division Mitigate Program

S&T's Infrastructure and Geophysical Division will specifically focus on the Mitigate Program by identifying and prioritizing projects and activities in this area.

Mitigate Program – reduces the effects of bombs that cannot be detected or cannot be rendered safe through practical and available means. This project enhances, the protection of conveyances and high-value or prominent buildings, and infrastructure (for example, blast-resistant building materials, tunnels, and bridges). The program area contains the following projects: Infrastructure Blast Mitigation, Conveyance Blast Mitigation, Marking, Tagging, Advanced Surveillance, and Inerting.

Infrastructure Blast Mitigation Project – develops proof-of-concept technologies to mitigate the explosive and damaging force from an IED. This project will include basic research studies on advanced mitigation technologies, including new glass materials and deflecting structures that reduce damage to critical infrastructure or personnel.

Milestones and Deliverables

FY 2008:

- Conduct test and evaluation of prototype technologies to evaluate blast mitigation performance and to conduct proof-of-concept demonstrations.

FY 2009:

- Begin to develop models to further determine the vulnerability of infrastructure, bridges, and tunnels to various explosive threats.

FY 2010:

- Evaluate state-of-the-art mitigating technologies.

FY 2011:

- Develop optimized users guide/manual for mitigating technologies.
- Optimize mitigation designs and beta version of simplified 3-D analysis tool.

FY 2013:

- Conduct full scale testing to validate mitigation strategies and technologies.

Conveyance Protection Project – enhances and broadens the investment in the Conveyance Protection Program, which focuses on aircraft hardening and the risk of catastrophic loss of passenger aircraft resulting from various sizes of IEDs detonated in the passenger cabins or cargo holds.

Milestones and Deliverables

FY 2008:

- Continue assessments on aircraft vulnerability, focusing on narrow-body aircraft and blast testing of fuselage liners.

FY 2009:

- Deliver computational models to predict aircraft vulnerability to HME threats at various locations within the passenger cabins and cargo holds.

FY 2010:

- Evaluate state-of-the-art mitigating technologies.

FY 2011 – FY 2013:

- Conduct physical testing and numerical models to address 3-D gaps and design of hardening materials.

Marking Project – identifies and matures enabling technologies that improve marking capabilities so explosives can be reliably identified pre-detonation by manufacturer, production location, distribution, and sales. This project plans to develop technology to improve pre-detonation marking, and identify efficient processes in production/manufacturing. Milestones and deliverables for FY 2010 to FY 2013 will depend on the recommendations in the strategic plan.

Milestones and Deliverables

FY 2009:

- Conduct a cost-benefit analysis of marking technologies.

Tagging (Forensics) Project – identifies and matures enabling technologies to improve tagging capabilities so explosives can be reliably identified post-detonation by manufacturer, production location, distribution, and sales. This project plans to develop technology to improve post-detonation tagging and identify of efficient processes in production/manufacturing.

Milestones and Deliverables

FY 2009:

- Conduct a cost-benefit analysis of tagging technologies.

FY 2010 – FY 2013:

- Conduct research on the use of taggants in commercial boosters, detonating cords, and other low-vapor pressure, cap sensitive commercial explosives.

Advanced Surveillance Project – develops technology to provide constant surveillance of a post-blast event to protect first responders from being baited to a secondary blast or from being further endangered by unstable structures. This project will investigate surveillance of high-value infrastructure to evaluate threats before and after an event.

Milestones and Deliverables

FY 2009:

- Investigate the use of automatic target recognition, data processing, and imaging to address the large number assets.

FY 2010 –FY 2013:

- Milestones to be determined by recommendations from FY 2009 effort.

Explosives

Inerting Project – develops advanced applications, improved strategies, and implementation planning to render a compound non-explosive. This project plans to investigate advanced inerting applications and technologies and perform cost-benefit analyses as well as technology and pilot demonstrations.

Milestones and Deliverables

FY 2008:

- Conduct and deliver a cost-benefit analysis and a list of potential inerting materials.

FY 2009:

- Demonstrate a reliable chemical formulation to inactivate high explosives in less than two minutes without deflagration or detonation.

FY 2010:

- Develop projectile to deliver the chemical inerting material.

FY 2011:

- Demonstrate technologies to inert explosives post blast.

FY 2012:

- Deliver technologies to inert explosives during legal manufacture of precursors.

FY 2013:

- Develop technologies to inert explosives during disposal.

Transition – Detect and Respond/Defeat Programs

The following section addresses the transition efforts to bolster the C-IED Thrust Area:

Detect Program – develops advanced technologies to detect explosive threats to the Nation's aviation, rail and ship transportation systems. Activities in this program will:

- Improve existing explosive detection methods;
- Develop new detection methods for screening people, baggage and cargo; and
- Ensure freedom-of-movement for people and commerce.

This program includes projects that address five specific aspects of IED detection: Person-Borne Improvised Explosive Device Detection, Technology Demo/System Integration, Vehicle-Borne Improvised Explosive Device Detection, Canine Detection Research and Development, Standards, Tagging, and Modeling and Simulation.

Person-borne Improvised Explosive Devices (PBIED) Detection Project – investigates potential technologies capable of detecting all types of explosive threats such as home made, commercial, and military explosives. Using balanced, broad, and long-term strategy, the project will apply fundamental sciences to enable improved detection of PBIEDs. Basic research efforts will expand chemical characterization and small-scale testing for detonability of PBIED threats; will advance scientific understanding behind deposition, sampling, removal; and trace detection of explosive particles on people and packages and explore fundamental science behind explosive particle behavior to improve sampling technology.

Milestones and Deliverables

FY 2008:

- Develop prototype backscatter X-ray portal and test at TRL 7.

FY 2009:

- Increase funding for transitional technologies and basic research.
- Expand contamination studies for non-intrusive sampling and detection of explosives residues, algorithm development for fusing multiple technologies, and investigate increased automation for

PBIED detection

FY 2010:

- Develop prototype of standalone technologies using spectroscopic technologies to detect both explosives and explosive device components for the standoff detection of Person-Borne IEDs.
- Demonstrate required laser system in Optimal Dynamic Detection (ODD) Project for broad bandwidth dynamic control.
- Demonstration of muon tomography on low Z materials.

FY 2011:

- Develop prototype of standalone technologies using spectroscopic technologies to detect both "explosives" and "explosive device components" for the standoff detection of Vehicle and Person Borne Bombers.

FY 2012:

- Develop prototype(s) at TRL 7 for standoff spectroscopic detection.

FY 2013:

- Integrate system solution comprised of mature technologies for the detection at 50-100 meters of both "explosives" and "explosive device components" for Suicide Borne Improvised Explosive Devices.
- Prototype ODD-Ex Shoe Scanner.

Technology Demo/System Integration Project – consolidates work with first responders, State and local public safety officials as well as Federal homeland security officials in developing a comprehensive plan and venue for technology demonstrations, to determine and validate system-integrated technologies to detect IEDs to improve system performance definition and integration.

Milestones and Deliverables

FY 2009:

- Conduct a larger-scale NSSE technology field demonstration.

FY 2010:

- Demonstrate Standoff Detection supporting Vancouver Winter Olympics.
- Conduct annual technology field demonstration to detect VBIEDs and Leave-Behind IEDS.

FY 2011:

- Continue to conduct technology field demonstrations to validate system-integrated technologies to detect IEDs.
- Conduct annual technology field demonstration to develop common architecture.

FY 2012:

- Continue to conduct technology field demonstrations to validate system-integrated technologies to detect IEDs.
- Conduct annual technology field demonstration to detect PBIEDs, VBIEDs, and Leave-Behind IEDs.

FY 2013:

- Conduct USSS Demo, which may include the following:
  - Vulnerability assessment/blast analysis;
  - COTS/prototype technology assessment;
  - Technology development.
- Demonstrate Standoff Detection National Planning Scenario #12.
- Support final technology field demonstration against complete, multiple threat, "Scenario #12" events.

Explosives

Vehicle-Borne Improvised Explosive Devices (VBIED) Detection Project – develops technologies to:

- Detect or image the physical IEDs within a vehicle;
- Sample and detect explosive residues and components non-intrusively;
- Fuse multiple technologies and provide a level of automation for VBIED detection; and
- Provide automation to help to speed screening and enable security screeners to concentrate on potentially high-risk vehicles.

Milestones and Deliverables

FY 2008:

- Complete the assessment and demonstration of vibrometric- and neutron-based technologies to screen VBIEDs.

FY 2009:

- Conduct expanded contamination studies for sampling and trace detection of explosives residues from vehicles.

FY 2010:

- Develop prototype for screening moving vehicles remotely.
- Develop prototype of standalone technologies using spectroscopic technologies to detect both explosives and explosive device components for the standoff detection of VBIEDs.
- Report on feasibility study for portable, external screening system of vehicle compartment contents (based on previous prototype for remotely screening moving vehicles for mass anomalies as potential VBIED indicators).

FY 2011:

- Develop prototype of standalone technologies using spectroscopic technologies to detect both "explosives" and "explosive device components" for the standoff detection of Vehicle- and Person-Borne Bombers.

FY 2012:

- Develop prototype(s) for standoff spectroscopic detection

FY 2013:

- Develop portable prototype for external screening of vehicle compartments.
- Develop integrated system for VBIED detection.

Canine Detection Research and Development Project – conducts extensive modeling of canine sampling to support further basic research in canine pattern recognition for trace detection, which will facilitate development of an electronic nose to mimic canine detection of trace particles and vapor for threat materials. This project significantly broadens the Canine Detection investment.

Milestones and Deliverables

FY 2008:

- Convene a panel of subject matter experts from other Government departments such as DOD, DOJ, and law enforcement agencies to develop a comprehensive Canine Research Investment Strategy.

FY 2009:

- Initiate the following Canine Detection R&D efforts:
  - Improve cross generalization of canine performance for threat materials;
  - Investigate common components or markers, such as stabilizers in commercial explosives, as opposed to training canines on specific threats;
  - Improve quality control aids to monitor performance of canines in the field; and
  - Conduct a systematic analysis of Remote Air Sampling Canine Olfaction (RASCO) collection

and screening to determine failure modes, technical basis for success or failure and enhanced reverse engineering of the actual canine receptor functioning for olfactory sampling and recognition.

FY 2010 – FY 2013:

- Continue to pursue Canine Detection R&D efforts to address customer needs.
- Develop enhanced canine/biology based capability.

Standards Project – develops a comprehensive set of performance standards and evaluation criteria for IED detection and defeat technologies. This project will develop technology and standards to ensure that the products meet customers' technology requirements and performance standards.

Milestones and Deliverables

FY 2009:

- Develop minimum performance standards for Portable X-Ray and 3D imaging systems.

FY 2010 – FY 2013:

- Continue to support the development of a comprehensive set of performance standards and evaluation criteria for IED detection and defeat technologies.

Respond/Defeat Program – conducts R&D to better respond to and defeat explosive threats. This program plans to:

- Provide tools to assess explosive threats once they are detected or partially detonated and then render them safe for disposal; and
- Develop advanced technologies to defeat IEDs by means other than the current practice of detonation.

The program will complement other S&T R&D efforts for response to and defeat of explosives. The program includes the following Response and Defeat projects: (Defeat) Electronic Countermeasures, Robotics, Render Safe/Diagnostics and Directed Energy and (Response) Post Blast Forensics, Bomb Components, Body Armor, and Outreach.

Electronic Countermeasures Project – develops new radio frequency (RF) or infrared (IR) jamming technologies to inhibit RF hazardous devices while allowing the bomb squad to maintain the RF capabilities of their robot and communications system during an emergency.

Milestones and Deliverables

FY 2008:

- Initiate the development of a prototype and users' manual.

FY 2009 – FY 2012:

- Test and evaluate the prototype and manuals for their transition to private industry for further development and production.
- Develop enhanced Positive User Control (PUC)
- Develop upgrade for PCM rechargeable battery
- Develop antenna solutions that will increase current equipment performance.

FY 2013:

- Transition a prototype of a RF Jamming system at TRL 8 that will not interfere with the bomb squad robotic RF system.

Explosives

Robotics Project – improves robotics design and ability to defeat and disarm IEDs using fast, lightweight robotic platforms with a suite of tools for emerging explosive threats.

Milestones and Deliverables

FY 2009:

- Conduct developmental test, evaluation, and customer concept-of-operations (CONOPS) planning on a prototype.

FY 2010:

- Deliver advanced robotic platform with tools.

FY 2011 – FY 2013:

- Pursue technological developments that improve IED robotic standards and compliance tests.
- Conduct workshops with users/responders on robotic applications to IED situations.
- Develop guides, practices, and test methods for using robots to defeat IEDs.

Render Safe/Diagnostics Project – increases standoff capabilities, reduces collateral damage, and provides precision disruption and disablement capabilities and techniques.

Milestones and Deliverables

FY 2008:

- Transition Characterization of Disruption Tools.
- Transition Proof of Concept Study for Non-Explosive IED Defeat Tool. In addition, transition a prototype of the tool and its user's manual. Transition prototype of the Single Sided Imaging System.

FY 2009:

- Transition additional Characterization of Disruption Tools. Also, transition Tool Characterization Guide.
- Deliver a complete IED tool characterization guide to aid bomb technicians in the tactical decision making process for disabling the threat device.
- Develop technologies for precision disruption, aiming and ranging systems to disable and render safe IEDs, to assist bomb squads in accessing and analyzing an improvised terrorist device.

FY 2010:

- Transition Decision Support Tool, which will assist in the tactical decision making process for disabling the threat.

FY 2011:

- Transition a prototype of a Multi-shot Defeat System that can attack multiple IEDs without requiring the bomb technician to reload.

FY 2012:

- Transition improved version of the Decision Support Tool, which will assist in the tactical decision making process for disabling the threat.

FY 2013:

- Transition a prototype of the Defeat System that can access containers such as large trucks and cargo containers, disable, and render safe IEDs.
- Transition a prototype of a camera system at TRL 8 that enables first responders to see hazards while in a standoff mode.
- Transition a prototype of a diagnostics system at TRL 8 that has the capability to locate, determine the circuitry, and identify components of a hazardous device through the wall of vehicles and cargo containers.

Directed Energy Project – develops technology to defeat IEDs using directed energy (e.g., laser, etc.) aimed to destroy critical components (e.g., a power source, igniter, or detonator) and prevent detonation of the explosive. This project plans to identify and mature advanced directed-energy technologies, demonstrations, and pilot activities.

Milestones and Deliverables

FY 2010 – FY 2013:

- Develop system to electrically stop moving vehicles to include water-borne IEDs.
- Develop system to electrically destroy and disable bomb circuitry.
- Reduce system footprint and increase affordability.

Post Blast Forensics Project – develops and enhances technologies, tools, and procedures used by post-blast forensic teams to improve investigation and data collection.

Milestones and Deliverables

FY 2009 – FY 2013:

- Develop improved post-blast forensic technology for demonstration and follow-on feasibility studies.

Bomb Components Project – develops and enhances technologies, tools, and procedures available to detection teams to improve the tracking and detection capabilities of commercial explosive components. This project will investigate critical IED component detection, advanced and improved IED component analysis, as well as conduct demonstrations and pilots.

Milestones and Deliverables

FY 2009:

- Deliver to DHS customers a list of critical components used to construct IEDs, which will enhance decisions on policy, tracking, and detection of these components.
- Develop technologies for cell phones to self-detect when they have been illegally modified.

FY 2010 – FY 2013:

- Characterize signatures of existing electric/electronic components and develop a library of electronic IED components and vulnerabilities of each.
- Develop anti-tamper technologies for newly developed electronic components.

Body Armor Project – develops improved and advanced body armor for new threats and improves wearability in adverse environmental conditions.

Milestones and Deliverables

FY 2008:

- Deliver a prototype body-armor system for developmental testing and CONOPS planning.

FY 2009:

- Complete a study of the cost benefit of new body armor materials.

FY 2010 – FY 2011:

- Develop lightweight bomb suit.

FY 2012:

- Develop prototype of body armor.

FY 2013:

- Continue to develop and deliver prototypes.

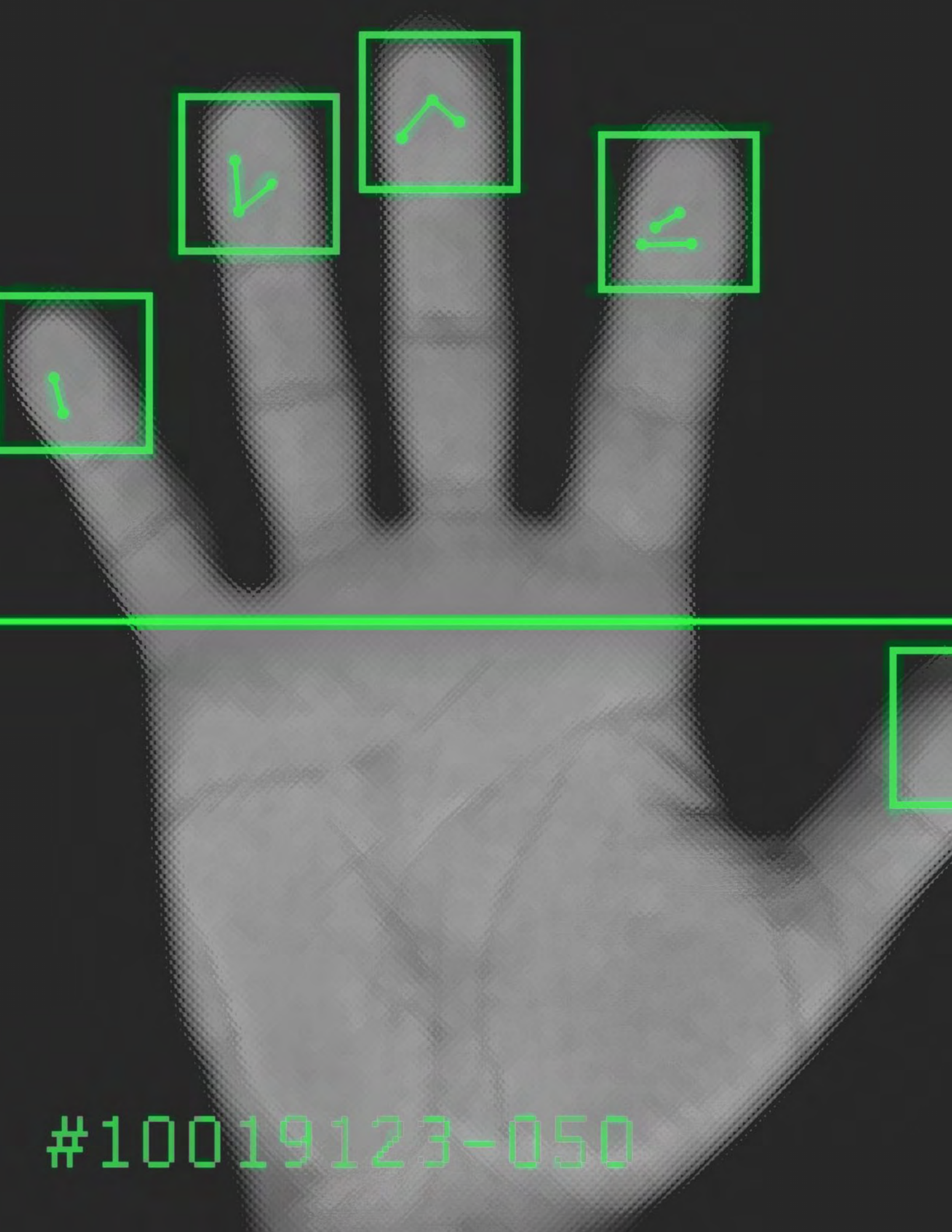
Explosives

Outreach Project – coordinates requirements from user communities/first responders/public safety officials and various Federal organizations. The project will include requirements understanding and development, vetting and coordination, as well as coordinating Test and Evaluation Master Plans.

Milestones and Deliverables

FY 2009 – FY 2013:

- Conduct an annual outreach meeting with first responders and other customers to further develop requirements for new technology advancements.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Human Factors

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Human Research & Engineering	Personal Identification Systems	2,842	3,400	3,200	3,635	3,809	4,497
	Technology Acceptance and Integration	350	350	350	350	350	450
	Transportation Technology and Human Integration	1,438	-	-	-	-	-
	Human Systems Optimization	-	228	1,567	1,508	1,756	1,701
Social-Behavioral Threat Analysis	Community Preparedness, Response, and Recovery	917	725	1,200	1,766	1,746	1,478
	Motivation & Intent	576	3,029	2,015	2,131	1,700	925
	Suspicious Behavior Detection	416	4,417	6,365	4,378	4,743	5,460
	Institute for Homeland Security	7,313	-	-	-	-	-
SBIR	SBIR	355	312	390	368	380	398
Human Factors Total		14,206	12,460	15,087	14,136	14,484	14,909

Overview

The Human Factors Division (HFD) applies social and behavioral sciences to improve detection, analysis, and understanding of the threats posed by individuals, groups, and radical movements. HFD supports the preparedness, response, and recovery of communities impacted by catastrophic events and advances homeland security capabilities by integrating human factors into homeland security technologies. HFD is also developing biometrics-based technologies to identify known terrorists and criminals and prevent their movement into and out of the United States. These biometric tools will identify known terrorists and criminals using fingerprints, iris scans/images, and facial recognition without impeding the movement of legitimate travelers.

The primary Federal customers for the division include Customs and Border Protection (CBP), Federal Emergency Management Agency (FEMA), Immigration Customs Enforcement (ICE), Transportation Security Administration (TSA), U.S. Coast Guard (USCG), U.S. Citizenship and Immigration Services (USCIS), Office of Intelligence and Analysis (OIA) and U.S. Secret Service (USSS). End users also include Federal, State, and local emergency management officials, first responders, and private sector infrastructure owners and operators.

HFD's science and technology efforts support the following DHS strategic goals:

Goal 1: Protect our Nation from Dangerous People

1.3 Strengthen Screening of Travelers and Workers

1.3.1. Ensure common credentials will support multiple licenses, privileges, or status identification, based on the risks associated with the environments where they will be used.

1.3.3. Verify entitlement to a license, privilege, or status, including immigration status using technology. Using technology to verify credentials, instead of visual inspection, will enable DHS personnel to know when an individual's license, privilege, or status has changed—especially regarding immigration status—between when the credential was issued and when it is used.

Goal 4: Build a Nimble Effective Emergency Response System and Culture of Preparedness

4.1 Ensure preparedness

4.1.5. Establish a plan to promote citizen and community preparedness and resiliency.

Human Factors

The Human Factors PPA supports the following performance metrics:

Performance Metric 1: Personal Identification Systems

Metric: Remote collection of two or more biometrics in less than 10 seconds at a 95-percent acquisition rate without impeding the movement of individuals to be achieved in FY 2014.

Supports customer metric:

USCG: Percent of undocumented migrants who attempt to enter the United States via maritime routes that are interdicted.

US-VISIT: Percentage of Traveler Identity Verifications at Entry

Performance Metric 2: Project Hostile Intent

Metric: By 2013, demonstrate a 70-percent detection rate of deception or hostile intent using an automated, non-invasive system.

Supports customer metric:

CBP: Percent of apprehensions at Border Patrol checkpoints.

CBP: Air Passenger Apprehension Rate for Major Violations.

CBP: Number of fraudulent documents intercepted.

Performance Metric 3: Enhancing Public Response and Community Resilience (211 Project)

Metric: Develop and deliver to FEMA and 50 state emergency management agencies a data-informed and empirically validated template for preparedness, response planning, and delivery of emergency services and information during a catastrophic event by FY 2011.

Supports customer metric:

FEMA: Percent of customers satisfied with Public Recovery Assistance

The division carries out its program through two thrust areas: Human Systems Research, and Engineering, and Social Behavioral Threat Analysis (SBTA).

Human Systems Research and Engineering Thrust Area – focuses on biometrics-based R&D and integrates human factors into the development and use of homeland security technologies with the goal of achieving high levels of system effectiveness, safety, and acceptance. HFD works with other divisions in S&T to ensure that human factors are appropriately integrated into the development and use of technologies. HFD directly manages programs or, in some cases, the relevant portions of programs that are funded by other divisions by providing guidance and tools related to human systems integration.

Personal Identification Systems Program – develops biometrics-based technologies to identify known terrorists and criminals and prevent their movement into and out of the United States. Projects in this program are:

- Biometrics
- Credentialing
- Commercial Data Sources
- Mobile Biometrics
- Remote Biometrics
- Ten-print Capture

Biometrics – develops biometric tools to accurately identify, without physical contact, known terrorists,

and criminals using fingerprints, iris scans/images, or face recognition while allowing the unconstrained movement of legitimate travelers.

Milestones and Deliverables

FY 2008:
- Enhance capture of face and iris images for multi-modal systems.
- Initiate development of multi-modal (Face, Iris, Finger) biometrics T&E framework for multi-modal vendor test

FY 2009:
- Initiate development of a contact less multi-modal biometrics identification prototype.
- Create multi-modal biometrics reference datasets.

FY 2010:
- Perform demonstration and test of prototypes.
- Analyze performance of biometrics vendors against T&E framework.

FY 2011:
- Demonstrate improved acquisition of multi-modal biometric information.

FY 2012:
- Complete Expanded Multi-modal Reference Dataset
- Perform assessment of Multiple Biometrics systems against Test Dataset.

Credentialing – develops tamper-proof credentialing systems that incorporate biometric information such as a biometrics-based card-and-reader system. This supports development of the Transportation Worker Identification Credential (TWIC), which will produce a tamper-proof, electronic, biometrics/ biographical credential to identify 850,000 port and transportation workers.

Milestones and Deliverables

FY 2008:
- Develop a laboratory test and evaluation protocol for the TWIC reader.

FY 2009:
- Initiate research and design to improve range and reliability of secure contact less technologies.
- Initiate development technologies to ensure secure wireless interrogation of the TWIC biometric.

FY 2010:
- Initiate development of a contact less prototype.

FY 2011:
- Perform demonstration and test of contact less prototype.

FY 2012:
- Create final wireless interface design for credentialing.
- Deliver wireless interface system for credentialing.
- Demonstrate and test credentialing system.

FY 2013:
- Conduct operational testing.
- Transition credentialing system to TSA.

Commercial Data Sources – improves screening and interviewing processes at ports of entry.

Milestones and Deliverables

FY 2009:
- Obtain customer and S&T approval of research plan.

FY 2010:
- Deliver final report on feasibility of Commercial Data Sources for identity verification to DHS Office of Screening Coordination and Operations, TSA, USCIS, and CBP.

Mobile Biometric Systems – develops mobile biometrics systems to be used during natural disasters or terrorist incidents at remote locations along U.S. borders and at sea where only wireless network access would be available. The systems will demonstrate high-data rate communications and near real-time biometrics processing.

Milestones and Deliverables

FY 2008:
- Define Mobile Biometrics Functional Requirements based on input provided by DHS operational components.

FY 2009 – FY 2010:
- Develop components for the future Mobile Biometrics System to meet prioritized functional requirements.

FY 2011:
- Integrate components into a prototype Mobile Biometrics System.
- Complete Demonstration and Operational Testing of the Integrated Prototype. Mobile Biometrics System.

FY 2012:
- Transition Integrated Prototype Mobile Biometrics System.

Remote Biometric Capture – develops accurate, real-time capability relying on remote capture of multimodal biometrics to identify known terrorists and criminals at U.S. checkpoints. It will also produce a standoff biometrics capture capability with an operational distance of 30 feet. This project will improve accuracy, sample acquisition time, and ease of use.

Milestones and Deliverables

FY 2012:
- Identify functional requirements and design potential demonstration scenarios.
- Initiate development of prototype systems.

FY 2013:
- Conduct preliminary demonstration and prototype assessments.

Ten-print Capture – develops next generation ergonomically correct, three-dimensional, high-speed fingerprint collection for enrollment of detainees into immigration databases. It will also produce the next-generation implementation of multimodal biometrics screening capabilities (face and iris) and non-contact, rolled fingerprint capture. This project will improve real-time biometrics processing and dissemination.

Milestones and Deliverables

FY 2012:
- Identify system requirements.

FY 2013:
- Develop design and demonstration plans for multimodal implementations.

Technology Acceptance and Integration Program – addresses issues of user acceptance and application of new technologies. The program examines peoples' attitudes toward new technologies and the identification of the factors that drive usage and successful adoption of technologies. The program has established a Community Perceptions of Technology (CPT) Panel (formerly known as Community Acceptance of Technology Panel) to convene industry, public interest groups, and community-oriented organizations to better understand and integrate their perspectives and issues in the development, deployment, and public acceptance of technology.

Milestones and Deliverables

FY 2008:

- Develop CPT Panel structure and technology identification/prioritization process.
- Identify initial technologies to be vetted by CPT Panel.

FY 2008 – FY 2013:

- Coordinate three to five meetings per year with members of the CPT Panel to draft specific issue papers on vetted technologies.

Transportation Technology – Human Integration Program – addresses issues critical to the integration of human-in-the-loop technology systems used by transportation screeners. The program focuses on increasing the effectiveness and efficiency of transportation screening systems, decreasing physical stress and fatigue, and reducing human error in the transportation screening process. Work will initially focus on a display for baggage screening sensors used at transportation checkpoints where significant data on screeners' perceptual and cognitive processes already exists.

Enhanced Screener-Technology Interface – characterizes screener-performance issues, proposes new screener technologies and procedures, and develops training curricula to optimize security effectiveness and reduce human fatigue and injury, while reducing training requirements and overall cost.

Milestones and Deliverables

FY 2008:

- Complete pilot study of new training technique for X-ray visual search task.

FY 2009:

- Pilot test on an attention focusing technique for increasing TSA screener hit rates.
- Conduct Phase II of "threat-discrimination" screener training pilot for TSA.
- Conduct field test of new fatigue detection technology for X-ray screeners.

FY 2010:

- Create Motion X-ray prototype.

Human-Systems Optimization Program – develops and validates a suite of technologies and procedures designed to insert operational users into and throughout the development process of physical- and information-based systems. This effort will reduce programmatic risk and increase effectiveness, efficiency, and user acceptance to DHS operational customers. The program builds upon accepted human systems integration principles to ensure that human knowledge, skills, and abilities are embedded into requirements, design, testing, and logistics components of the larger life-cycle development process. Accepted human systems integration principles and processes include:

- task analyses;
- modeling and simulation;
- structured experimentation and operations research;

- functional- and participatory-based design and testing; and
- operator-based effectiveness evaluations.

Milestones and Deliverables

FY 2009:
- Establish a technical baseline of existing human systems integration technologies and a concept-of-operations (CONOPS) for testing such technologies.

FY 2010:
- Deliver plan for development of Human Reliability Model and software including conditions, assumptions, and constraining scenarios for the Human Performance project.
- Develop Human Systems Integration risk assessment, mitigation, and program plans for selected S&T programs.

FY 2011:
- Conduct all required analyses to develop Human Reliability Model and associated algorithms.
- Conduct front-end analyses and identification of human performance requirements for selected programs.

FY 2012:
- Develop a Human Reliability Model and any associated algorithms.
- Conduct required analysis, design, development, and Human Systems Integration testing and support activities for selected programs.

FY 2013:
- Develop human reliability modeling software for the Human Performance project.
- Conduct required analysis, design, development, and Human Systems Integration testing and support activities for selected programs.

Social Behavioral Threat Analysis (SBTA) Thrust Area – applies the social and behavioral sciences to improve the detection, analysis, and understanding of threats posed by individuals, groups, and radical movements. It also addresses the psychological, social, and economic impacts of catastrophic events to enhance risk analyses, risk communications, preparedness, response, resiliency, and recovery efforts. Programs within SBTA include motivation and intent; suspicious behavior detection; and community preparedness, response, and recovery.

Community Preparedness, Response, and Recovery Program – sponsors work to support the preparedness, response, and recovery of communities impacted by catastrophic events. The objective is to enhance the government and public sector's ability to prepare, respond, and recover from catastrophic events with effective risk communications and identification of public needs during emergencies. Activities carried out within this program enhance the mission performance of numerous DHS components, include:
- Enhancing Public Response and Community Resilience
- Quantitative Psycho-Social Impacts Index
- Risk Perception, Public Trust, and Communication
- Muslim Community Integration

Enhancing Public Response and Community Resilience – examines public needs (shelter, food, disaster relief, etc.) that arose during the evacuation from southern Texas during Hurricanes Katrina and Rita in order to enhance Federal, State, local and private sector response to future catastrophic events.

Milestones and Deliverables

FY 2008:
- Begin development of database of 2-1-1 calls received by Texas 2-1-1 Call System.
- Develop a research plan to standardize 2-1-1 Call System data collection that enables categorizing information for analysis and later integration of data with GIS mapping system to track needs of population during a disaster.

FY 2009:
- Report on geospatial analysis of needs for shelter, food, disaster relief, and others as identified by callers into the Texas 2-1-1 System during Hurricanes Katrina and Rita.

FY 2010:
- Provide a software development template to states with 2-1-1 Systems for analysis of caller needs to facilitate preparedness, response, and recovery efforts.
- Develop a GIS mapping system to geo-locate 2-1-1 System calls and correlate with hazards and public needs.

Social Network Analysis for Community Resilience – develops a modeling capability for identifying formal and informal social networks that may be useful in enhancing preparedness and community resilience to natural disasters and terrorist events. This effort will leverage Social Network Analysis (SNA) research for understanding terrorist networks, social and financial transactions, and spread of infectious diseases and apply that knowledge to the construction of networks dedicated to strengthening local response capabilities and preparedness. It will also leverage on past and on-going work from the Department of Defense (DOD) and other agencies.

Milestones and Deliverables

FY 2010:
- Develop a research methodology for identifying and visualizing social networks at the community level.

FY 2012:
- Deliver a prototype Modeling & Simulation tool to enhance multi-agency planning and coordination at the local level.

Quantitative Psycho-Social Impacts Index – develops a quantitative index of the psychological, social, and indirect and long-term economic impacts of catastrophic events to provide improved predictive analysis of DHS's risk assessments.

Milestones and Deliverables

FY 2011:
- Draft interim report detailing candidate variables for inclusion in the index.

FY 2012:
- Collect archival data for the periods preceding and following several large-scale catastrophic events.

FY 2013:
- Deliver report documenting the analysis of data and the refinement of the index.

Risk Perception, Public Trust, and Communication – establishes statistical baselines to improve communications with the public during catastrophic events. Activities include evaluating the effects of particular risk communication messages on the public's understanding, trust in, and response to official communications during the Top Officials 4 (TOPOFF 4) practical exercises in October 2007.

Human Factors

Milestones and Deliverables

FY 2008:

- Collect data during TOPOFF 4 regarding impact of risk communications on public's understanding of Radiological Detection Devices, protective actions, and compliance with security directives.
- Draft findings from TOPOFF 4 Exercise for the After Action Report.
- Provide report on risk communication guidance to persons and organizations tasked with communicating to the public during emergencies.

FY 2009:

- Produce a report outlining effective message communication strategies to better deliver emergency announcements to diverse groups within the larger population.
- Develop a template for evaluating risk and hazard communications during TOPOFF exercise series.

FY 2010:

- Provide a report with recommendations detailing the differential impact of messaging on diverse audiences (e.g. single parents, various socioeconomic levels, etc.).
- Develop training module to improve public service announcements and communications for local officials.

FY 2011:

- Provide a report with recommendations detailing the most effective media (e.g. U.S. Postal Service, internet, television, radio, etc.) for communicating effectively with diverse audiences.

Muslim Community Integration – conducts ethnographic research to examine the experiences of Muslims and non-Muslims in several communities throughout the United States. The project will provide insights into the current state of Muslim communities focusing on their role and status in America and their perceptions of American society.

Milestones and Deliverables

FY 2009:

- Present seminar on research findings to an audience that will include homeland security policymakers.

FY 2010:

- Deliver book-length manuscript reporting on the integration of Muslim Americans into communities in the United States for use by policymakers, operational components, and academia.

Motivation and Intent (M&I) Program – applies social and behavioral science research and theory to understand terrorist motivation, intent, and behavior, including terrorist recruitment and the intent to engage in violence. This information enhances the understanding of analytical, operational, and policy concerns related to terrorist activities. Current activities focus on the following projects:

- Violent Intent Modeling and Simulation (formerly known as Group Violent Intent Modeling)
- Global Terrorism Database

Violent Intent Modeling and Simulation – develops intelligence analysis frameworks including extraction of terrorist intention signatures, systematic estimation of future terrorist behavior based on social and behavioral sciences and modeling and simulations of future terrorist behavior influences. It identifies leading edge social science modeling and simulation technologies and advances social science modeling, and data fusion capabilities in such areas as hybrids of neural nets, structural equations, genetic algorithms, social networks, etc.

Milestones and Deliverables

FY 2008:
- Complete demonstration projects using analytical problems relevant to intelligence and analysis.
- Complete integrated group-level analytical framework/system, version 2, for the Office of Intelligence and Analysis.

FY 2009:
- Update modeling capabilities, and content analysis and information extraction.

FY 2010:
- Deliver final group-level analytical framework to the Office of Intelligence and Analysis.
- Deliver additional results on survey of U.S. residents on levels of support for terrorism for on-going integration of data into analytical framework.
- Deliver radical movement-level modeling and simulation capability version 1.

FY 2011:
- Complete a radical movement-level analytical framework/system (relevant data, ontology of terms and concepts, modeling and simulation activities, etc.) version 1.

Global Terrorism Database – funds the update of the Global Terrorism Database (GTD), housed at the DHS Center of Excellence for the Study of Terrorism and Responses to Terrorism (START). This project funds the update of this database through the first quarter of 2008; however, starting in FY 2008, START will secure alternate funding to support the continual update of the GTD.

Milestones and Deliverables

FY 2008:
- Develop enhanced database user interface.
- Release GTD Phase I data to broader research community.
- Complete coding of terrorist incidents occurring from 1970 through first quarter of 2008.

FY 2009:
- Release GTD Phase II data to U.S. Government.

FY 2010 – FY 2011:
- Release GTD Phase II data to broader research community.

Suspicious Behavior Detection Program – builds the capability to non-invasively detect suspicious behavior that indicates the intent to cause harm. This program's activities support DHS's operational screening and interviewing missions and include:
- Hostile Intent Detection – Automated Prototype
- Hostile Intent Detection – Screening Passenger by Observation Technique (SPOT)
- Hostile Intent Detection –Training & Simulation
- Insider Threat Detection

Hostile Intent Detection – Automated Prototype – demonstrates real-time automated intent detection using non-invasive and culturally neutral behavioral indicators. S&T will transition the automated hostile intent prototype to the Transportation Security Administration, Customs and Border Protection, and Immigration and Customs Enforcement.

Milestones and Deliverables

FY 2008:
- Demonstrate near real-time intent detection.

- Transition multi-cultural intent indicators.

FY 2009:
- Demonstrate real-time auto intent detection.
- Transition expanded multi-cultural intent indicators.

FY 2010:
- Demonstrate real-time intent detection.

FY 2011:
- Identify cross-cultural intent indicators.

FY 2012:
- Transition multi-culturally validated, reconfigurable automated intent detection.

Hostile Intent Detection – provides cross-cultural validation of behavioral indicators, employed by DHS's operational components to screen passengers at air, land, and maritime ports. The project will integrate these validated behavioral indicators into the screening concept of operations through each component's existing training program.

Milestones and Deliverables

FY 2009:
- Establish protocols for collecting cross-cultural research data.
- Transition validated multi-cultural SPOT indicators.

FY 2010:
- Transition validated cross-cultural SPOT indicators.
- Insert multi-cultural indictors into Stand-Off Hostile Intent Training Simulation.

FY 2011:
- Transition mobile SPOT collection/reporting tool.
- Transition Validated Cross-Cultural SPOT Courseware.

Hostile Intent Detection –Training & Simulation – develops computer-based simulation to train behavior-based stand-off detection for future hostile intent using indicators from the interactive screening environment (Hostile Intent Detection – Automated Prototype) and the observational environment (Hostile Intent Detection – SPOT) to support screening and interviewing interactions at air, land, and maritime portals.

Milestones and Deliverables

FY 2009:
- Establish operational performance baseline.
- Conduct training and technical trade-off analysis.
- Develop performance specification.
- Demonstrate courseware prototype.
- Conduct test readiness review.

FY 2010:
- Complete testing and operational delivery.
- Evaluate training effectiveness.
- Transition validated courseware.

Insider Threat Detection – detects insider behavior that is likely to present or lead to a physical threat to critical infrastructure using behavioral research and pattern extraction technologies. The project will produce enhanced tools to identify behavior patterns and characteristics identifiable during pre-employment screening.

Milestones and Deliverables

FY 2009:
- Conduct a market survey of existing insider countermeasure technologies and related behavioral research.
- Develop concept of operation and identify policy and legal requirements.

FY 2010:
- Assemble data corpus: research, training, and testing sets.
- Develop metrics to measure tools and provide linkage to standard threat measurements.
- Identify behavioral indicators.

FY 2011:
- Extract behavioral patterns.

FY 2012:
- Develop detection algorithms.

FY 2013:
- Test and evaluate measurement tools.

Institute for Homeland Security Solutions (IHSS) – supports the establishment IHSS, a congressionally mandated center for applied technological and social science research. IHSS focuses on analysis of operational and policy implications of new technologies and will work in close coordination with the Human Factors Division to support relevant DHS missions and tasking.

Milestones and Deliverables

FY 2008:
- IHSS formed and research strategy identified.
- Conduct agency research needs assessment and develop prioritized research plan.
- Review social, behavioral, and cultural theories relevant to Violent Intent Modeling and Simulation (VIMS) project and validate design criteria and modeling and simulation requirements for VIMS modeling.
- Conduct needs assessment of Synthesis and Analysis of Homeland Security Research.

FY 2009:
- Validate core set of strategic models for Violent Intent Modeling and Simulation (M&S) and deliver expandable GUI and M&S architecture to analyze and present VIMS data.
- Conduct survey of Modeling and Simulation tools for disaster planning/training and conduct gap analysis to support first responders and agencies in M&S needs to support operational requirements.
- Commence regular delivery of Synthesis and Analysis research products to agency stakeholders.

Infrastructure and Geophysical

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Critical Infrastructure Protection	Advanced Surveillance and Detection Systems	-	3,986	4,734	5,202	2,892	1,986
	Community Based CIP Institute	10,725	-	-	-	-	-
	National CIP R&D Plan	1,000	634	640	635	634	636
	Protective Technologies	-	8,367	8,169	9,002	9,728	10,267
	Response and Recovery Technologies	-	4,521	6,040	3,701	3,576	4,625
	Risk Reduction Technologies	5,250	-	-	-	-	-
	Modeling, Simulation & Analysis	2,677	2,731	3,510	3,565	5,943	5,789
Geophysical	Southeast Regional Research Initiative	26,325	-	-	-	-	-
Prepareness and Response	Incident Management Enterprise	5,000	10,292	8,511	11,355	11,144	9,147
	Integrated Modeling, Mapping, & Simulation	-	2,438	2,294	3,586	3,608	4,504
	Preparedness & Response Advance Concepts and Systems	1,500	-	-	-	-	-
	Preparedness & Response Technologies	1,000	-	-	-	-	-
	Regional Technology Integration	9,410	-	-	-	-	-
	First Responder Technologies	-	3,901	5,979	6,049	5,959	5,653
SBIR	SBIR	1,613	945	1,023	1,105	1,115	1,093
Infrastructure/Geophysical Total		64,500	37,816	40,900	44,200	44,600	43,700

Overview

The Infrastructure and Geophysical Division's (IGD) mission is to increase the Nation's preparedness for and response to natural and man-made threats through enhanced situational awareness, emergency response capabilities, and critical infrastructure protection. The division develops technical solutions and reach-back capabilities to improve Federal, State, local, tribal, and private sector preparedness for and response to all-hazards events impacting the U.S. population and critical infrastructure. The division also develops modeling and simulation and analysis capabilities applicable to communities, regions, the Nation and its critical infrastructures to:

- determine how various scenarios will affect each sector;
- provide decision support tools to guide decision makers in identifying gaps and vulnerabilities; and
- develop predictive tools and methods to aid in preparing for and responding to catastrophic events.

The primary Federal customers for IGD are the Department's Office of Infrastructure Protection (OIP), DHS National Protection and Programs Directorate (NPPD), and the Federal Emergency Management Agency (FEMA). IGD's customers also include Federal, State, and local emergency managers, first responders, and critical infrastructure owners and operators.

IGD science and technology efforts support the following DHS strategic goals:

Goal 3: Protect Critical Infrastructure

Infrastructure and Geophysical

3.1 Protect and strengthen the resilience of the Nation's critical infrastructure and key resources

3.1.1 Enhance preparedness, protection, screening, and risk mitigation within the 17 sectors of critical infrastructure, as defined in the National Infrastructure Protection Plan. Implement and update the Sector Specific Plans as necessary.

Goal 4: Build a Nimble, Effective Emergency Response System and Culture of Preparedness

4.1 Ensure preparedness

4.1.1 Strengthen emergency response doctrine. Enhance and maintain national doctrine for emergency response, incorporating foundational documents such as the National Response Framework (NRF) and Presidential directives, as part of a national homeland security doctrine.

4.1.2 Fully implement capabilities-based planning for national preparedness. Define, assess, and update risk-based national performance objectives for all-hazards preparedness, including prevention, mitigation and response.

4.2 Strengthen response and recovery

4.2.1 Reinforce the Nation's distributed all-hazards incident management structure by strengthening regional command and control integration, improving disaster logistics capability and enhancing national strategic and operations coordination capability.

The Infrastructure and Geophysical PPA supports the following customers' metrics:

Performance Metric 1: Number of advanced surveillance technology suites delivered to monitor critical infrastructure and key assets. This measure links to the NPPD's measure:

- Percent of high priority Critical Infrastructure/Key Resources (CIKR) where a vulnerability assessment has been conducted and enhancement(s) have been implemented.

Performance Metric 2: Time required to setup and run training exercise for major complex scenarios (i.e., National Planning Scenarios). This measure links closely to FEMA's measure:

- Number of state and local homeland security preparedness professionals trained each year.

Performance Metric 3: Time required for first responders to receive information on location and status of equipment and supplies. This measure links closely to FEMA's measure:

- Average time in hours to provide essential logistical services to an impacted community of 50,000 or fewer.

The division carries out its activities through three thrust areas:

- Critical Infrastructure Protection;
- Geophysical; and
- Preparedness and Response.

Critical Infrastructure Protection (CIP) Thrust Area – focuses on the 17 Critical Infrastructures/Key Resources (CI/KR) sectors identified in the *National Infrastructure Protection Plan* (NIPP). This thrust area addresses the requirements of OIP in the Preparedness Directorate, and supports Homeland Security Presidential Directive 7 (HSPD-7), *Critical Infrastructure Identification, Prioritization, and Protection*. CIP provides the overarching approach for integrating the Nation's many CI/KR protection initiatives into a single, national effort. The CI/KR sectors are:

- agriculture and food;
- the defense industrial base;
- energy;

- public health and healthcare;
- national monuments and icons;
- banking and finance;
- drinking water and water treatment systems;
- chemical;
- commercial facilities;
- dams;
- emergency services;
- commercial nuclear reactors, materials, and waste;
- information technology:
- telecommunications;
- postal and shipping;
- transportation systems; and
- government facilities.

Advanced Surveillance and Detection Systems Program – integrates advanced, automated, and affordable technologies for monitoring, surveillance and detection into CI/KR to improve the ability of infrastructure owners and operators to monitor their infrastructure assets internally and externally.

Advanced Surveillance Systems Project – develops advanced surveillance technologies to more effectively monitor critical infrastructure and reduce manpower requirements. Activities will focus on developing automated anomaly detection that will replace operator-dependent monitoring of large numbers of cameras. The project will design systems to interpret information from multiple surveillance modes (such as closed-circuit television cameras, infrared cameras, intrusion detection alarms, acoustic sensors) and provide actionable information to infrastructure operators.

Milestones and Deliverables

FY 2009:

- Conduct an analysis of Commercial-Off-The-Shelf (COTS) advanced surveillance technologies and select sets of sensor systems (optical, infrared, ultraviolet, and acoustic) appropriate for monitoring different types of infrastructure.

FY 2010:

- Conduct a technology demonstration.

FY 2011:

- Continue research on key sensors and algorithms to support advanced surveillance.

FY 2012:

- Conduct a second technology demonstration.

FY 2013:

- Transition technology to OIP.

Underwater Surveillance – Dams and Tunnels Project – provides advanced, automated, affordable underwater monitoring and surveillance technologies to detect underwater threats against dams and tunnels. The technologies will be capable of operating in harsh environments for extended periods and should seamlessly and transparently integrate into existing infrastructure security operations.

Milestones and Deliverables

FY 2009:

- Identify, prioritize, and select potential solutions for underwater surveillance based on cost, performance and integration.

FY 2010:
- Adapt identified technologies to specific requirements for dams and tunnels.

FY 2011:
- Conduct demonstration of underwater surveillance solutions.

FY 2012:
- Transition underwater surveillance technologies.

Underwater Surveillance – Basic Research Project – studies bubble jetting resulting from underwater explosions and its impact on vertical structures (such as dam spillway gates and navigation locks), and then determines appropriate standoff distances for submerged targets, thus defining which areas will require surveillance. Defining parameters for effective underwater surveillance is currently limited by fundamental knowledge of underwater blast effects. This research will have the added benefit of informing effective design of blast mitigation measures for underwater targets.

Milestones and Deliverables

FY 2009:
- Evaluate numerical codes that simulate underwater blasts.
- Conduct scaled centrifuge testing of underwater blasts.

FY 2010:
- Conduct full scale physical testing to describe bubble jetting and inform numerical codes.

FY 2011:
- Complete final report on bubble jetting with final recommendations for underwater surveillance standoff.

Community Based CIP Institute Program – supports university and private industry partnerships to develop community-based homeland security technologies and mature them so that they can become commercially viable. Products include:
- continuous monitoring of beef cattle;
- monitoring and securing milk from farm to processor;
- advances in less expensive biometrics for iris and handprint imaging; and
- development of affordable nanomaterials for blast mitigation.

Milestones and Deliverables

FY 2008:
- Develop a wireless security system that will assure the delivery of milk, milk samples, and security information from the dairy farm to the dairy plant.
- Demonstrate a more practical approach for desensitizing agricultural-grade ammonium nitrate with respect to detonation by coating it with an ash-like, coal-combustion by-product (CCB).

The National Critical Infrastructure Protection R&D Plan Program – prepares and updates the *National Critical Infrastructure Protection Research and Development Plan* (NCIP R&D Plan), as required by HSPD-7, to support implementation of the *National Infrastructure Protection Plan* (NIPP), and by corollary, the supporting Sector Specific Plans (SSPs), Sector Annual Reports and the National Annual Report (NAR) in collaboration with the Department's Office of Infrastructure Protection. The NIPP, the SSPs, NAR, and the NCIP R&D Plan work together to integrate near-term (NIPP), mid-term (SSPs), and long-term (NCIP R&D) research objectives to

form a coordinated approach to technology development to meet sector infrastructure protection goals and work toward a national vision of a secure homeland. The Infrastructure and Geophysical Division closely coordinates all these activities with the National Protection and Programs Directorate, Sector Specific Agencies (as designated by HSPD-7), private industry, through the NIPP Coordinating Council System, and all other agencies involved in funding R&D relevant to CIP, including international technical collaboration though the agreements established by S&T. This group developed the first annual NCIP R&D Plan in FY 2004.

Milestones and Deliverables

FY 2008:

- Update the plan to reflect improvements on baseline information established in the previous years.

FY 2009 – FY 2013:

- Update the plan based on advances in technology and discussions with the DHS National Protection and Programs Directorate, the Sector Specific Agencies, private industry through the Coordinating Council System, and all other agencies involved in funding R&D relevant to CIP.

Protective Technologies Program (formerly Risk Reduction Technologies) – conducts research on sector-specific and region-specific needs, as identified by OIP, or as requested from critical infrastructure sectors and Sector Specific Agencies (SSAs). The primary customer for these technologies is OIP, although end-users may include the SSAs, State and local governments, and in some cases the private sector.

The program is developing revolutionary capabilities to protect the Nation's most vital critical infrastructure targets primarily against blast loads and blast effects such as shrapnel from a weapon, flying debris fragments, or fire. The goal is to enable owners and operators of infrastructure sites to implement effective, affordable, and reliable materials, design procedures, and innovative construction methods to reduce the risk to critical infrastructure assets.

Blast/Projectile Protection Project – conducts basic research to understand the blast failure mechanisms of the most vital critical infrastructures such as dams, tunnels and bridges. The project also investigates advanced materials, design procedures, and innovative construction methods that can be used to protect critical infrastructure and key resources. It leverages existing Department of Defense (DOD), Department of Transportation (DOT), and Department of Energy (DOE) research and development, along with existing federal investment in materials science, including nanotechnology.

Milestones and Deliverables

FY 2008:

- Evaluate blast effects and mitigation measures for dams, tunnels, and bridges (results will feed into the transition projects below).
- Conduct a feasibility demonstration.
- Initiate prototype development.

Blast/Projectile - Advance Materials Design (Basic Research) Project – conducts basic research in conjunction with existing Federal investments in nanotechnology and other materials science efforts to develop extremely strong, lightweight, resilient materials. These advanced materials, design procedures for their use, and innovative construction methods will enable more effective and affordable hardening and provide increased resiliency assets deemed most vital to the safety, economy, and security of the Nation, for both existing infrastructure and new construction.

Milestones and Deliverables

FY 2009:

- Survey existing materials to consider, the appropriate scale of materials, and numerical analysis codes needed to model these materials.

FY 2010:
- Report on the use of advanced materials in Critical Infrastructure Protection.

FY 2011:
- Conduct numerical modeling of material properties.

FY 2012:
- Begin development of materials with enhanced blast-resistance properties.

FY 2013:
- Develop materials to meet requirements with enhanced blast-resistance properties.

Blast/Projectile - Protective Measures and Design Tools Project – provides enhanced and additional protective measures along with the tools required to design them for the Nation's most critical infrastructure assets. Protective measures could include blast protection, rapid restoration, and other counter measures. The project plans to numerically analyze designs against blast and projectile threats and to conduct physical demonstrations to assess their effectiveness. This work will seek to mature and expand existing protective measures by making existing designs less expensive, easier to apply, and more effective, and will derive entirely new materials and design concepts for additional classes of infrastructure.

Milestones and Deliverables

FY 2009:
- Mature the protective measures for tunnels developed in the basic research project, update the respective design tools.
- Demonstrate and conduct field experiments of new prototype protection measures for tunnels.
- Initiate development of protective measures for additional classes of vital critical infrastructure such as bridges, dams, and other classes of CI/KR identified by OIP.

FY 2010:
- Demonstrate and field test protective measures.
- Demonstrate the prototype design tool for blast protection of high value assets.

FY 2011:
- Conduct analysis and demonstration of additional protective measures.

FY 2012:
- Conduct analysis and demonstration of additional protective measures.

FY 2013:
- Conduct analysis and demonstration of additional protective measures.

Blast/Projectile - Unified Blast Analysis Tool Project – develops a uniform platform for practical, fast analysis of existing vulnerabilities for key assets and effectiveness of protective upgrades including those developed in the basic research in FY 2007 and FY 2008 programs. This tool will improve CI/KR capabilities to design against threats from blast and projectiles by providing advanced analysis capabilities to the communities that design protective measures for key assets.

Milestones and Deliverables

FY 2009:
- Develop vulnerability and mitigation design numerical models for the most vital critical infrastructure and add these modules to the unified blast analysis toolkit.

FY 2010:
- Demonstrate first generation blast analysis tool.

FY 2011:
- Demonstrate second generation blast analysis tool.
- Transition tool to OIP.

Response and Recovery Technologies Program – provides pioneering, automated response and rapid recovery technologies for the Nation's most vital Tier 1 infrastructure assets and their long-lead time components. Focus is on those infrastructure types where effective, affordable protective measures could not be identified. The technologies developed in this program will provide all-hazards infrastructure resilience against multiple natural and man-made threats. Many Tier 1 and 2 assets need these capabilities to prevent or limit structural failure, and maximize life safety; these measures also add to a layered defense system, thus buying down further risk.

Recovery Transformer Project – specifies, designs, builds, and demonstrates a new type of transformer to be used during recovery from emergency grid blackouts. The recovery transformer will be designed for easy transport and installation, low maintenance and long service life. IGD will partner with OIP and the Department of Energy (DOE). This project was formerly known as New Electrical Grid Transformer.

Milestones and Deliverables

FY 2009:
- Design and demonstrate a recovery transformer in a laboratory environment.

FY 2010:
- Demonstrate a recovery transformer on the electric grid.

FY 2011:
- Design and demonstrate a smaller, lighter, more transportable and more efficient recovery transformer.

Rapid Mitigation and Recovery Project (formerly known as Rapid Response and Recovery) – provides rapid mitigation and recovery technologies for CI/KR assets to limit damage and consequences, and quickly resume normal operations. There is a basic research and transition component to this project. The basic research portion will focus on longer-term needs and will investigate techniques for rapid repair of dams. The transition portion focuses on near-term needs of OIP; specifically it will develop protective technologies to mitigate damage to a stationary storage tank or a railcar from a puncture or small caliber weapon impact.

Milestones and Deliverables

FY 2009:
- Develop protective sealing materials to mitigate the damage to a storage tank or railcar from a puncture or small-caliber weapon impact.
- Determine the system behavior of embedded concrete dams with embankment wrap-around abutments when attached by surface, underwater, and subsurface explosives.
- Demonstrate rapid mitigation and recovery solutions for infrastructure assets such as rail cars.
- Examine ways through basic research to rapidly arrest the failure, limit damage, and rapidly restore service for bridges, tunnels, and dams.

FY 2010:
- Demonstrate rapid mitigation and recovery solutions.

- Complete system behavior study and begin research on rapid means of closing off damaged gate/dam/lock openings fighting against high water flow forces.

FY 2011:

- Develop and demonstrate technologies that provide protection, mitigation and/or detection for rail transport or stationary storage of toxic materials.
- Continue developing an understanding of forces and systematic approaches for rapidly repairing gates/dams/locks fighting against high head water flows.

FY 2012:

- Transition rapid mitigation and recovery solutions.

FY 2013:

- Demonstrate additional rapid mitigation and recovery technologies for rail and stationary storage assets.

Modeling, Simulation, and Analysis Program – develops modeling, simulation, and analysis (MSA) capabilities that can improve the ability of decision makers to evaluate threats to CI/KR and changes in risks (including interdependencies). This capability will help public service and private industry policy and decision makers, owners/operators, planners, and responders to understand the consequences of policy and investment options before enacting solutions, and to provide support during crises. The program will enable:

- rapid examination of interdependencies, trade-offs between risk reduction benefits and protective action costs, and
- incorporation of threat information, vulnerability assessments, and disruption consequences.

Sector and Threat Specific Modeling Simulation and Analysis (MSA) Project – implements a transition plan for deployment of the Critical Infrastructure Protection Decision Support System (CIPDSS) to the National Infrastructure Simulation and Analysis Center (NISAC) and pilots interdependencies tool to model regional interdependencies that support OIP-driven interactions with key stakeholders, such as the Homeland Infrastructure Threat and Risk Analysis Center (HITRAC), Government Coordinating Councils (GCC) , Sector Coordinating Councils (SCC), and sector subject matter experts . The project allows these stakeholders to vet metropolitan and national-scale CIPDSS models and provide analysis support for national exercises and drills.

Milestones and Deliverables

FY 2008:

- Integrate with the Critical Infrastructure Protection Analytical Capability (CIPAC) and initiate the architecture design of CIPAC.

Critical Infrastructure Protection Analytical Capability (CIPAC) Project (formerly known as Real-time Decision Support Tool) – provides significant improvements in timelines, quality and usability of information to provide decision makers up-to-date information to make informed decisions during an event. The project will focus on interdependencies and cascading effects and the dynamics of multi-event and multi-vector attacks. IGD will start this project in FY 2009 to meet the Infrastructure Protection Integrated Product Team (IPT)-identified capability gaps.

Milestones and Deliverables

FY 2009:

- Continue the development of CIPAC, based on the architecture design stated in FY 2008, and include updated databases, as well as focus on the systems level design and interfaces of the technology.

FY 2010:
- Conduct a proof of concept and feasibility demonstration.

FY 2011:
- Continue the development of CIPAC.

FY 2012:
- Demonstrate capability to analyze interdependencies and cascading effects.

FY 2013:
- Continue the development of CIPAC by expanding threats and disruptions.

Decision Support Tool Augmentation Project – assesses state of the art advances in decision theory and determines suitability for incorporation into decision support systems and data feeds. This basic research effort will build on on-going MSA and common operating picture advances accomplished in the CIPAC program in FY 2009 through FY 2011.

Milestones and Deliverables

FY 2012:
- Report to inform which advances need to be considered for DHS decision support systems.

FY 2013:
- Select a technology to mature for hand-off to transition to CIPAC.

Geophysical Thrust Area – develops technologies and systems to address the geophysical concerns of the Nation, i.e., hurricanes, flooding, earthquakes. The thrust area includes the Southeast Regional Research Initiative (SERRI) program.

Southeast Regional Research Initiative (SERRI) Program – assists State, local, and tribal leaders in developing the tools and methods required to anticipate and forestall terrorist events and to enhance disaster response. SERRI combines science and technology with validated operational approaches to address regionally unique requirements and suggests regional solutions with potential national implications. SERRI's regional approach capitalizes on the region's history of collaboration during natural disaster response as well as the inherent research capabilities resident in the southeastern United States.

Milestones and Deliverables

FY 2008:
- Deliver proof-of-concept study for mitigation methods for natural disasters.

Preparedness and Response (P&R) Thrust Area – develops and deploys capabilities that improve the ability of the Nation to prepare for, respond to, and recover from all-hazards emergencies. P&R applies the best available science and technology to the safety and security of our emergency responders and homeland security professionals so that they can effectively and efficiently perform their jobs – saving lives, minimizing damage and restoring critical services. All programs will be compliant with National Incident Management System (NIMS), National Response Plan (NRP), and in accordance with all Homeland Security Presidential Directives that enable all government, private-sector, and nongovernmental organizations to work together during domestic incidents of all sizes.

Incident Management Enterprise (formerly Incident Management and Decision Support) Program – develops advanced, scalable, interoperable, and non-proprietary incident information-management,

decision-making, and training tools for emergency responders and incident commanders to use during everyday incidents to events of national significant that increasingly demand more highly coordinated responses. The need to manage incidents in a comprehensive and transparent way across the government and with various agencies is paramount to the first responder's ability to prepare, protect, and respond to all hazard incidents.

Interagency Modeling and Atmospheric Assessment Center (IMAAC) Project – coordinates all national capability in atmospheric modeling and provides the single Federal prediction of atmospheric hazards and their consequences. IMAAC model predictions are distributed throughout the incident command structure across Federal, State and local jurisdictions for improved situational awareness.

Milestones and Deliverables

FY 2008:

- Deliver accredited event reconstruction and building infiltration models.
- Provide responses to real-world events, support federal exercises, and release alerts and assessments.

FY 2009:

- Prepare to transition the operational aspects of IMAAC to DHS Office of Emergency Communications.

Unified Incident Command and Decision Support (UICDS) Project – develops a framework based on NIMS/ Incident Command System (ICS) and NRP and develops compliant tools to manage and share incident information that will enhance Incident Command Systems and Multi-Agency Coordination common situational awareness and decision support during all types of incidents. UICDS framework will be based on an open-architecture to allow multiple responding organizations (using their own equipment) to jointly manage personnel, direct equipment, and seamlessly communicate, gather, store, redistribute, and secure any mission-critical information needed by incident commanders and emergency responders during an emergency situation.

Milestones and Deliverables

FY 2008:

- Develop a draft information management architecture and pilot in an urban environment to demonstrate multi-jurisdiction incident response
- Deploy pilot implementations of the architecture at one or more Regional Technology Integration (RTI) cities.
- Initiate efforts to transition UICDS into the Advanced Incident Management Enterprise System (AIMES). (using prior year funds)

FY 2009:

- Complete an advanced concept technology demonstration of the UICDS architecture, publish the UICDS standards-based architecture and integrate this into the DHS Grant Guidance process through the Department's Office of Grants and Training (using prior year funds).

Training, Exercise & Lessons Learned (TELL) Project – develops a federated simulation-based training and exercise capability that uses advanced computer models and will allow responders at all levels to affordably train and exercise for large and complex events in a virtual/constructive/live environment. TELL will link multiple agencies, functions, and jurisdictions to improve preparedness and decision-making for emergency responders and managers during emergency situations. TELL incorporates training objectives, scenarios, and metrics defined by other programs, and the capability to capture lessons learned to improve future emergency response capabilities. TELL addresses the overarching need of successful implementation of the NIMS and the ability to conduct quick, repeatable, economical, and effective means of training incident commanders so they can be better prepared to handle complex incidents.

Milestones and Deliverables

FY 2008:

- Develop a system prototype based on the architecture developed in FY 2007.

FY 2009:

- Conduct several joint training exercises, using the TELL prototype, across the United States with various first responder communities.
- Deploy the TELL architecture at the Seattle and Anaheim RTI cities.
- Identify sub-components to migrate to the Advanced Incident Management Enterprise System and Simulation Based Incident Planning and Response projects.

FY 2010:

- Transition federated simulation-based training and exercise capability to the customer.

Advanced Incident Management Enterprise System Project (AIMES) – develops the next-generation incident management enterprise system that will revolutionize the way our Nation's responders handle incidents. It builds upon the UICDS architecture and TELL framework by providing an integrated, interoperable, and unified common operating picture with total visibility into:

- incident information;
- resources;
- environment;
- logistics supply chain;
- response and recovery plans;
- methods;
- tactics; and
- policies.

AIMES is a technology leap to integrate all elements of the incident management enterprise in order to provide a secure, scalable, interoperable, and unified situational awareness to the responder community.

Milestones and Deliverables

FY 2009:

- Establish overall system requirements for AIMES through a series of workshops with customers.
- Complete execution plan and develop a system concept prototype to establish a high-level architecture for AIMES, based on the UICDS effort, demonstrate its functionality, validate and prioritize its requirements.

FY 2010:

- Design an AIMES prototype enterprise framework.

FY 2011:

- Integrate logistics functions and some of the modeling tools into AIMES.

FY 2012:

- Complete an integrated prototype system.

FY 2013:

- Conduct prototype operational testing with users.

Incident Logistics and Resource Tracking System Project – provides a comprehensive and transparent disaster logistics enterprise across the entire area of responsibility of all disaster response, public and private, partners. This capability will provide decision makers overall situational awareness

relative to the public and private inventories, locations of resources, and supplies as it relates to timely procurement and disbursement supplies. The tracking system will allow FEMA to manage more effectively critical resources and will enhance real-time coordination and situational awareness, setting the standard for all disaster response partners. This capability will be scalable and interoperable with Federal, State and local systems (legacy and future) to enable efficient use of the supply chain by identifying the best routes between staging areas, disaster site, and supply areas.

Milestones and Deliverables

FY 2009:
- Develop a prioritized list of FEMA Logistics System Requirements

FY 2010:
- Develop a Logistics System Functional Prototype

FY 2011:
- Complete user testing of the first system prototype.

FY 2012:
- Conduct testing of the first functional system to validate tracking food, water, ice and other supplies.

FY 2013:
- Conduct regional operational tests of the system.

Integrated Modeling, Mapping and Simulation Program – develops and integrates advanced modeling and simulation technologies to support the incident management teams of first responders, commanders, and decision makers to better understand, be prepared, and plan for emergency operations in order to enhance the quality of response and recovery operations. Specifically, this program element will focus on three technology areas:

- Advanced models of the critical infrastructure;
- Standard integration process and methodology to enable plug and play of legacy and new models; and
- Support for a real-time modeling framework.

These technologies will be integrated in an advanced simulation infrastructure so that the first responders can conduct simulation based planning exercises to verify and validate their response plans in an economical fashion.

Simulation Based Incident Planning and Response Project – provides a capability for FEMA to provide accurate and reliable estimates of possible hazards from a wide range of natural and terrorist events, analyze and use route mapping to effectively manage transportation assets during mass evacuations or the post-event flow of emergency supplies, and conduct impact analysis that provides a better understanding of possible impacts from natural disasters and terrorist events. This capability will leverage the results of the TELL project and will focus on three tracks:

- Model development;
- Integration Framework; and
- Support for conducting planning exercises.

IGD will use a spiral-development process to insert technology as it matures and to refine requirements and concepts before committing to significant development efforts.

Milestones and Deliverables

FY 2009:
- Conduct workshops with stakeholders from FEMA and the modeling and simulation communities from across DHS and other government agencies to identify, capture, and prioritize the simulation models that need to be developed.

- Conduct disaster planning training scenarios to prepare FEMA decision/policy makers to validate their plans, procedures, tactics, and doctrine when responding to major events.

FY 2010:

- Develop framework specification for new models.

FY 2011:

- Integrate and test select modeling technologies (i.e., predictive modeling, route mapping, and impact analysis).
- Incorporate additional customer requirements.

FY 2012:

- Conduct testing and an exercise for disaster planning training scenarios.

FY 2013:

- Integrate tools with the Advanced Incident Management Enterprise System (AIMES)

Preparedness and Response Advanced Concepts and Systems Program – develops advanced technologies to improve the ability of emergency responders to instantly track, locate and identify responders. The program will interact with the emergency response communities at the Federal, State, and local levels to establish requirements. Based on requirements captured from the responder community, the program plans to develop and experiment with advanced concepts and produce early prototypes to validate functional performance so S&T can generate a detailed technology development and acquisition plan. Based on customer input, this program will develop technologies for locating first responders in challenged areas (e.g., subterranean facilities, skyscrapers and warehouses).

Advanced Concepts and Special Studies Project – utilizes a systems approach in reviewing all preparedness and response capabilities to look for compatibility and interoperability issues across all projects. The ability to plan for these studies several years in advance varies by type.

Milestones and Deliverables

FY 2008:

- Conduct government testing of the 3-D location system;
- Conduct functional test of the real-time, distributable standoff structure integrity monitoring system
- Complete project and transition to the Advanced First Responder Locator project described below.

Preparedness and Response Technologies Program – develops tools and equipment to support rapid and effective emergency response and recovery for all-hazards for emergency responders. This capability will enable emergency responders to assess and respond to incidents of national significance by creating science-based response guides, which currently do not exist, to improve the response quality by an order of magnitude. The program is developing highly innovative and revolutionary protective materials and material systems that emergency responders and other homeland security operators can use in all hazardous situations.

Personal Protective Equipment (PPE) Project – develops highly innovative and revolutionary protective materials and materials systems that can be used by emergency responders, Federal, State, local and tribal law enforcement officers, and other homeland security operators (e.g., Border patrol agents, USCG), in all hazardous environments. PPE made with these materials will have properties such as:

- self-decontamination for chemical and/or biological agents;
- increased service life;

- self-healing upon being compromised (e.g., ripped, torn); and
- flame resistance.

Milestones and Deliverables

FY 2008:

- Transition the new advanced personal protection materials to the material integration phase for the production of prototype first responder gear.
- Work in conjunction with the U.S. Army Natick Soldier Center and private sector technology developers to provide further RDT&E.
- Complete project and program and transition technologies to "First Responders Technology" program area.

Regional Technology Integration (RTI) Program – transitions innovative technologies and organizational concepts to national, regional, State, and local jurisdictions. Four urban areas served as pilot locations for this program: Anaheim, California; Memphis, Tennessee; Cincinnati, Ohio; and Seattle, Washington. These pilot sites provide an opportunity for fine-tuning new hardware and processes under real-life conditions and will help validate whether technologies can be transitioned to other small/large jurisdictions. IGD is testing key capabilities pilot locations, including:

- atmospheric monitoring and detection systems for chemical and biological toxins;
- monitoring and detection systems that are integrated with existing emergency response and traffic management infrastructures (like video surveillance systems);
- connecting emergency operations centers to a common operational picture and facilitate rapid and coordinated response across multiple jurisdictions;
- planning and exercise tools to evaluate multi-jurisdictional performance for State and local decision-makers; and
- technologies credentialing emergency responders and verifying victims' identities during an incident.

Regional Technology Integration Initiative – Anaheim Project – deploys and demonstrates technology solutions in and around the Anaheim Convention Center (ACC). IGD concentrates its efforts on:

- secure two-way access to new sources of information;
- improved sensors and monitoring capabilities for detection of chemical agent or large scale biological attacks; and
- integration of new capabilities into the region's current and emerging infrastructure to create a comprehensive situational awareness picture.

This system will establish an optimum process to check people, packages, containers, and vehicles entering the ACC for explosives or explosive devices, while minimally impacting the normal flow of events at the ACC. Customers that will benefit from this program are State and local first responders in and around the Anaheim Convention Center. Users include: Anaheim Convention Center personnel, the city managers office, Anaheim law enforcement, Anaheim fire and rescue responders, and Orange County, Calif. emergency response personnel.

Milestones and Deliverables

FY 2008:

- Conduct a Command, Control and Interoperability and Chem/Bio Detect-to-Warn Pilots
- Transition to Local Operations/Support.

FY 2009:

- Support the Anaheim urban area to conduct simulation based exercises using the TELL system in

order to increase the local community's level of preparedness (using prior year funds).

Regional Technology Integration Initiative – Cincinnati Project – deploys and demonstrates technology solutions in the Cincinnati Urban Area including the City of Cincinnati, Hamilton County, a portion of southwestern Ohio, southeastern Indiana and northern Kentucky. Building upon the results of the regional preparedness needs assessment phase and in cooperation with the Office of Grants and Training IGD will seek to develop, integrate, and implement several technologies for Cincinnati, to include:

- Wired/wireless access to a "virtual emergency operation center (EOC)" capability;
- Enhanced regional interoperable communications for voice and data exchange;
- Regional exercise capability that more effectively engages all emergency support functions (ESFs) and multiple jurisdictions in the Cincinnati Urban Area; and
- Enhanced regional alert and notifications systems.

Milestones and Deliverables

FY 2008:

- Transition from an EOC connectivity prototype system to a spiral 1 development/pilot.

FY 2009:

- Test the 3D Locator system in several venues in the area and deploy the TELL simulation based system to help the responder community train in various scenarios and conditions (using prior year funds).
- Transition to Cincinnati Operations Center.

Regional Technology Integration Initiative – Seattle Project – serves as a blueprint for future planning of additional investment in communications systems and addresses known gaps, such as the need for high-speed mobile data and two-way mobile video, the development of new wireless technologies, and the availability of new spectrum for communications. RTI Seattle will address incident credentialing to provide a capability for the commanders to identify, track, and locate responders in a timely fashion. This will ensure that the right number of resources are dispatched to respond to an event and can be contacted, if needed. Current information from across the region will be consolidated and interfaced with new sources of information in an interoperable data portal and provide a "picture" of the region for situational awareness.

Milestones and Deliverables

FY 2008:

- Develop RTI Seattle EOC connectivity prototype system spiral 2 and deploy it for use in the SoundShake Statewide exercise.
- Demonstrate the 3-D Locator system at RTI Seattle and transition to Seattle Operations Center.

FY 2009:

- Start developing and deploying technologies for rapid and effective decision making, coordinated response efforts, and effective planning and staging of resources to accelerate delivery of needed supplies to incident response teams (using prior year funds).
- Integrate several ongoing capabilities such as interconnected EOCs and sensor and data fusion tools to increase the urban area's levels of preparedness for the 2010 Olympics.

First Responder Technologies Program – develops advanced life saving technologies to track, locate, monitor, and protect first responders, emergency managers, and incident commanders as they respond to all-hazard incidents. For any response operation to be successful, commanders must know the whereabouts and health of their first responders. Additionally, first responders rely on effective personal protective equipment so they can save incident victims quickly and rapidly. The mission-critical technologies developed by this program will go through test and evaluation (T&E) before they become part of any acquisition programs.

Infrastructure and Geophysical

Advanced First Responder Locator Project – develops an advanced first responder locating system. It builds off efforts in previous years by including integrated sensor components and software for visualizing locations and tracks for incident commanders (such as building diagrams, floor maps, office/apartment location), and secure connectivity to EOCs. In this manner, incident commanders and decision makers will be able to observe visually responders, their tracks, resources, and activities that will enhance overall situational awareness during an incident.

Milestones and Deliverables

FY 2009:

- Develop a prioritized list of technology challenges to improve accuracy and signal penetration through difficult structures (i.e., underground, over ground).
- Demonstrate key 3D locator prototype sub-components to track first responders within an accuracy of three meters.

FY 2010:

- Develop system prototype.

FY 2011:

- Demonstrate locating accuracy of 1 meter for the 3D locator sensor.
- Develop detailed visualization component.

FY 2012:

- Integrate system components.

FY 2013:

- Transition advanced 3D locator to state and locals, FEMA/USFA and AEL.

First Responder Physiological Monitoring Project – develops an integrated sensor package that will monitor a responder's vital signs such as cardiac rhythm, heart rate, blood pressure, body temperature, and oxygen saturation, which could indicate Pre-Ventricular Contractions (PVCs) or cardiac arrhythmias. First responders need a highly reliable metric and notification system for on-scene identification of firefighters who are about to experience an immediate heart attack or other life-threatening condition. This project plans to fuse these measurements to establish the physical health of the responder based on a set of metrics, and alarm both the wearer and command staff to prevent loss of life.

Milestones and Deliverables

FY 2009:

- Establish system requirements through interaction with U.S. Fire Administration (USFA) and other end users across the Nation.
- Demonstrate through concept prototype to validate system requirements, architecture, and concept of operations (CONOPS).

FY 2010:

- Develop brassboard model.

FY 2011:

- Develop engineering model.
- Integrate, test, and conduct system demonstration.

FY 2012:

- Conduct field test and evaluation.

FY 2013:

- Transition advanced physiological monitoring system to state and locals, FEMA/USFA and authorized equipment listing (AEL).

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Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
High Impact Technology Solutions (HITS)	High Impact Technology Solutions (HITS)	4,500	17,070	11,000	9,500	8,000	5,000
Homeland Innovative Prototypical Solutions (HIPS)	Homeland Innovative Prototypical Solutions (HIPS)	28,500	27,930	37,860	39,889	41,830	45,293
Innovation Total		33,000	45,000	48,860	49,389	49,830	50,293

Overview

The Office of the Director of Innovation oversees S&T's Homeland Security Advanced Research Projects Agency (HSARPA). Established by the *Homeland Security Act of 2002*, HSARPA funds research and development (R&D) of homeland security technologies to

> "support basic and applied homeland security research to promote revolutionary changes in technologies that would promote homeland security; advance the development, testing and evaluation, and deployment of critical homeland security technologies; and accelerate the prototyping and deployment of technologies that would address homeland security vulnerabilities."

The Director of Innovation/HSARPA works closely with the Under Secretary for Science and Technology, the S&T division directors, other S&T portfolio directors, industry, academia, other government agencies, and other sources to determine topic areas for projects. The Director uses many sources for guidance including:

- The Secretary of Homeland Secretary strategic goals;
- Department of Homeland Security Strategies and Priorities
- Office of Management and Budget (OMB) and Office of Science and Technology Policy (OSTP) Research and Development Budget Priority Guidance;
- DHS Components technology requirements regarding their operational capability gaps; and
- Congressional priorities and recommendations

The activities within the office focus on homeland security R&D that could lead to significant technology breakthroughs that would greatly enhance DHS operations. Innovation is different from transition or basic research. The goal of its R&D is not incremental improvement (transition) or long-term research that develops, tests, and improves theories (basic research), but to apply emerging technologies or develop leap-ahead proofs-of-concept and/or prototypical solutions that could significantly increase the operational effectiveness and efficiency of DHS components' capabilities to support their homeland security mission. Innovation's efforts complement technology programs in the other divisions at S&T by pushing scientific limits to address gaps in areas where current technologies and R&D are inadequate or non-existent. Innovation focuses on issues that may not be explored primarily because of the high-risk nature of the effort. Successful accomplishment of these projects would prove extremely beneficial; perhaps even substantively change the operating environment of the DHS Components or their customers.

The Innovation/HSARPA projects consist of Homeland Innovative Prototypical Solutions (HIPS) and High Impact Technology Solutions (HITS). Projects have decision points (Go/No Go) to determine the viability

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of the remaining efforts. As a result, Innovation programs may not follow the normal life cycle of transition programs. Innovation/HSARPA requires flexibility to:

- assess its high risk projects to determine whether or not they should continue;
- consider emerging technologies that may have utility for S&T's customers within DHS;
- adjust to changing or emerging threats; and
- capitalize on emerging opportunities to leverage other Federal programs and activities for use by DHS.

The office is constantly seeking new and innovative ideas on how science and technology can enhance components' capability to effectively support the homeland security mission. As the Innovation Office extends its science and technology efforts beyond the scope of conventional and accepted methods to identify novel capabilities, the projects that the office undertakes require flexibility and scalability.

The Innovation Office supports the following DHS strategic goals:

Goal 1: Protect Our Nation from Dangerous People

1.1 Control our Borders and Protect Our Interior
1.2 Enforce and Reform Immigration laws
1.3 Strengthen Screening of Travelers and Workers

Goal 2: Protect Our Nation from Dangerous Goods

2.2 Prevent, Detect, and Respond to Biological Attacks
2.3 Prevent, Detect, and Respond to Chemical and Explosive Attacks
2.4 Prohibit the Introduction of Illicit Contraband

Goal 3: Protect Critical Infrastructure

3.1 Protect and Strengthen the Resilience of the Nation's Critical Infrastructure and Key Resources

Goal 4: Build a Nimble, Effective Emergency Response System and a Culture of Preparedness

4.1 Ensure Preparedness
4.2 Strengthen Response and Recovery Capability

The Innovation Office supports the following performance metrics, which are dependent upon success of new technologies and the transition of those successful technologies into operational systems:

Performance Metric 1: Prototype technologies for tunnel detection in sub-surface geophysical groups on the northern and southern borders (number of experiments).

Demonstrate multiple technologies that will detect tunnels across a spectrum of geological stratum at greatly improved detection speeds compared to today's technology. Currently, tunnel detection capabilities are almost non-existent, and the technologies that do exist are very slow. Innovation is the only division in S&T studying this problem. The challenge in detecting tunnels is largely due to the various types of geography or geological stratum with different characteristics and in developing systems that can cover large areas quickly by ground or air. Systems that might work in one type of stratum may not work in others or may work at reduced speed and accuracy. Other considerations include:

- Detecting clandestine tunnels at various depths (2 - 30 m)
- Mineral composition, grain size, moisture content, conductivity, permeativity, and magnetic susceptibility are critical for assessing the effectiveness of near-surface geophysical techniques
- Geologic factors plus the small physical size of the targets limit the usefulness of commercial off-the-shelf techniques (COTs)

Innovation will prototype technologies that address the following geophysical groups at increased speed and accuracy:

Geophysical Groups	# of Experiments
Subsurface inhomogeneous and homogenous soils	4
Glacial gravels	4
Volcanic Tuff	4
Alluvial sands imbedded with marine clays, voids, and other sub-terrarium anomalies	4
Other, less common	2
Total	**18**

Performance Metric 2: Identification of physical and behavioral cues leading to detection and prevention of an individual's intent to cause harm or attempt to employ deception. Detection of people with the intent or desire to cause harm poses an enormous operational and technical challenge at controlled security checkpoints. Today, the focus is on active/interactive detection processes, requiring subjects to respond to operator-induced stresses (agents asking questions, scans, radio frequency energy, etc.) and/or physical verification. If people know they are under examination, they can adversely affect the accuracy of the data by behaving differently. Innovation will focus on improving active/interactive detection capabilities, while working towards passive detection, which involves an even larger technical challenge, but also a much higher payoff. Passive detection will enable the interpretation of physiological and behavioral cues or signatures that the body produces naturally and rapid/accurate validation of associated documentation. The relative payoff of active/interactive to passive detection is that passive will produce more accurate data and improve the validity of referral of individuals selected for secondary screening.

Innovation will study the following types of cues or signatures (the number of cues validated relates to the number of individual physical/physiological and/or behavioral attributes studied within various screening methodologies):

Type of Cues or Signatures	# of Cues Validated
Pore Count and Galvanic Skin Response (GSR)	2
Micro Thermal Gradients	1
Cardiopulmonary	5
Pupil Size/Eye Blink	2
Paralinguistic	1
Classic Biometrics (Fingerprint, Iris, Documentation, etc.)	4

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Social Capital Signatures and Analysis	2
Passive Signature Detection	11
Pheromones/Human Chemical Signatures	3
Gait/Illustrating Gestures	2
Cognitive Load	1
Total	**34**

Performance Metric 3: Number of demonstrations showing increase ability to identify, measure, and analyze precursor signatures, mitigate damage, and respond to protect critical infrastructure between 2008 and 2014.

Critical Infrastructure Type	# of Demos
Office Buildings in Urban Environments	7
Public Transportation Conduits – Roads, Bridges, and Tunnels	9
Power Infrastructure	7
Chemical and Material Processing Infrastructure	3
Network Assessable Process Control and Operating Systems	9
Total	**35**

Performance Metric 4: Improve the operational potential index or "operability index" of detecting chemicals and explosive agents by a factor of 10. Chemical and explosive detection is a function of distance, composition, and environmental complexity. Currently, many agents take hours to identify in pristine, uncontaminated conditions such as a laboratory. Innovation has a number of chemical and explosive detection projects that vary in their approach and missions (e.g., airports versus container scanning) and defines the operability index as improvement from the baseline in one or more of the following aspects: speed and accuracy of detection, identification, and differentiation. An operability index of 100 percent is equal to improvement by a factor of 10.

Operability Index (1 = 10-percent improvement; 10 = 100 percent)	Percent Improvement
10	100
Total	**100**

Performance Metric 5: Ability to persistently survey and automatically detect, classify, and generate alerts to characterize illegal border breaches by hidden or concealed means. Current border surveillance technologies provide limited real time, remote observation, and reporting capabilities. Systems in use are generally overt in nature and easy to defeat making surveillance less effective or impossible. Innovation will prototype remote, covert, and difficult to defeat technologies for border surveillance that support deployment across a broad geographic region. Innovation defines a score for concealment as follows:

Degree of Concealment (0 = Easy to discover; 10 = Completely undetectable)	Score
Fully exposed and easy to discover, particularly due to large size, noisiness, and small distance of surveillance	0-4
Partially exposed but unlikely, due to smaller size, less noise, or distance away from subjects	5-8
Completely undetectable due to magnitude decrease in size (perhaps invisible to the naked eye) or greater distances from the subjects	9-10

Performance Metric 6: Improve the operational potential index or "operability index" of detecting biological agents by a factor of 10. Detection of biological agents is a function of distance, type, and environmental complexity. Currently, many critical agents take hours to identify in pristine, uncontaminated conditions such as a laboratory. Innovation has a number of biological detection projects that vary in their approach and missions (e.g., airports versus container scanning) and defines the operability index as improvement from the baseline in one or more of the following aspects: speed and accuracy of detection, identification, and differentiation. An operability index of 100 percent is equal to improvement by a factor of 10.

Operability Index (1 = 10-percent improvement; 10 = 100 percent)	Percent Improvement
10	100
Total	**100**

High Impact Technology Solutions (HITS) Thrust Area – provides proof-of-concept solutions that could result in major technology breakthroughs. These projects could potentially make significant gains in capability; however, they run considerable risk of failure. Examples of HITS projects are provided below.

Biometric Detector – HSARPA is investigating a highly effective, small, non-contact fingerprint scanner used for identification.

Milestones and Deliverables

FY 2008:
- Conduct preliminary design review.
- Create report for a non-contact biometric detector design approach.
- Conduct proof-of-concept design review.

FY 2009:
- Conduct laboratory demonstration and baseline performance capture of a non-contact biometric detector proof-of-concept.

FY 2010:
- Demonstrate biometric detector prototype in the field.
- Issue final report of the biometric prototype detector performance.

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Document Validator – develops a highly effective scanner that can identify fraudulent documents in a single pass.

Milestones and Deliverables

FY 2008:
- Request for information.

FY 2009:
- Complete needs assessment.
- Initiate proof-of-concept design.

FY 2010:
- Complete proof-of-concept design.
- Issue final proof-of-concept report.

FY 2011:
- Initiate prototype development and conduct prototype development review.
- Complete prototype and conduct operational demonstration.

Tunnel Detect – develops technologies to locate underground tunnels.

Milestones and Deliverables

FY 2008:
- Demonstrate an improved airborne system, combined with ground-based technologies, to increase the probability and accuracy of detection of these systems.

FY 2009:
- Integrate sensors into modular design, and phase-in high-resolution listening devices and confirmation/denial technologies.
- Conduct integrated system demonstration.

Resilient Tunnel – develops affordable, practical alternatives to protect transit tunnels against terrorist IED attacks.

Milestones and Deliverables

FY 2008:
- Conduct concept testing.
- Develop and demonstrate prototype for inflatable tunnel plug.

FY 2009:
- Continue prototype construction, develop small-scale plug for a pressurized environment, and test alternative concepts.

FY 2010:
- Deploy a full-scale prototype.
- Evaluate project for termination or transition.

Real-Time Bio Detect – explore potential technologies for rapid genomic sequencing of biological threat agents. Near real-time genomic sequencing technologies could eliminate the need to transfer samples to a laboratory for a culturing and identification of the agent. The system will:
- analyze samples in less than 1 hour
- provide continuous and autonomous monitoring of the environment
- detect pathogens from CDC's Category A and B agents list

Milestones and Deliverables

FY 2008:

- Complete technology development roadmap.

FY 2009:

- Conduct proof-of-concept demonstration.

First Net – creates a communications solution that provides a rapidly deployable 24/7 mobile emergency communications network capability to regions recovering from the catastrophic loss or degradation of their existing communications systems due to natural disaster, major incident, or acts of terror. This technology will need to be rapidly deployable and a self-sufficient communications solution. It will need to be scalable to adopt emerging and future technologies.

Milestones and Deliverables

FY 2008:

- Issue Request for Information (RFI).

FY 2009:

- Conduct proof-of-principle demonstration.

FY 2010:

- Conduct prototype demonstration.

Critical Infrastructure Change Detect (Wide Area Surveillance) – evaluates high definition cameras and sensor options combined with smart algorithms to enhance surveillance of key infrastructure assets. The focus of the project is on protecting assets in densely populated urban areas.

Milestones and Deliverables

FY 2008:

- Conduct concept capability demonstration using novel high-resolution imagers to show camera handoff, image recognition, and change detection.

FY 2009:

- Demonstrate prototype wide area surveillance and tracking system in Manhattan.

FY 2010 – FY 2011:

- Continue demonstrations of wide area surveillance system and determine transition options

Cell-All Ubiquitous Chem/Bio Detect – creates a very wide distributed system of small chemical and biological agent detectors that provide rapid detection, classification, and notification to decision makers. Goals of this project include significant improvement in chemical and biological detectors:

- size;
- initial and operating costs;
- power consumption;
- maintenance requirements;
- ruggedness; and
- response time.

This project may lead to installation of chemical or biological detectors in cellular telephones and other ubiquitous power sources. Conceptually, users will have the option to enable the detector and transmission of detection information along with global positioning satellite (GPS) location information.

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Milestones and Deliverables

FY 2008 –FY 2009:

- Conduct studies and early demonstrations.

FY 2010 – FY 2011:

- Conduct field demonstrations.
- Provide recommendations for scalable prototype development.
- Evaluate project for termination or transition.

Endemic Terrorist Deterrent – prototypes social and psychological tools for authorities to deter radicalization and terrorist tendencies.

Milestones and Deliverables

FY 2010:

- Document models and demonstrate early prototype tools to simulate deterrence methodologies.

FY 2011:

- Develop interactive models for exploring counter-radicalization strategies

FY 2012:

- Demonstrate counter-radicalization tools in an exercise environment.

Cross Agency Information Sharing and Collaboration – develops new information architecture for cross-homeland security community information sharing and collaboration. This architecture will allow users to adjust information sharing protocols depending on the situation, while ensuring security and need to know.

Milestones and Deliverables

FY 2012:

- Establish architecture and demonstrate core capability.

FY 2013:

- Demonstrate algorithms that enable cross member work information sharing with policy controls.

Advanced Crisis Communication – develops advanced social and psychological technologies and techniques to prepare the American people for deterring, detecting, reporting, and dealing with terrorism at the individual, family, and community level. The project will enable efficient and effective communication methods to speed the public's preparation and response to terrorism.

Milestones and Deliverables

FY 2012:

- Perform analysis of high impact scenarios.
- Develop communication model for risk communication.

FY 2013:

- Conduct simulation of risk communication and exercises.

Nanotech – High Sensitivity and Selective Chemical Detection – applies recent developments in nanotechnology to create carbon nano-tubes that can be modified for chemical detection, resulting in more effective and smaller, less expensive detection technologies.

Milestones and Deliverables

FY 2011:

- Perform materials analysis for chemical agent sensing.

FY 2012:

- Conduct laboratory demonstration of structure prototypes.

FY 2013:

- Develop sensor prototype.

Homeland Innovative Prototypical Solutions (HIPS) Thrust Area – delivers prototype-level demonstrations of game changing technologies in 2-5 years. These projects have moderate to high risk with a high payoff. Examples of HIPS projects are provided below.

Project Chloe – investigates using high altitude platforms and/or ground-based systems for detection and engagement of MANPADS to offer alternative solutions to installing a full detect-to-engage system on every commercial aircraft. This project is complementary to the Counter MANPADS project (within S&T's Explosives Division) and builds on the progress of detection and disabling technologies to demonstrate a cost effective and quick prototype for application.

Milestones and Deliverables

FY 2008 – FY 2009:

- Test and evaluate various air/land-based disabling technologies that would effectively work with a high altitude detection platform for comprehensive detect and defeat of MANPADS.
- Address technical issues identified during the course of the program.
- Evaluate alternative DHS missions for *CHLOE* payloads and technologies.
- Evaluate project for termination, continued development, or transition.

Scalable Common Operational Picture Experiment (SCOPE) – leverages Department of Defense's (DOD) unmanned systems expertise and investments such as the Joint Concept Technology Demonstration for Global Observer (GO), a High Altitude Long Endurance (HALE) Unmanned Aircraft System (UAS) to provide a common operational picture for decision makers and personnel at the Federal, State, and local levels. The backbone for a DHS scalable common operating picture will be rapidly deployable, long endurance communications, and situational awareness infrastructure that is mission ready during natural disasters and terrorist attacks. The program will demonstrate the military and homeland security utility, versatility, and affordability of GO UAS and integrated payloads. The GO UAS program will design, build, and test liquid hydrogen powered UAS to carry 380-pound payload at 65,000 feet altitude for five-day mission profile.

Milestones and Deliverables

FY 2008:

- Develop and integrate modular payloads; begin full systems integration.

FY 2009:

- Demonstrate and conduct a utility assessment for the following:
  - GO UAS airframe, liquid hydrogen propulsion system;
  - Commutations payload; and
  - Situational awareness payload.
- Evaluate project for termination or transition.

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Rapid Liquid Component Detector (MagVIZ) – screens of baggage in under 5 seconds, which is similar to the timeline associated with the current X-ray screening of baggage at airport entry points. MagViz will use very low signal-level MRI technology to screen baggage for liquid explosive components and explosive materials.

Milestones and Deliverables

FY 2008:

- Conduct partial demonstration of prototype system.

FY 2009:

- Demonstrate full prototype system.
- Demonstrate MagViz detection of liquid explosives within baggage.
- Determine the capability of the technology to inspect at a 40 cm height.

FY 2010:

- Demonstrate MagViz detection of solid materials.
- Evaluate project for termination or transition.

Safe Container (SAFECON) – screens containers for suspicious cargo. A major DHS capability gap is the ability to screen cargo quickly and effectively. Therefore, much of the cargo that enters the United States is unscreened or under screened.

Milestones and Deliverables

FY 2008:

- Complete container environment characterization.

FY 2009:

- Prototype and demonstrate sensor packages and targeted technologies.

FY 2010:

- Conduct pilot test and port demonstration of SAFECON.

FY 2011:

- Conduct full system demonstration.
- Evaluate project for termination or transition.

Future Attribute Screening Technologies Mobile Module (FASTM2) – develops real-time, non-intrusive mobile screening technologies to automatically detect people with malintent (the intent to cause harm) who are unknown threats at security checkpoints such as airports, border crossings, transportation portals, etc.

Milestones and Deliverables

FY 2008 – FY 2012:

- Demonstrate the capability to detect mal-intent, deception, and suspicious behavior in near real-time, using behavior- and physiologically-based non-invasive technologies.
- Continue to improve the sensor systems, algorithms, and fusion element required to provide real-time indication of mal-intent.

FY 2008:

- Conduct virtual demonstration of FAST mobile module.
- Demonstrate initial sensor integration.

FY 2009:

- Conduct a Real-Time Auto Intent Detection demonstration.

- Complete validation of mal-intent theory

FY 2010:

- Identify, integrate, and demonstrate advances of Physiological and Screening Sensor Technology derived from expanded research efforts.
- Demonstrate utility of mobile module as both research facility and operational component.

FY 2011:

- Operationalize Multi-Modal Auto Intent Detection.

Resilient Electric Grid (REG) – prevents cascading effects of a power surge on electrical grids, particularly in our financial districts and other highly power dependent infrastructure areas. The current plan for REG is to demonstrate High Temperature Superconducting (HTS) technologies for reliable distribution and protection of electrical power in New York City. After a successful demonstration, S&T will implement the system in the Manhattan financial district to protect the economic infrastructure of American business, with follow-on implementations for critical infrastructure in other metropolitan areas around the country.

Milestones and Deliverables

FY 2008:

- Conduct two proof-of-concept demonstrations leading to Go/No Go decision points.

FY 2009:

- Demonstrate additional capabilities in fault current limiter technology.
- Finalize cable design and begin manufacturing final cable to be inserted into the Manhattan grid in FY 2010.

FY 2010:

- Transition REG to existing grid and critical infrastructure.
- Begin in grid demonstrations.

FY 2011:

- Complete in grid demonstrations.
- Evaluate project for termination or transition.

Levee Strengthening & Damage Mitigation – develops techniques to rapidly prevent, reduce, and stop a breach in a levee. Potential concepts include:

- float-in structures guided by cables;
- drop-in structures lofted by aircraft; and
- roll-out coverings, such as an articulated concrete mat, possibly using aircraft in the construction effort.

S&T plans to advance these techniques to strengthen the levee in substandard areas quickly and before a breach initiates. The technology enhancement must sustain significant forces, be quickly deployable, and must be deployable in all weather conditions.

Milestones and Deliverables

FY 2007 – FY 2008:

- Develop concept for rapid identification of problem zones in levees.
- Conduct a levee rapid breach repair concept capability demonstration.

FY 2010 – FY 2013:

- Bring levee strengthening overtopping facility online.
- Demonstrate fielded systems.

- Conduct a pilot test/levee demonstration.
- Evaluate project for termination, further development, or transition.

Hurricane & Storm Surge Mitigation – develops methods to reduce the intensity and/or duration of a hurricane or storm by identifying the tipping point of the storm and acting upon that before the storm reaches a point of runaway growth in strength and size, with thermal, mechanical, or chemical means. This project will apply knowledge gained in the last 25 years (since the last attempt to modify hurricanes) to mitigate the effects of hurricane and storm surge damage.

Milestones and Deliverables

FY 2010 – FY 2011:

- Demonstrate the relation of vegetation to surge attenuation.
- Demonstrate natural and engineered features to reduce surge and waves.

FY 2012:

- Demonstrate selected innovative surge barrier concepts
- Demonstrate a decision support system for interdicting storm surge advance at the local scale

FY 2013:

- Improve existing models for predicting storm winds, surge, and waves and barrier island/levee responses

Cyber Wall for Control Systems – provides robust protection against cyber attacks to process and logic control systems that monitor and control transportation, energy, and other systems tied to a cyber backbone. The technology will recognize cyber reconnaissance, intrusion, and attack and then re-route critical functions.

Milestones and Deliverables

FY 2010 – FY 2011:

- Demonstrate cyber intrusion and attack protection at system component level.

FY 2012 – FY 2013:

- Demonstrate prototype of cyber intrusions.

Very Low Cost Bio-Agent Detection – decreases cost and improve efficiency of high specificity real-time pathogen detection and characterization; conduct comparative experiments between competing approaches; and conduct field pilots within the homeland security community to validate cost and efficiency models.

Milestones and Deliverables

FY 2010:

- Analyze emerging pathogen detection/characterization capabilities and develop low cost models.
- Build laboratory prototypes for low cost sensing packages.

FY 2011:

- Conduct experiments on prototypes.

FY 2012:

- Spiral prototypes for field-testing.

FY 2013:

- Field pilot demonstration and validation of cost models

Passive Methods for Precision Behavioral Screening – develops technologies that will enable of extension of security perimeter monitoring for increased standoff, increased automation and throughput by development of non-intrusive, non-detectable technologies to screen for behavioral and psychological cues of a person's intent to commit a harmful act at safe standoff ranges. Passive detection will enable the interpretation of physiological and behavioral cues or signatures that the body produces naturally and rapid/accurate validation of associated documentation and does not require operator-induced stress (agents asking questions, scans, radio frequency energy, agents asking questions, scans, etc.).

Milestones and Deliverables

FY 2011:

- Analyze technologies/sensor validation plan.

FY 2012:

- Conduct sensory laboratory experiments on:
  - Gait analysis
  - Chemical signatures/pheromones
  - Magnetic Imaging
  - Near Infrared Imaging
  - Others

FY 2013:

- Conduct laboratory prototype demonstrations.

Domestic Standoff Explosives Detection – uses novel relativistic effects of femto-second (one-billionth of one-millionth of a second) laser radiation and other complimentary approaches to detect and correctly identify chemicals used and released in the manufacture, assembly, and placement of explosives at standoff detection ranges of greater than 50 meters.

Milestones and Deliverables

FY 2011:

- Conduct conceptual analysis and begin laser-based prototype.
- Perform laboratory analysis and characterizations of material emissions.

FY 2012:

- Demonstrate explosives detection at 30 meters in a laboratory environment.

FY 2013:

- Develop robust standoff detection prototype.

Augmented Border Alert and ID – provides automatic, accurate, and actionable alerts to cue law enforcement attention to illegal activity to prevent border incursions. The innovative technologies will overcome limitations in the speed, interpretation, and effort required to enable swift recognition and response to border violations. A key feature of the general approach is to use increasingly concealed technologies to preserve technical advantages, perform surveillance covertly to protect sensor assets, and to more accurately observe behavior when subjects do not know they are being observed.

Milestones and Deliverables

FY 2011:

- Conduct laboratory analysis of emerging sensors for detecting illegal activity and border violations at a distance.

FY 2012:

- Develop prototype systems to assist in alert and id.

- Conduct operator evaluations in the laboratory.

FY 2013:

- Develop field cable prototypes and conduct a dry run test on the border.

Multi-modal Tunnel Detect – develops and integrates various approaches (seismic, acoustic, magnetic, etc.) to detect and characterize cross border tunnels. Current capabilities for tunnel detection are almost non-existent, and the few that are available work in limited geologic conditions. This effort will enable investigators to use an integrated system in a wider range of field conditions.

Milestones and Deliverables

FY 2010:

- Characterize geophysical characteristics of the relevant border regions.

FY 2011 – FY 2013:

- Develop and demonstrate best performing methods for various geophysical conditions.

Operationally Deployable Explosives Mitigation – develops new approaches and technologies to mitigate the shrapnel damage (nails, tacks, ball bearings, etc.) from an explosive. This project will focus on disabling the suicide bomber and mitigating the effects of explosives (beyond just suicide bombers) by forcing the shrapnel into the ground.

Milestones and Deliverables

FY 2011:

- Perform conceptual analysis and concept of operations.
- Perform laboratory analysis of materials.

FY 2012:

- Conduct laboratory prototype module demonstrations.

FY 2013:

- Conduct field demonstration of prototype modules.
- Demonstrate laboratory system prototype.

Armored and Self Healing Rail Tank Car – prototypes technology that prevents leakages in armored and rail tank cars that terrorists can easily exploit resulting in a high consequence chemical contamination event.

Milestones and Deliverables

FY 2010:

- Develop conceptual designs and conduct analysis for threat mitigation.

FY 2011:

- Conduct laboratory demonstrations of self-healing tanks.

FY 2012:

- Initiate spiral prototyping for self-healing tank design.

FY 2013:

- Conduct field test and analyses.

Scalable Surveillance and Alert in Challenging Environments – develops augmented surveillance architecture to accommodate a wide range of geographical areas, terrain types, and infrastructure target types in order to differentiate suspicious activity from the normal background

environment to anticipate and prevent attack or quickly mitigate damage. This project will consider approaches that provide true persistent surveillance, are adaptable to changing threats, and in some cases integrate with existing architectures.

Milestones and Deliverables

FY 2010:
- Identify critical challenges for high value infrastructure assets.

FY 2011:
- Develop algorithms and sensors for selected environments.

FY 2012:
- Demonstrate event detection and tracking for limited scenarios.

FY 2013:
- Develop and test integrated system.

Efficient Distributed Power for Resilience and Recovery – provides a source of sustained power for critical infrastructure, neighborhoods, and perhaps individual families should they become cut off from the electric grid. This project will leverage existing and emerging technologies including fuel cells, combined heat and power, micro-hydroelectric, solar and wind technologies.

Milestones and Deliverables

FY 2011:
- Initiate proof-of-concept.

FY 2012:
- Execute demos for proof-of-concept.

FY 2013:
- Initiate integrated systems demonstrations in a laboratory.

Bio-mimetic Sensors for High Confidence Chemical Detection – develops new materials and micro-mechanisms to detect chemical agents at concentrations below 1 part/trillion; prototype biologically inspired chemical detectors for identification and concentration of chemical agents in air and water; and leverage emerging results from strategic research in biologically inspired sensor design prototypes.

Milestones and Deliverables

FY 2010:
- Perform laboratory analysis and comparative experiments with emerging bio-mimetic designs.

FY 2011:
- Prototype sensor design modules.

FY 2012:
- Conduct laboratory demonstration of sensor systems.

FY 2013:
- Conduct spiral development of prototype designs and laboratory demonstrations.

N B A C C

Laboratory Facilities

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Construction	NBAF Construction	11,000	35,600	183,749	170,688	-	-
	Plum Island Animal Disease Center (PIADC) Upgrades	17,319	-	-	-	-	-
	Plum Island Animal Disease Center D&D	-	-	-	-	-	61,457
	PNNL 300	15,000	10,000	-	-	-	-
Operations	CSAC Operations	225	500	510	520	530	550
	EML	2,700	7,700	1,250	1,350	1,400	1,450
	NBACC Operations	16,770	32,940	28,202	28,947	29,593	31,000
	NBAF Operations	-	-	-	-	-	-
	Plum Island Animal Disease Center (PIADC) Operations	27,030	30,700	33,186	34,743	35,883	38,089
	TSL Operations	13,770	15,500	16,250	17,037	17,467	18,826
	Federal Salaries at the Labs	-	14,000	14,501	15,020	15,558	16,239
Laboratory Facilities Total		103,814	146,940	277,648	268,306	100,431	167,611

Overview

The Office of National Laboratories (ONL) strengthens homeland security capabilities by providing enhanced knowledge and technology. ONL executes Laboratory Facilities programs to provide the Nation with a coordinated, enduring core of productive science, technology, engineering laboratories, organizations, and institutions.

The Homeland Security Act of 2002 assigns ONL the responsibility for "the coordination and utilization of the Department of Energy national laboratories and other sites under Section 309 in a manner to create a networked laboratory system for the purpose of supporting the missions of the Homeland Security Department." In addition to laboratory operations oversight in direct support of the Department and its missions, ONL is responsible for coordinating homeland security related activities and laboratory directed research conducted within the Department of Energy (DOE) national laboratories.

ONL's internal customers are S&T's executing divisions, including test and evaluation program areas. The primary external Federal customers are the United States Department of Agriculture (USDA), Transportation Security Administration (TSA), and the Federal Bureau of Investigation (FBI). ONL outlay activities lie in two thrust areas: Laboratory Operations and Construction.

The ONL PPA supports the following DHS strategic goals:

Goal 2: Protect our Nation from Dangerous Goods

2.2 Prevent, detect, and respond to biological attacks.
2.3 Prevent, detect, and respond to chemical and explosive attacks.

Goal 5: Strengthen and Unify DHS Operations and Management

5.1 Improve Performance.
5.1.2 Optimize Processes and Systems.

Laboratory Facilities

ONL supports the following performance metrics:

Performance Metric 1 (Construction): Percent of the National Bio and Agro-defense Facility (NBAF) complete. DHS will provide a facility to further enable the development of vaccine and other countermeasures for foreign animal disease and increase support for threat detection, vulnerability, and countermeasure assessments for animal and zoonotic diseases. Facility will be complete by FY 2014 if funds are available.

Performance Metric 2 (Construction): Percent of decommission and decontaminate (D&D) completed. Fully D&D Plum Island Animal Disease Center (PIADC) by 2017. As S&T completes NBAF construction and the facility becomes operational in FY 2014, all operations and research at PIADC will transition to this new facility. The S&T anticipates closing the PIADC facility beginning in FY 2014 and starting D&D activities in FY 2015. Planning for D&D at PIADC will begin in FY 2012.

Performance Metric 3 (Operations): Percent of current services. Ability to manage operations such that O&M does not exceed core budget (does not include information technology, which could greatly increase the O&M budget). Provide continuous operations of existing laboratories within an overall increase of 5 percent a year in O&M budgets. (NBACC, PIADC, TSL, EML, and CSAC all have O&M costs, but EML and CSAC costs are very low relative to the other labs.)

Performance Metric 4 (Operations): Maintain staffing levels within 3.58 percent increase a year. Provide for federal staffing needs at the field labs within an overall increase of 3.58 percent year in annual budgets.

Construction Thrust Area – focuses on planning, budgeting, and management of laboratory infrastructure construction or upgrade projects. These projects are required to maintain or provide new R&D capabilities supporting the missions of S&T, the Department, and other government agencies (e.g., USDA, HHS, and DOD) which have interrelated homeland security missions. ONL construction investments encompass the construction of future assets, where current capability does not exist, and upgrades to extend the life and capabilities of present facilities.

National Bio and Agrodefense Facility (NBAF) Construction – enhances and protect the country's agriculture and public health and support complimentary missions of DHS, and USDA. NBAF is a next-generation agricultural defense facility, once completed, will replace PIADC, and provide new research, development, testing, and evaluation infrastructure that allow research to enhance agriculture and public health. NBAF supports the agro security program in the Chemical and Biological Division and offers safe, secure, state-of-the-art biocontainment laboratories of sufficient capacity to work on high-consequence foreign animal and zoonotic diseases in livestock, and addresses a current gap in our national strategy for bio-countermeasure vaccine licensure.

ONL will manage and oversee the planning, site selection, design, and construction of the estimated 500,000 square feet NBAF project. The project is currently in the Environmental Impact Statement (EIS) phase for the potential six sites being considered for the facility. The final EIS will be published in September 2008 followed by a Record of Decision in October/November 2008.

Milestones and Deliverables

FY 2008:

- Complete EIS.

FY 2009:
- Site selected (Record of Decision).
- Begin detailed design.

FY 2010:
- Construction begins.

Plum Island Animal Disease Center (PIADC) Upgrades – provides protection of agricultural infrastructure. As the Nation's first line of defense against foreign animal diseases, ONL is managing major upgrades and enhancements to PIADC (located on Plum Island, New York) that are necessary to support ongoing and expanded research activities of DHS and USDA. These upgrades will contribute to bringing the facility into compliance and help to ensure safe and secure operations. In FY 2007, design began on various laboratory enhancements such as a new animal wing and upgrades of various support facilities. In addition, funds requested continue to support projects that were identified in the FY 2005 multi-year Corrective Action Plan Report to Congress. These projects are in five general areas: (1) security programs and systems; (2) information technology and communication systems; (3) environmental, health, and safety systems; (4) buildings, grounds, and infrastructure systems; and (5) administrative and management programs. These upgrades will ensure PIADC's fulfillment of near term S&T and USDA missions to provide the U.S. research and confirmatory diagnostic capability for specific high consequence foreign animal diseases in support of the Biological Countermeasures Thrust Area. PIADC research facilities permit the study of these diseases in livestock, such as cattle, sheep, and swine.

Milestones and Deliverables

FY 2008:
- Finish Designs.
- Start construction of major upgrades.

FY 2010:
- Upgrade construction completed.
- Overall, corrective actions completed.

Plum Island Animal Disease Center (PIADC) Decontamination and Decommissioning (D&D): Serves as the new transition facility for all operations and research at PIADC once S&T completes its construction of NBAF. S&T anticipates closing the PIADC facility beginning in FY 2014 and starting D&D activities in FY 2015. Planning for D&D at PIADC will begin in FY 2013. Because of the nature of current and past work, PIADC will require proper D&D of the facility to meet regulatory compliance.

Milestones and Deliverables

FY 2013:
- Initial contract award for planning and scoping.

Pacific Northwest National Laboratory (PNNL), Area 300 Program – represents DHS in providing oversight and management for the construction of this DOE-led project scheduled to be operational in FY 2011. The PNNL *Capability Replacement Laboratory* construction project is in Richland, Washington. PNNL currently provides DHS with research and development in several national mission-critical areas, such as radiological detection and information analytics, in support of S&T, Preparedness/Infrastructure Protection, and Customs and Border Patrol (CBP). S&T participation in this effort after FY 2009 is subject to additional funding.

Milestones and Deliverables

FY 2008:

Laboratory Facilities

- Start Construction of facility.

FY 2010:

- Complete construction of lab.

Laboratory Operations Thrust Area – manages the operations and maintenance of the DHS laboratories and infrastructure. ONL provides the planning, budgeting and coordination needed to ensure that these laboratories effectively support S&T programs. The current DHS laboratories include: Plum Island Animal Disease Center (PIADC), National Biodefense Analysis and Countermeasures Center (NBACC), Transportation Security Laboratory (TSL), Chemical Security Analysis Center (CSAC) and Environmental Measurements Laboratory (EML).

Chemical Security Analysis Center (CSAC) Operations – develops and communicates risk assessments related to national chemical defense. The CSAC located in interim facilities at DOD's Edgewood Chemical Biological Center (ECBC) in Aberdeen, Maryland, operates in cooperation with the Federal Bureau of Investigation (FBI) and the DOD, the CSAC directly supports S&T's chemical countermeasures thrust area in the Chemical and Biological Division. CSAC provides S&T with the scientific basis for the awareness of chemical threats and the attribution of their use against the American public. CSAC is a resource that provides a centralized compilation of chemical hazard data. The current operations costs for this facility (office space and computer equipment) include rent, security, and utilities.

In October 2006, the DOD commenced construction of a state-of-the-art Sample Receipt Facility (SRF) at ECBC. CSAC will be a component of the DOD SRF in Edgewood Maryland, with its own dedicated space. It will be the premier facility with the capability to integrate knowledge across the full chemical threat spectrum. The SRF will be operational in FY 2009. Planned operational costs include rent, security, and utilities.

Environmental Measurements Laboratory (EML) Operations – measures low-level radiation. The EML is located in a General Services Administration (GSA) facility in the Borough of Manhattan in New York City. The management of EML transferred from DOE to DHS in 2003. In past years, when the Domestic Nuclear Detection Office (DNDO) was part of S&T, EML provided staff to support their mission. DNDO continues to be a significant customer of EML.

In FY 2007, a strategic assessment of EML's contribution to the DHS mission concluded that it was most prudent to chart a new course for EML. Consistent with these findings, ONL undertook the disposition of surplus materials and radioactive sources and began the decontamination and decommissioning (D&D) of unused areas. In FY 2008/2009, these efforts will continue, with the expected net result being a reduced budget and associated funding requirements for operations. After D&D, DHS will be able to return the current space to GSA and occupy a much smaller space in the same building or in another GSA-owned facility in New York. Planned operations costs for this facility include rent, security, and utilities that are paid to the GSA based on an annual occupancy agreement.

National Biodefense Analysis and Countermeasures Center (NBACC) Operations – supports S&T's Chemical and Biological Division's programs. In support of the Biological Thrust Area, NBACC Operations oversees two separate centers: The National Bioforensics Analysis Center (NBFAC) and the Biological Threat Characterization Center (BTCC). The unique missions of threat characterization and bioforensics analysis compliment the mission of the Department of Defense (DOD), the Department of Health and Human Services (HHS), and USDA.

- The NBFAC conducts forensic analysis of evidence from bio-crimes and terrorism, to assist in identifying perpetrators and determining the origin and method of attack.
- The BTCC conducts studies and laboratory experiments to fill in information gaps to better understand the current and future biological threats, assess vulnerabilities, conduct risk assessments, and determine potential impacts in order to guide the development of countermeasures such as detectors, drugs, vaccines, and decontamination technologies to protect the United States against these threats.

Through these efforts, the NBACC protects U.S. citizens, attributes biological events to perpetrators, and serves as a national informational resource. NBACC currently operates with limited capability in leased DOD facilities in Frederick, Maryland along with contracted intramural facilities in the United States with limited capability. In September 2006, DHS began construction of a facility that will house these activities in the future. The NBACC facility is located on the National Interagency Biodefense campus at Fort Detrick, Maryland. In December 2006, DHS awarded a contract to Battelle National Biodefense Institute (BNBI) (Federally Funded Research Development Center) to manage the NBACC program and operate the new building. Under the current schedule, the new facility will be ready for occupancy in early FY 2009 and fully operational by the end of FY 2009. Completion of the new NBACC will greatly expand research capability. The operations costs for NBACC are management costs for FFRDC, utilities, and security.

National Bio and Agrodefense Facility (NBAF) Operations – conducts forensic analysis of evidence from bio-crimes and terrorism, to assist in identifying perpetrators and determining the origin and method of attack. The first year of O&M funding will support the start up of the new facility and transition costs associated with the start of the transfer of staff and equipment from PIADC to the new facility. The start up costs will include systems maintenance, utility costs, and salaries for security and maintenance support personnel.

Plum Island Animal Disease Center (PIADC) Operations – researches contagious animal diseases (e.g., foot-and-mouth) identified in other countries. The mission of the facility is to develop strategies and vaccines resulting in the protection of the Nation's animal industries and exports from the accidental or deliberate introduction of foreign diseases. The research and development (R&D) work at PIADC is a joint mission between DHS and the United States Department of Agriculture (USDA). Both organizations have employees working at PIADC, but DHS is the landlord and responsible for the operations. The combined work of both agencies at PIADC is in direct support of S&T's agro-terrorism countermeasures programs.

PIADC, located on Plum Island, New York, is a self-sustaining operation, with its own power plant, fuel storage, fire protection, waste disposal, and security systems. DHS also provides the only ferry transport to and from the island and therefore is responsible for the ferries, docks, and harbor. Research is performed in laboratory space that is rated biosecurity level (BSL)-2, BSL-3, and BSL-3Ag.

S&T employs an operations contractor to provide much of the day-to-day support and labor at the facility. This contract represents the largest portion of operations investments for PIADC. Other major operations investments include security, utilities, and fuel costs.

Transportation Security Laboratory (TSL) Operations – develops, tests, and evaluates civilian transportation security technologies such as explosives and weapons detection systems. TSL is a science and engineering laboratory that enhances and accelerates development of promising technologies to the point of operational test and evaluation. The TSL program directly supports transportation security and S&T's explosives countermeasures programs. TSL is located at the Federal Aviation Agency (FAA) William J. Hughes Technical Center in Atlantic City, New Jersey. The real property belongs to FAA.

Laboratory Facilities

An annual Interagency Support Agreement and payment to the FAA provides the funds for operations related to buildings maintenance, utilities, security, environment, and safety. The other significant portion of operational costs is for contractor personnel supporting various internal TSL research, engineering and test facilities.

Federal Salaries at DHS Laboratories – Beginning in FY 2009, ONL's funding will pay the salaries and benefits for all non-headquarters S&T Federal employees located at PIADC, EML, and TSL. These employees perform program work related to the operation and execution of programs at S&T's labs.

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Test & Evaluation and Standards

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
Standards	Borders/Maritime	904	1,250	1,000	1,100	1,100	1,100
	CCI	798	900	1,001	1,150	1,150	1,255
	Chem/Bio	3,085	3,239	3,372	3,525	3,703	3,810
	Explosives	3,511	3,000	3,300	3,400	3,600	3,750
	Human Factors	2,074	2,162	2,200	2,300	2,400	2,400
	Infrastructure - Geophysical	6,729	5,974	5,350	5,350	5,350	5,350
	Standards Development	1,905	1,050	1,700	1,700	1,700	1,700
	Peer Review	2,925	-	-	-	-	-
	Platforms	2,128	2,000	2,000	2,000	2,000	2,000
Testing & Evaluation	Plans and Policy	479	700	500	450	450	500
	T&E Infrastructure	612	700	477	475	475	475
	Test Area/Capability	2,658	3,082	2,500	2,150	1,872	1,750
SBIR	SBIR	713	617	700	700	700	710
T&E/Standards Total		28,520	24,674	24,100	24,300	24,500	24,800

Overview

The Test & Evaluation (T&E) and Standards program provides technical support and coordination to assist the Department and the Nation's emergency management officials and responders in the acquisition of equipment, procedures, and mitigation processes that support an effective emergency response.

Standards help ensure the functional effectiveness of equipment and processes. Test and Evaluation programs focus on certifying testing programs and providing guidance. Together, Standards, Testing and Evaluation help ensure that both the Department of Homeland Security (DHS) and emergency responders are purchasing safe and reliable equipment and implementing effective procedures and mitigation measures. The program carries out its activities through two thrust areas:

- Standards - supports the development of consensus-based measures, from basic specifications to performance criteria, that gives DHS and its customer's confidence that technology and systems will perform as required.
- Test and Evaluation (T&E) - works across DHS to measure whether technologies and tools perform well and are applicable to homeland security operations. T&E results influence deployment and acquisition decisions.

The Director of Test & Evaluation and Standards, in conjunction with the Under Secretary for Science and Technology, works across DHS and with numerous external partners to build consensus and encourage the adoption of necessary, voluntary standards, and to provide testing and evaluation guidelines. The primary Federal customers for the T&E and Standards Division are all the DHS Components, who represent end-users including first responders; Federal, State, and local emergency managers; and private sector infrastructure owners and operators.

The Office supports the successful transition of technologies that will substantially improve DHS components' performance and support the Secretary's goals:

Test & Evaluation and Standards

Goal 1: Protect Our Nation from Dangerous People
Goal 2: Protect Our Nation from Dangerous Good
Goal 3: Protect Critical Infrastructure
Goal 4: Build a Nimble, Effective Emergency Response System and Culture of Preparedness

The T&E and Standards Division support the following performance metrics:

Performance Metric 1 (Standards): Number of Homeland Security official technical standards introduced.

Performance Metric 2 (Standards): Percent of standards introduced that are adopted by the Department of Homeland Security and partner agencies.

Standards Thrust Area – provides specifications throughout the entire development cycle of a technology or system. Standards are the basic measures of effectiveness that provide specifications throughout the entire development cycle of a technology or system. The Standards thrust area coordinates the adoption of national standards and appropriate conformity assessment methods to ensure

- our Nation's emergency responders can rely on the equipment, procedures, and mitigation processes they need to do their jobs;
- personnel from different jurisdictions can easily communicate with one another;
- detection and testing for threat agents produces consistent, accurate results; and
- training exercises provide the instruction and practice that will best prepare homeland security personnel for responding to certain events.

The lack of effective standards can lead to inconsistent grant guidance and the purchase of inferior or inappropriate products.

DHS does not have authority to impose regulatory standards, and must therefore promote the development of voluntary consensus standards. Voluntary consensus standards rely on coordination and consensus between large numbers of entities. Therefore, the Standards thrust area gathers requirements and facilitates the adoption of standards through formal standards working groups, interagency task forces and conferences and workshops with private-sector standards organizations such as the National Fire Protection Association (NFPA) and American Society for Testing and Materials (ASTM) International. The Standards thrust area does not seek to generate new standards, but solicits and endorses existing national-level standards.

Borders/Maritime Standards Program – focuses on cargo security and Radio Frequency Identification Device (RFID) technologies. Standards for border security technologies and systems are critical to ensure their effectiveness in protecting the Nation's ports and borders. Program activities focus on the security of shipping containers and cargo handling processes; and the reliable use of RFID systems for homeland security and first-responder applications.

Milestones and Deliverables

FY 2008:

- Work with Customs and Border Protection (CBP) and other organizations to build a functional cargo security standards program. This will include a review of existing standards, gap analysis, and requirements gathering from users.

- Transition developing performance requirements for RFID technologies to standards development and adoption.

FY 2009:

- Promote and facilitate adoption of voluntary electromagnetic consensus standards and standards on sensor networks for cargo and border security.
- Develop additional RFID-based sensor network standards requirements, and performance metrics for cargo and border security.
- Evaluate the feasibility of RFID counterfeit detection by electromagnetic signatures or other means.
- Demonstrate technology required for FIPS-140 Level IV compliant RFID systems.
- Initiate Cargo security standards development based on FY 2008 analysis.

FY 2010:

- Analyze emerging cargo screening and sensor technologies for standards needs and to deploy a pilot RFID counterfeit detection system.
- Develop consensus standards for reaching FIPS-140 Level IV compliant RFID systems.

FY 2011:

- Develop performance requirements for (RFID) counterfeit detection systems.
- Develop performance requirements for emerging RFID and sensor technologies for standards needs.

FY 2012:

- Initiate development of performance standards and test methods for identified new cargo screening and RFID technologies.
- Develop standards to support generalized deployment of RFID counterfeit detection systems.

FY 2013:

- Support standards development for identified new cargo screening and RFID technologies.
- Develop standardized approaches to verify effectiveness of RFID on-chip security standards.

Command, Control, and Interoperability Standards Program – develops standards related to interoperable communication and incident management. Specific projects within this area address gaps not covered in the larger, overarching SAFECOM and National Institute of Justice (NIJ) interoperable communications projects, but rather address issues related to interfaces with protective equipment. Additional program activities focus on establishing communication and coordination with the National Incident Management System (NIMS) Integration Center.

Milestones and Deliverables

FY 2008:

- Present the communications standards discussed above to U.S. manufacturers in workshops and test exercises to for industry partnership for test protocol development.
- Work with the NIMS Integration Center (NIC) to collect, assess, and evaluate FY 2007 compliance data to support revisions of NIMS-related standards.

FY 2009:

- Adopt existing IM standards, complete gap analysis for new requirements, update existing standards, and formulate new standards for new requirements.
- Initiate standardization efforts in the area of knowledge management and information sharing. Information sources include maps, addresses, crime reports, sensor locations, etc. that first responders, Federal officials, and others need to access through secure, reliable distribution channels during incident response.

FY 2010:

- Investigate the feasibility of using multiple-input, multiple-output (MIMO) communication concepts to

improve ad hoc system performance for IM.
- Incorporate performance requirements into the National Fire Protection Association (NFPA) standard on radio communication equipment and to develop standards for indoor localization based on NFPA requirements.

FY 2011:
- Support development of IM training standards and a continuous improvement process for IM standards.
- Complete development of standards for indoor localization based on NFPA requirements.

FY 2012:
- Release draft standards for Knowledge management/Information sharing, initiate progressive revision/evaluation to keep pace with rapidly changing technology.

FY 2013:
- Develop conformance and interoperability tests for newly developed indoor localization standards for communications.

Chemical/Biological Standards Program – develops standards related to chemical and biological threat detection. This includes development of a comprehensive suite of performance standards. The program, through two stakeholder groups, provides State and local authorities with guidance on purchases for chemical/biological detectors.

Milestones and Deliverables

FY 2008:
- Develop decontamination guides and support conformity assessment of chemical detectors through the use health and hazard assessments, for both chemical warfare agents (CWA) and toxic industrial chemicals (TIC).
- Finalize development of standard test materials and stimulants for Bacillus anthracis and Ricin, release interim guidance for chemical and biological decontamination, and develop guidance for first-responder assessment of detection technology claims.

FY 2009:
- Develop chemical detector conformity assessment program.
- Initiate CWA/TIC detection standards program, including standoff (optical) detection systems.

FY 2010:
- Develop draft training protocols to support decontamination guidelines.
- Initiate standards development for networks of urban detection systems.

FY 2011:
- Finalize training protocols for decontamination guidance, begin revision of guidance, and develop draft standards for chemical standoff detection technologies.
- Develop draft standards for chemical standoff detection technologies.

FY 2012:
- Finalize chemical standoff detection systems standards.

FY 2013:
- Initiate standards development for detection of nanotechnology threat agents.
- Initiate standards development for global surveillance and detection, of chemical and biological release, via satellite imagery.

Explosives Standards Program – develops standards related to explosives detection, including those for detectors and protective equipment. In FY 2006, the program began development of trace explosive detection

standards. There are several technologies on the market to detect the presence of highly explosives (e.g., "sniffer" detectors used by security forces and walk-through portals used at airports). There is a need to verify and validate these technologies for DHS use.

Milestones and Deliverables

FY 2008:

- Test development for bulk and trace explosives equipment.
- Release of image standards for X-ray detection, body scanning, and performance evaluation criteria.
- Support the development of Standard test protocols for Blast Resistant Trash Receptacle.

FY 2009:

- Draft standards for trace explosives detection using Ion Mobility and Mass spectrometry.
- Develop standards for high energy computed tomography (HECT) beam energy.
- Develop a methodology and test kit for quality control and assurance of field deployed equipment.
- Initiate standards development for standoff explosives detectors, and improvised explosive devices (IED) countermeasures technology, including Radio Frequency countermeasures, scanning millimeter waves, and terahertz technologies.

FY 2010:

- Complete development of trace explosives standard test materials for RDX and C4 explosives.
- Develop a test kit for evaluation and quality control of walk-through portals.
- Finalize and adopt standards test methods for X-ray inspection systems and body scanners in light of results from equipment testing and evaluation (generation two standards).

FY 2011:

- Finalize and adopt Blast Resistant Trash Receptacle Standard and Performance test methods; expand Blast Resistant Trash Receptacle standard resources to include placement and deployment guidelines.
- Test, evaluate, and refine the HECT system using realistic objects for the development of test methods.
- Finalize ASTM International test methods for trace explosives detection.

FY 2012:

- Finalize and release standard test methods and protocols for electronic counter measures (ECM) in support of IED countermeasures.
- Complete development of minimum performance standards and test protocols for Standoff explosives detectors. This includes millimeter wave imaging metrology standards, Neutron based standoff detection systems and standoff/remote spectroscopic detection of explosives residues.
- Test, evaluate and refine integrated bomb suite minimum performance standards.

FY 2013:

- Finalize and adopt ASTM standards for Integrated Bomb Suits Standards (Bomb Squad).
- Initiate development of minimum performance standards for wake sampling (non-intrusive trace detection technology).
- Initiate development of minimum performance standards and test protocols for portable trace explosive detectors.

Human Factors Standards Program – develops standards for biometrics technologies and on developing consensus standards for government personnel credentials. A primary focus is on developing biometric standards and tests to ensure that a nationwide system can accurately identify individuals. Searchable databases, accessible to many government entities, containing biometrics, will facilitate the identification of individuals. The overall success of such a database requires standards for acquiring and processing biometric information.

Test & Evaluation and Standards

Milestones and Deliverables

FY 2008:

- Identify and integrate emerging biometric technologies into its efforts and certify these technologies with DHS partner organizations – ensuring through performance testing and analysis that new technologies and equipment meet the developing suite of biometrics standards.
- Develop consensus standards for credentials for officials and responders at various levels in the government. This will enable the rapid identification of personnel as well as verify their certifications, capabilities, and duties.
- Develop standards for version 2 of the Transportation Worker Identification Card (TWIC) and development of a suite of standards based on the universal access control mechanism through the American National Standards Institute's (ANSI) International Committee on Information Technology Standards (INCITS) CS1 technical committee INCITS/CS1.

FY 2009:

- Provide standards for image quality for biometric images of face, fingerprint, and iris used to enhance interoperability of US VISIT and Federal Bureau of Investigation (FBI) Integrated Automated Fingerprint Identification System (IAFIS) fingerprint databases.
- Provide on-line test data sets used by manufacturers for test and develop next generation software.
- Complete initial standardization of the data model/architecture for first responder credentials.

FY 2010:

- Implement an accreditation program for biometrics test and evaluation and develop training materials for assessors to use in performing audits under the accredited test lab program (biometrics).
- Finalize and publish universal access control standards and to develop a reference implementation and conformance testing tool for responder credentials.

FY 2011:

- Develop protocols for usability testing of multimodal biometrics for cooperative subjects (biometrics).
- Produce guidance on the implementation of universal access control standards for credentialing and to develop an assurance-testing program for the responder credential data model.

FY 2012:

- Develop test protocols for next generation iris, face and fingerprint systems to measure optimum throughput with requisite image quality.
- Develop performance standards and test methods for applications of voice recognition and differential temperature measurements in access control.
- Pilot testing of compliance for access control standards for credentialing.

FY 2013:

- Identify standards developed by the Biometrics Program. Solutions will be posed and projects initiated to close these gaps in regards to biometric client technologies, latent fingerprint analysis, biometric quality, and biometric human factors and usability.
- Revise access control standards based results of pilot testing for credentialing.

Infrastructure/Geophysical Standards Program – develops standards to enable emergency responders to purchase the right equipment to protect responders and the best operational equipment to use in protecting the public. A key program focus is on protective clothing and gear, (e.g., breathing apparatus) used by emergency responders.

Milestones and Deliverables

FY 2008:

- Develop protocols for the testing and evaluation of protective equipment.

- Initiate standards development for Wild land/urban interface fire prevention.
- Support responder equipment performance standard development activities.

FY 2009:

- Support the development of draft all-hazards protective clothing standards with attention to dermal hazards for Toxic Industrial Chemical /Toxic Industrial Material (TIC/TIM) threats.
- Implement standards for hybrid CBRN respiratory protection equipment, e.g. combination Self-Contained Breathing Apparatus/Air Purifying Respirator (SCBA/APR) systems.

FY 2010:

- Review existing respiratory protection guidelines, and in collaboration with other federal partners, propose modifications to existing standards or CFR Rule making changes as appropriate for PPE.

FY 2011:

- Finalize revisions of protective clothing standards and to initiate performance testing guideline development.

FY 2012:

- Evaluate new position location and emergency responder electronic safety equipment technologies.
- Propose new standards to meet emerging standards needs based on new and emerging threats, reflecting newly developed technologies and lessons learned from existing standards and fielded equipment within PPE effort.

FY 2013:

- Coordinate, facilitate and participate in development of new/revised standards and test methods emphasizing fully integrated ensembles, to include broad threat protection, integrated sensors and communications systems for PPE effort.

Platforms Program – In FY 2008, the Standards Thrust organized standards development for Urban Search and Rescue (USAR) robots, sensor networks and alert systems, and HAZMAT equipment standards under the Platforms Program. The program will have two areas of work, mobile platforms – which include robots and UAVs plus other mobile detection applications – and Sensors and Alert Networks which will include stationary sensor systems and the networks to support them.

Milestones and Deliverables

FY 2008:

- Support standards for responder use of location technology in emergency operations, specifically technologies for locating responders and alerting systems used by the responders.
- Initiate best practices equipment standards development program

FY 2009:

- Finalize NFPA standard for indoor localization technologies to support responders and to support NFPA development of a Personal Alerting Safety System standard and test method.
- Support the development of standard test methods for advanced sensors and mobility used in USAR Robots.
- Conduct technology maturity assessment exercises to identify new candidate robot technologies for standardization.
- Finalize sensor standards suite for adoption.

FY 2010:

- Calibrate and characterize a test facility that can conduct standard test methods for USAR as well as produce usage guides that assist in decision-making about appropriate robots for given situations, based on existing standard test methods.
- Draft standards and organize review of best practices by responders.

Test & Evaluation and Standards

- Develop data sets for verification of conformance of commercial products to sensor standards.

FY 2011:

- Conduct workshops with responders and manufacturers of USARs to prioritize which test methods are appropriate for development, based on technology maturity and responder needs.
- Perform gap analysis, initiate a second round of NFPA indoor localization standard development, and draft a performance and test method standard for a GIS Interoperability effort.
- Review and approve draft standard for HAZMAT responders
- Develop sensor network conformance test methods for commercial products

FY 2012:

- Update calibration and characterization of test facilities to incorporate latest standard tests and characterization approaches for USARs.

FY 2013:

- Test, evaluate and refine second round indoor localization standards.
- Finalize and adopt GIS interoperability standards.

Standards Development Program – Standards require consensus and significant resources across and outside of DHS. The Standards thrust area elements require a unique commitment to partnerships and ongoing infrastructure to support both general activities (databases, working groups) and specific projects (biothreat identification protocols). For some organizations, S&T must pay to maintain its membership and ensure voting rights in decision-making processes. S&T maintains important relationships with standards development organizations such as ANSI, ASTM International, Institute of Electrical Engineers (IEEE), NFPA, NIJ, NIOSH, etc; and program partners such as the NIC, Transportation Security Laboratory (TSL), AOAC International, Homeland Security Institute (HSI), Interagency Board for Equipment Standardization and Interoperability (IAB).

Test and Evaluation Thrust Area – establishes and issues policy and procedures and coordinates T&E resources to verify attainment of technical performance specifications, and operational effectiveness and suitability. The goal is to integrate a uniform and centrally managed Departmental T&E process into the entire development and acquisition cycle via early and continuous evaluation of system test requirements, planning, and execution, providing for independent T&E oversight and assessment. An integrated T&E process will provide vital information to decision makers that can help ensure the meeting of DHS capability needs while reducing risk and aiding first responder selection of systems.

Part of the coordination role is to assess, integrate, and coordinate Federal and non-Federal test assets, including but not limited to colleges, universities, and local governmental and private research institutes and companies.

Plans and Policy – T&E Plans and Policy will develop and institute T&E architecture/policy that supports the Office's strategic goals and ensure uniform implementation of the architecture/policy across DHS. T&E will also develop and promulgate policies and procedures to address T&E shortcomings and adopt best-in-class practices through this program area. The T&E Plans and Policy program will support the implementation of T&E policies and procedures by developing educational materials and implementing training, workshops, etc. Finally, in coordination with the T&E Infrastructure program, T&E Plans and Policy will develop and begin to implement an overarching strategy for the accreditation of facilities and programs.

Milestones and Deliverables

FY 2008:

- Formulate and promulgate DHS T&E policy.
- Review existing DHS T&E infrastructure and identify T&E infrastructure gaps.

- Participate in requirements development and test planning activities across DHS.
- Evaluate potential T&E partners across federal government.
- Report on 1) needed T&E resources, 2) emerging technologies needing T&E. support within DHS, and 3) external T&E resources available.
- Evaluate T&E Capability accreditation/recognition program options.
- Provide M&S expertise, guidance, and support
- Initiate M&S strategic plan.
- Develop and implement necessary business processes at the Transportation Security Laboratory.

FY 2009:

- Implement T&E Policy.
- Complete the Integrated DHS T&E Infrastructure Plan.
- Evaluate T&E Capability accreditation/recognition program options.
- Develop T&E Training courses.
- Implement M&S strategic plan.
- Develop and implement necessary business process at the Environmental Measurements Laboratory.
- Implement Web-based T&E program test report and infrastructure database.
- Implement T&E Capability accreditation/recognition program.
  Transportation Security Laboratory accreditation.
- Transition mature programs into T&E:
  - personal protective and operational equipment for responders and law enforcement;
  - explosives detection technologies
  - interoperable sensor technologies.

FY 2010:

- Complete Integrated DHS T&E Infrastructure Plan.
- Transition mature programs into T&E:
  - biometrics collection and analysis technologies;
  - credentialing management and verification technologies; and
  - access control technologies.
- Implement T&E Training course program.
- Continue Laboratory Accreditation Program.
- Update M&S strategic plan.

FY 2011:

- Review and update T&E Policy.
- Transition mature programs into T&E.
- Continue Laboratory Accreditation Program.

FY 2012:

- Update Integrated DHS T&E Infrastructure Plan.
- Continue Laboratory Accreditation Program.
- Update M&S strategic Plan.
- Update Integrated DHS T&E Infrastructure Plan
- Transition mature programs into T&E
- Update T&E Training course program

FY 2013:

- Review and update T&E Policy.
- Continue Laboratory Accreditation Program.
- Transition mature programs into T&E.

Test & Evaluation and Standards

T&E Infrastructure – assesses, integrates, and coordinates the physical Federal test assets and non-Federal assets at colleges, universities, local governments, private research institutes, and companies. This analysis will map T&E needs against infrastructure and identify and address overlaps and gaps. The T&E Infrastructure program will establish a network of accredited T&E laboratories and facilities for homeland security products and services and maintain awareness of these available resources that DHS may leverage.

Test Areas and Capabilities – supports the T&E processes to

- assess whether products meet performance requirements;
- reduce developmental and operational risk;
- provide input to acquisition and deployment decisions; and
- coordinate T&E resources across DHS.

The Test Areas and Capabilities program will support test and evaluation of DHS acquisition programs through a cyclical process of support and coordination that will include:

- reviewing program documentation;
- overseeing the development of Test and Evaluation Master Plans (TEMPs);
- reviewing and providing input to Test Plans and Reports; and
- providing T&E input at Milestone Decisions.

The T&E Office also supports the cycle that operates continuously with periodic evaluation and insertion of new technologies as they mature out of S&T or are identified by partners or end users.

Modeling, Simulation and Analysis (MS&A) – develops guidelines on modeling and simulation development, evaluation and use for S&T and Capstone IPT projects to promote the advancement and judicious use of modeling and simulation for analysis, acquisition, and training.

WWW.SAFETYACT.GOV

Transition

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
SAFETY Act	SAFETY Act	4,297	8,500	8,680	8,864	9,052	9,242
Transition	International & Interagency Programs	3,501	3,571	3,642	3,715	3,790	3,865
	Program Transition	7,210	4,463	1,066	1,572	1,682	1,900
	Tech SHARE	9,500	9,500	9,000	9,000	9,200	9,300
HSI	HSI	5,000	5,000	7,103	7,311	7,454	7,649
SBIR	SBIR	757	796	643	655	668	681
Transition Total		30,265	31,830	30,134	31,117	31,846	32,637

Overview

The Transition Office focuses on delivering near-term products and technology enhancements by working with the Department's components to expedite the technology transition process. The Transition Office carries out related activities that complement the transition efforts through the Office of the SAFETY Act Implementation (OSAI), operation of the Technology Clearinghouse, Technology Solutions, Commercialization, Technology Transfer Program, and management of S&T's International and Interagency Programs.

The primary Federal customers for the Transition Office are operating components of DHS. These stakeholders also include first responders, Federal, State, and local emergency managers, and private sector infrastructure owners and operators. The Transition Office supports the successful transition of technologies that will substantially improve DHS components' performance to support the homeland security mission.

Transition supports all DHS strategic goals:

Goal 1: Continue to Protect our Nation from Dangerous People
Goal 2: Continue to Protect our Nation from Dangerous Goods
Goal 3: Protect Critical Infrastructure
Goal 4: Build a Nimble, Effective Emergency Response System and Culture of Preparedness
Goal 5: Strengthen and Unify DHS Operations and Management

Transition supports the following metrics:

TechSHARE

Performance Metric 1: Number of Communities of Practices websites developed for First Responders to share technical information

Performance Metric 2: Number of TechSolutions products operationally tested and evaluated

Studies & Analysis FFRDC

Performance Metric 3: Percent of Federally Funded Research and Development Centers (FFRDC) funds that are provided directly by non-core sponsors

Transition

SAFETY Act Thrust Area – evaluates and qualifies technologies for liability protection in accordance with the *SAFETY Act of 2002* and the supporting regulations of the Final Rule implemented on July 10, 2006. As part of the *Homeland Security Act of 2002* (Public Law 107-296), the SAFETY Act provides risk management and litigation management protections for sellers of qualified anti-terrorism technologies (ATT). The SAFETY Act ensures that the threat of liability does not deter potential manufacturers or sellers of anti-terrorism technologies from developing, deploying, and commercializing technologies that could save lives.

There are three key areas of focus for OSAI:

- Operations;
- Outreach; and
- Coordination.

Operations - processes applications under the provisions of the SAFETY Act in an expeditious manner. As part of this process, the OSAI evaluates candidate technologies, considers the insurance picture of the company and advises DHS whether to issue liability protection to the company under the SAFETY Act.

Milestones and Deliverables

FY 2008:

- Reduce the number of Requests for Information (RFIs) sent to the applicants requesting clarification of information, thus shortening the entire evaluation process.
- Conduct an independent assessment of the business process performance of the office to identify further efficiencies.

FY 2009:

- Evaluate and streamline business processes so that at least 85 percent of applications are processed within 120 days.
- Build an "application wizard" that will lead applicants through the process of filling out the application. Functions:
  - automatic entering of basic information;
  - cross-check information for errors or inconsistencies; and
  - prompts for important technical and economic information that evaluators will need to properly process the application.

FY 2010 – FY 2013:

- Improve the application evaluation process for SAFETY Act.

Outreach - promotes homeland security technologies by raising public awareness of the benefits of protections available under the SAFETY Act and thereby expand the creation, proliferation and use of anti-terrorism technologies.

Milestones and Deliverables

FY 2008:

- Expand outreach into untapped markets identified through analysis to encourage full industry participation.
- Attend conferences and stakeholder meetings
- Continue aggressive communication strategy at conferences and with previously unreached industry groups and trade associations.

FY 2009 – FY 2012:

- Continue outreach efforts to increase the number of applications received.

Coordination - coordinates the SAFETY Act application review process across DHS and with other Federal agencies to support these partners in their missions and to minimize the burden on applicants for SAFETY Act protection. This crucial advance coordination regularly occurs wherever the SAFETY Act can play an important role in a pending Federal procurement.

Milestones and Deliverables

FY 2008:

- Align the SAFETY Act process into the Federal procurement process to:
  - reduce submission of contingent contracts by offerors;
  - streamline the application process for similar or identical technologies containing the same basic scientific principles (such as CAT scans or X-ray systems); and
  - identify, in advance of Requests for Proposals (RFPs), appropriate anti-terrorism technologies that will be considered for, or entitled to, SAFETY Act protections.

FY 2009:

- Work with Biometrics consortiums to identify promising technologies for prompt consideration under the SAFETY Act.

FY 2010:

- Work with Universities and National Laboratories to identify promising technologies for prompt consideration under the SAFETY Act.

FY 2011:

- Work with our international partners to identify promising technologies for consideration under the SAFETY Act

FY 2012:

- Target constituents that have not been traditionally represented in the application pool for SAFETY Act consideration.

Transition Thrust Area – serves as the advocate for transition and advanced technology transfer, this thrust area provides the personnel, processes and resources necessary to integrate technology development efforts across all appropriate disciplines within S&T to develop the most cost effective and timely solutions. This also includes coordinating technology efforts with international agencies and other government agencies and providing an appropriate venue for first responder input to this transition process.

International and Interagency Programs – leverages the capabilities of external organizations to address high-priority homeland security needs. Program activities focus on facilitating science and technology and cooperative research, development, testing and evaluation (RDT&E) across Federal, State, local and tribal governments, the international community, and the private sector. These activities include:

- guiding S&T's coordination of Federal government and private-sector efforts to identify and develop countermeasures against current and emerging threats;
- leading a world-wide staff of science and technology liaison officers who help execute S&T's programs of national and international scope; and
- facilitating international technology awareness to avoid technological surprise and ensure the Department's technological superiority.

Milestones and Deliverables

FY 2008:

- Hold first international conference in the UK to help set the global agenda for RDT&E related to homeland security.

Transition

- Conduct binational science and technology exercise with the Government of Sweden on maritime domain awareness (MDA) to identify joint strengths and gaps for port and maritime security and to develop a coordinated binational MDA S&T program.
- Establish scientist and engineer exchange program with key nations to facilitate international technology awareness and prevent technology surprise.
- Fund six international research projects through grant solicitation program to expand the DHS's access to world-wide access to cutting-edge science and technology research in support of our homeland security.
- Coordinate with S&T divisions (Explosives, Human Factors, Command Control and Interoperability, Infrastructure, Chemical/Biological, and Borders and Maritime) to leverage their work with Inter-Agency (except the Department of State) and other Federal, State, local, tribal, first responder and critical homeland security and homeland defense entities.
- Continue S&T cooperation, coordination, leverage, and liaison with Federal agencies that have either responsibilities in homeland security that would benefit from scientific/technological improvements or those with significant science and technology investments such as the Department of Defense, Department of Energy, the Inter-Agency (except the Department of State), the National Guard, and the Intelligence Community.
- Continue S&T cooperation, coordination, leverage, and liaison with the Joint Staff and appropriate Combatant Commanders including U.S. Northern Command, U.S. Joint Forces Command, U.S. Transportation Command, and U.S. Strategic Command.

FY 2009:

- Hold International Conference on Science & Technology in Sweden.
- Expand scientist and engineer exchange program to additional partner nations.
- Develop joint strategic R&D programs with each S&T division and other appropriate partner nations as defined in the coordinated research agendas established in FY 2008.
- Fund six international research projects through grant solicitation program to expand the DHS's access to world-wide access to cutting-edge science and technology research in support of our homeland security mission.
- Pursue negotiations and/or conclude S&T agreements with four new international partners.
- Mature the Interagency division by establishing and growing a visible, valued, and value-added presence across the country with S&T's customer agencies, Federal officials, State, local, tribal, first responder, private, and other critical local/regional homeland security and homeland defense entities.
- Continue to develop S&T cooperation, coordination, leverage, and liaison with Federal agencies that have either responsibilities in homeland security that would benefit from scientific/technological improvements or those with significant science and technology investments such as the Department of Defense, Department of Energy, the Inter-Agency (except the Department of State), the National Guard, and the Intelligence Community.
- Continue to develop S&T cooperation, coordination, leverage, and liaison with the Joint Staff and appropriate Combatant Commanders including U.S. Northern Command, U.S. Joint Forces Command, U.S. Transportation Command, and U.S. Strategic Command. The focus should include Homeland Defense/Homeland Security.

FY 2010:

- Hold International Conference on Science & Technology in Canada.
- Explore options for an S&T office in South America to bolster DHS and U.S. strategic goals in the science and technology sector in Central and South America.
- Maintain scientist and engineer exchange program with key international partners.
- Fund six international research projects through grant solicitation program to expand the DHS's access to world-wide access to cutting-edge science and technology research in support of our homeland security mission.

- Pursue negotiations and/or conclude S&T Directorate agreements with new international partner.
- Expand S&T cooperation, coordination, leverage, and liaison with Federal agencies that have either responsibilities in homeland security that would benefit from scientific/technological improvements or those with significant science and technology investments such as the Department of Defense, Department of Energy, the Inter-Agency (except the Department of State), the National Guard, and the Intelligence Community.
- Expand S&T cooperation, coordination, leverage, and liaison with the Joint Staff and appropriate Combatant Commanders including U.S. Northern Command, U.S. Joint Forces Command, U.S. Transportation Command, and U.S. Strategic Command. The focus should include Homeland Defense/ Homeland Security.

FY 2011:

- Hold International Conference on Science & Technology in East Asia.
- Explore options for a second permanent S&T office in Europe to bolster DHS and U.S. strategic goals in the science and technology sector in Eurasia and Middle East.
- Maintain scientist and engineer exchange program with key international partners.
- Fund six international research projects through grant solicitation program to expand the DHS's access to world-wide access to cutting-edge science and technology research in support of our homeland security mission.
- Pursue negotiations and/or conclude S&T Directorate agreements with new international partner.
- Continue to expand and deepen interagency interactions through active participation in workgroups, identifying technology gaps, and coordinating with other science and technology entities to mature the RDT&E planning process.

FY 2012:

- Hold International Conference on Science & Technology in Canada.
- Maintain scientist and engineer exchange program with key international partners.
- Fund six international research projects through grant solicitation program to expand the DHS's access to world-wide access to cutting-edge science and technology research in support of our homeland security mission.
- Pursue negotiations and/or conclude S&T Directorate agreements with new international partner.
- Strengthen Interagency coordination leadership through setting national research agendas, hosting workshops and symposia, and providing leadership to state, local, and private sector HLS entities.

FY 2013:

- Hold International Conference on Science & Technology in Australia.
- Maintain scientist and engineer exchange program with key partners.
- Fund six international research projects through grant solicitation program to expand the DHS's access to world-wide access to cutting-edge S&T research in support of our homeland security mission;
- Pursue negotiations and/or conclude S&T agreements with new international partner.
- Establish an interagency exchange program to provide appropriate S&T personnel with awareness and understanding of relevant RDT&E and program management at other appropriate executive agencies and recruit personnel from other appropriate executive agencies for temporary details at S&T.

Program Transition – aligns and coordinates S&T's transition effort with the Departmental component's requirements using Capstone Integrated Product Teams (IPT). This product transition program focuses on delivering near-term technology to meet customer-identified science and technology requirements as well as informing the Basic Research and Innovation Offices of priority customer technology needs. The Capstone IPTs consist of twelve functional homeland security areas:

- Border Security;

Transition

- Cargo Security;
- Chemical/Biological Defense ;
- Cyber Security;
- Counter-IED;
- Transportation Security;
- Incident Management;
- Infrastructure Protection;
- Information Sharing/Management;
- Interoperability;
- Maritime Security; and
- People Screening.

In addition to the Capstone IPT's, the Transition Office, through the efforts of the Chief Commercialization Officer (CCO), manages the development and execution of programs and processes that identify, evaluate, and commercialize technologies that meet the operational requirements of the Department of Homeland Security's Operating Components, First Responder community and end users. The CCO also develops and manages S&T's outreach effort with the private sector to establish and foster mutually-beneficial working relationships leading to the fielding of technologies to secure the Nation.

Within the Transition Office, the Technology Transfer Program manages the Office of Research and Technology Application (ORTA), to conduct technology transfer in accordance with Federal Legislation 15 USC 3710. The Technology Transfer Program also represents S&T in the DOD 1401 Tech Transfer Program, used to identify and transfer Department of Defense (DOD) technology, items, and equipment that can be used by the Federal, State, Tribal, and local first responder community to support their role to protect and secure the homeland.

Milestones and Deliverables

FY 2008:

- Mature the IPT process and conduct further analysis to align the S&T's advanced technology efforts to the Department's highest priority mission capability gaps.
- Conduct quarterly status updates and semi-annual program reviews.
- Implement Office of Research and Technology Applications (ORTA) to manage patents and intellectual property issues.
  - Provide vehicle to promote partnerships and facilitate commercialization of the technologies.
  - Enhance the DOD Technology transfer (1401) process and leverage developments from other agencies such as the National Aeronautics and Space Administration and the Department of Energy.

FY 2009:

- Identify appropriate support and analysis of customer gaps through the IPT process.

FY 2010 – FY 2011:

- Refine support and analysis of customer gaps through the IPT process.
  - Monitor efforts for cost, schedule and capability to ensure the technology effectively transitions into acquisition.

FY 2012 – FY 2013:

- Follow up the IPT process by monitoring the efforts for cost, schedule and capability to ensure the technology effectively transitions into acquisition.
- Continue to improve the application review process for SAFETY Act.
- Target constituents that have not been traditionally represented in the application pool for SAFETY Act consideration.

Technologies to Secure the Homeland and Advance Responder Effectiveness (Tech SHARE) Program – develops a web-based central resource system of information. The system will allow for the dissemination of homeland security science and technology solutions and information to Federal, State, local and tribal agencies. TechSHARE consists of Tech Clearinghouse and Tech Solutions.

Tech Clearinghouse – encourages and supports innovative solutions to enhance homeland security and fulfills Section 313 of the Homeland Security Act of 2002. The goal is to provide:

- government organizations with information to support procurement and grant guidance decisions; and
- technology developers with requirements and operational information that can help them develop more useful tools.

Milestones and Deliverables

FY 2008:

- Develop procurement decision support tools and advanced search mechanisms.
- Expand content to include topics such as public health information.
- Develop communities of interest and professional discussion boards.

FY 2009:

- Establish testing and evaluation standards for technologies developed by TechSHARE.
- Expand content to include topics such as public health information.
- Develop additional communities of interest and professional discussion boards.

FY 2010 – FY 2013:

- Establish a technology transfer community database, continuously identifying and integrating content from other existing government agencies databases, such as the Center for Disease Control (CDC) and the Federal Emergency Management Agency (FEMA).
- Partner with Underwriters Laboratories (UL) to provide testing and certification of equipment on the DHS Authorized Equipment List (AEL) and the Inter Agency Board (IAB) Standardized Equipment List (SEL).

Tech Clearinghouse continually identifies and integrates new sources of information into its website.

Tech Solutions – addresses technology gaps identified by Federal, State, local, and tribal first responders (Police, Fire, EMS). Tech Solutions gathers gaps using a web site www. dhs.gov/TechSolutions. The goals include:

- rapidly fielding prototypical solutions within approximately 12 months while establishing a cost that is commensurate with the proposal but usually less than $1 million per project; and
- developing a solution that meets 80 percent or more of the identified requirement.

Milestones and Deliverables

FY 2008:

- Initiate prototype development for a compressed air, self-contained breathing apparatus (SCBA) cylinder that's lighter, more flexibility, and is smaller in profile than existing SCBA cylinders used by First Responders.
- Initiate prototype development for an Interoperable Communications Device that operates over all emergency bands and frequencies.
- Initiate prototype development for a Standoff Patient Triage Device that monitors heart beat, breathing rate and body temperature.
- Initiate prototype development for a vehicle mounted sensor capable of identifying 13 toxic industrial chemicals and reporting the results to a command post via a wireless network.

Transition

FY 2009 – FY 2013:

- The capability gaps received through the TechSolutions web site will determine the prototypes to be developed and demonstrated. Final selection for prototypes will not occur until a thorough review and evaluation is performed for each gap received. Between FY 2009 - 2012, Tech Solutions plans to demonstrate up to 8 prototypes per year, which potentially include:
  - Ocular Scanning;
  - Extremity Protection;
  - Location Orientation Using a FireGround Compass;
  - Physiological Monitoring;
  - Brain Music Therapy;
  - Chem/Bio Exposure Detection and;
  - Miniaturized Chem/Bio Detectors.

Homeland Security Institute (HSI) – provides a unique source of in-depth knowledge of homeland security mission objectives, operational concepts and requirements, strategies, resources, systems and technologies. It is a specialized study and analysis Federally Funded Research and Development Center (FFDRC) established by the Homeland Security Act of 2002. The Institute's mission is to assist the Department of Homeland Security and its operating elements in addressing important homeland security issues, particularly those requiring scientific, technical and analytical expertise. The research agenda covers the spectrum of homeland security issues and activities, including threat trends and adversarial perspectives, information sharing and communications interoperability, border and transportation security, law enforcement, infrastructure protection, preparedness, emergency response and training.

As the primary sponsor, S&T provides core funding for this homeland security-focused FFRDC. Prior to FY 2008, S&T funded HSI's core activities through its division budgets. In FY 2008, S&T created a new program within the Transition Division to fund HSI.

HSI customers include all operational components of the Department—FEMA, CBP, TSA, USCG, National Operations Center, USSS, ICE, USCIS, OHA, DNDO, DHS Chief of Staff, Policy Directorate, National Preparedness and Protection Directorate (NPPD), Management Directorate, Intelligence and Analysis Directorate, and the Office of Counter-Narcotics.

Recent studies completed by HSI include: the National Response Framework, Nation Preparedness Response Guidance, Assessment of PI Readiness at Ports of Entry, Comprehensive Integrated Product Team Capability Gap Analysis, Validation of Interoperability Capability Gaps, CBP Operational Assessment, CBP Apprehensions at the Border, Biological Defense Net Assessment, Radicalization: An Overview, TSA RMAP Analysis, FAMS Risk Assessment, TSA General Aviation Risk Assessment, REAL ID Program Analysis, Independent Assessment of Cargo Security, Analysis of I&A Products and Processes, Risk Assessment Process for Informed Decision Making (RAPID), Homeland Security Mission Area Analysis, Homeland Security Strategic Planning Landscape, National Small Vessel Security, Pandemic Planning for the USCG, Deterring Terrorist Attacks, National Incident Management System (NIMS) Doctrine, NIMS Five Year Training Plan, NPS 2.0: A National Planning Scenarios Maintenance and Management Process, Facilitating Collaboration on Innovation and the Future, Mass Egress Simulation and Modeling, Wide area Bio-Restoration, and many others.

Milestones and Deliverables

FY 2008:

- Conduct studies and analysis for the Department and its components in support of their mission needs.

FY 2009:

- Continue to support the DHS mission by performing studies and analysis for the Department. The authorization for HSI expires in April 2009.

FY 2010:

- Conduct operations analyses to develop measurable and meaningful operational performance metrics as guided by DHS senior leadership.

FY 2011 – FY 2013:

- Continue mapping of capabilities against mission requirements, forward analyst deployments for on-scene analysis, operations analysis, and exercising for metrics data collection, as guided by senior leadership.

University Programs

Thrust Area	Program	FY 08 (RE) ($000)	FY09 (PB) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)	FY12 (Plan) ($000)	FY13 (Plan) ($000)
DHS Centers	Multi-Center Priority Projects	1,000	-	-	-	-	-
	Center for Advancing Microbial Risk Assessment (CAMRA)	-	-	-	-	-	-
	Center Of Excellence for Risk & Economic Analysis of Terrorism Events (CREATE)	-	-	3,060	3,141	3,200	3,255
	Institute For Discrete Sciences (IDS) University Affiliate Centers	-	-	-	-	-	-
	Center of Excellence for Command, Control and Interoperability	2,000	3,580	3,060	3,141	3,200	3,255
	Center of Excellence for Maritime Island & Extreme/Remote Environmental Security	3,500	3,580	3,060	3,141	3,200	3,255
	Center of Excellence for Explosives Detection, Mitigation, and Response	3,490	3,580	3,060	3,141	3,200	3,255
	Center of Excellence for Border Security and Immigration	3,500	3,580	3,060	3,141	3,200	3,255
	Center of Excellence for Biological, Chemical and Agricultural Security	-	-	3,060	3,141	3,200	3,255
	Center of Excellence for Foreign Animal & Zoonotic Disease Defense (FAZD)	4,750	3,580	-	-	-	-
	Center of Excellence for Food Protection & Defense (NCFPD)	4,750	3,580	-	-	-	-
	Center of Excellence for National Consortium for the Study of Terrorism and Responses to Terrorism (START)	3,640	3,580	3,060	3,141	3,200	3,255
	Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management	3,500	3,580	3,060	3,141	3,200	3,255
	Center of Excellence for the Study of Preparedness and Catastrophic Event Response (PACER)	-	-	3,060	3,141	3,200	3,255
	Center of Excellence for Transportation Security	4,000	3,580	-	-	-	-
Educational Programs	Educational Programs	9,685	6,555	6,243	6,180	6,421	6,624
Minority Serving Institutions	Minority Serving Institutions	4,250	3,900	3,300	3,400	3,450	3,600
SBIR	SBIR	1,232	1,095	951	970	992	1,013
University Programs Total		49,297	43,770	38,034	38,816	39,663	40,535

University Programs

Overview

S&T's Office of University Programs (UP) engages the academic community to conduct research and analysis, and provide education and training to enhance DHS homeland security capabilities. UP brings together the best scientific talent and resources from diverse academic institutions to help solve complex and technologically challenging homeland security problems. Program activities focus on building homeland security expertise in the academic community, creating strategic partnerships, and fostering a new generation of homeland security experts. UP invests in three primary programmatic thrusts: 1) a coordinated, university-based system of DHS Centers of Excellence (COEs); 2) DHS Science, Technology, Engineering and Mathematics (HS-STEM) Education Programs to prepare the next generation of homeland security scientists and engineers, and 3) Minority Serving Institutions (MSI) Programs to enhance the diversity of the homeland security science and technology community.

The primary Federal customers for UP are all the DHS Components, who represent end-users including first responders; Federal, State, and local emergency managers; and private sector infrastructure owners and operators. Successful transition of these technologies will substantially improve DHS components' performance and support the homeland security mission.

UP supports the following DHS strategic goals:

Goal 1: Protect Our Nation from Dangerous People

1.1 Control our Borders and Protect Our Interior
1.2 Enforce and Reform Immigration laws
1.3 Strengthen Screening of Travelers and Workers

Goal 2: Protect Our Nation from Dangerous Goods

2.2 Prevent, Detect, and Respond to Biological Attacks
2.3 Prevent, Detect, and Respond to Chemical and Explosive Attacks
2.4 Prohibit the Introduction of Illicit Contraband

Goal 3: Protect Critical Infrastructure

3.1 Protect and Strengthen the Resilience of the Nation's Critical Infrastructure and Key Resources
3.2 Improve Maritime Safety and Stewardship

Goal 4: Build a Nimble, Effective Emergency Response System and a Culture of Preparedness

4.1 Ensure Preparedness
4.2 Strengthen Response and Recovery Capability

UP supports the following customers' metrics:

Performance Metric 1: Number of Science, Technology, Engineering and Mathematics (STEM) students matriculated.

Performance Metric 2: Number of papers published as the result of research conducted with University Programs funds.

Performance Metric 3: Number of projects completed at University Centers of Excellence.

Centers of Excellence Thrust Area – conducts multidisciplinary research in DHS priority mission areas.

Their work improves the understanding of the causes, elements, and consequences of a range of threats from terrorists and natural disasters, including chemical, biological, radiological, explosives, hurricanes, floods, earthquakes and tsunamis. Additionally, COE researchers are developing countermeasures, mitigation and prevention approaches based both on technologies and on the behavioral aspects of terrorism. To accomplish this, the centers have assembled a powerful group of academic experts, researchers and educators in fields relevant to homeland security.

Funded primarily through research grants and cooperative agreements, the COEs are building scientific leadership and core competencies in multi-disciplinary areas of importance to homeland security. Presently, these areas are:

- risk and economic analysis of terrorism;
- food system protection and defense;
- foreign animal and zoonotic disease defense;
- social origins of and behavioral responses to terrorism;
- preparedness and response to catastrophic events;
- microbial risk assessment;
- discrete sciences;
- natural disasters, infrastructure protection and emergency management;
- explosives detection, mitigation and response;
- maritime, island, remote environment and port security;
- border security and immigration, and
- transportation security.

S&T designed the COEs to:

- work with and complement other DHS research and development programs, including Federal laboratories' homeland security research;
- take advantage of other related Federally-sponsored research; and
- provide outcomes useful to Federal, State and local government, private sector, and international partners.

Selection for awarding the COEs is highly competitive, peer-reviewed, and merit-based. S&T currently funds seven COEs and is in the process of establishing five new COEs through FY 2010. S&T will hold several new competitions to replace existing COEs and will extend the term of some of the original COEs. These adjustments will bring the total of COEs to 12 over the next 2-3 years. These COEs will be closely aligned to an S&T division or program with cross-cutting responsibilities such as Operations Analysis and the Homeland Security Institute.

COEs Existing in FY 2007:

- Center of Excellence for Risk and Economic Analysis of Terrorism Events (CREATE); based at the University of Southern California (http://www.usc.edu/dept/create/index.php)
- Center of Excellence for Food Protection and Defense (NCFPD) based at the University of Minnesota (http://www.fpd.umn.edu/);
- Center of Excellence for National Center for Foreign Animal and Zoonotic Disease Defense (FAZD) based at Texas A&M University (http://fazd.tamu.edu/);
- Center of Excellence for National Consortium for the Study of Terrorism and Responses to Terrorism (START) based at the University of Maryland (http://www.start.umd.edu/);
- Center of Excellence for the Study of Preparedness and Catastrophic Event Response (PACER) based at Johns Hopkins University (website in development);
- Center for Advancing Microbial Risk Assessment (CAMRA) based at Michigan State University,

established jointly with the United States (http://camra.msu.edu/); and
- Institute for Discrete Sciences (IDS) University Affiliate Centers, led by Rutgers University in collaboration with Lawrence Livermore National Laboratory (awarded August 2006).

New COEs for FY 2008:

S&T will establish new COEs in FY 2008, which will last until 2012 to 2014 and an additional new COE in FY 2009, which will extend to 2015:

FY 2008:
- Center of Excellence for Maritime Island and Extreme/Remote Environmental Security collocated at the University of Hawaii and Stevens Institute of Technology (awarded in FY 2008);
- Center of Excellence for Explosives Detection, Mitigation, and Response collocated at Northeastern University and the University of Rhode Island (awarded in FY 2008); and
- Center of Excellence for Border Security and Immigration collocated at the University of Arizona at Tucson and the University of Texas at El Paso (awarded in FY 2008).
- Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management collocated at the University of North Carolina at Chapel Hill and Jackson State University
- Center of Excellence for Transportation Security collocated at Texas Southern University, Tougaloo College, and the University of Connecticut

FY 2009:
- Center of Excellence for Command, Control and Interoperability

CAMRA Program – aligns with S&T's Chemical and Biological Division. DHS and EPA jointly established CAMRA to fill critical gaps in the area of microbial risk assessments – answering the question, "How clean is safe?" Following anthrax contamination events, the Federal government recognized the need to develop safe standards for cleanup of biological agents of concern (BAC); this is an important focus for both DHS and EPA. Based at Michigan State, CAMRA researchers are developing a scientific basis for such standards for BACs in different media (air, water, and on surfaces) with which humans come in contact.

CAMRA initiated work and began a five-year research program in:
- Exposure, Detection, Fate and Transportation of Biological Agents of Concern;
- Infectious Disease Models for Assessing Microbial Risk and Developing Control Strategies;
- Dose Response Assessment; and
- Risk Communications and Analysis, and Information Sharing platforms.

Milestones and Deliverables

FY 2008:
- Identify parameters that affect fate and transport of BAC.
- Develop new experimental protocol for assessment of fate and transportation of BAC in aerosols and water distribution systems using BAC surrogates.
- Complete a single object infectious disease model to redesign an intervention study with the following parameters:
  - advice on sampling strategies;
  - single venue intervention scenario using a single venue model;
  - multiple venue intervention scenarios using the multiple venue model; and
  - complete the influenza model at the college campus level.
- Develop dose-response information for exposure to:
  - Variola (smallpox); and
  - hemorrhagic viruses (e.g., Lassa, Marburg, Ebola)

- Develop novel dose-response models incorporating time to infection and physiological parameters and review of outbreak studies for validation data sets.
- Develop new ways to communicate risks.

CREATE Program – is a cross-cutting enterprise that evaluates the risks, costs, and consequences of terrorism, and guides economically viable investments in countermeasures that will make our Nation safer and more secure. This center based at the University of Southern California and contributes significantly to the Department's ability to identify and select options for enhancing national security and minimizing the human/economic casualties in the face of a range of hazards.

Milestones and Deliverables

FY 2008 – FY 2013:

- Develop and test new dynamic and adaptive risk assessment tools to improve our ability to predict and prevent terrorist attacks.
- Develop advanced economic models, with special emphasis on the effects of household, business, and market resilience to terrorism events.
- Improve understanding of negative behavioral responses to terrorism and develop strategies to reduce the effects of these responses.
- Integrate risk and economic analysis models include red teaming, experimental games, intelligence analysis, and advanced decision theory components.
- Re-compete award in FY 2011.
- Improve understanding of negative behavioral responses to terrorism and develop strategies to reduce the effects of these responses.
- Test integrated risk and economic models in experimental and applied settings to show their validity and usefulness.
- Confirm cases of significant reductions in cost of implementing risk management options and resource allocation decisions.
- Transition a suite of CREATE models and software tools to industry for further commercialization.
- Commercialize all major CREATE-based models and tools.
- Complete testing, validation and verification of integrated risk management model.
- Commercial use of CREATE-based products in industrial and government settings for resource allocation and risk-based security investment decisions.

Institute for Discrete Sciences - University Affiliate Centers Program (IDS-UACs) Program – conducts coordinated research on advanced methods for information analysis and the development of computational technologies to protect the Nation. This group aligned with S&T's Command, Control and Interoperability Division. Awarded in August 2006, the IDS-UACs represent a collaborative effort with several national laboratories led by Lawrence Livermore National Laboratory. Rutgers University, the University of Southern California, the University of Illinois at Urbana-Champaign, the University of Pittsburgh and their partner institutions will be established as university affiliate centers (UACs).

Milestones and Deliverables

FY 2008:

- Conduct coordinated research on advanced methods for information analysis and the development of computational technologies to protect the Nation.
- Plan to work with the national laboratories and other Centers to investigate ways to use and present that data that are meaningful to analysts and decision makers.

University Programs

Center of Excellence for Command, Control, and Interoperability **(C2I)–** aligns with S&T's Command, Control and Interoperability (CCI) Division. This COE is also initiating in FY 2009 but will merge activities that started in FY 2007 by the Institute of Discrete Sciences University Affiliate Centers (see below) and the DHS Regional Visualization and Analytics Centers. Individuals involved with homeland security increasingly face the problem of synthesizing information and deriving insight from massive, dynamic, ambiguous and possibly conflicting data sets. The goal of examining these data is not merely to acquire information, but rather to be able to obtain understanding and inform decision-making. Driven by this problem, two new, interdisciplinary fields have emerged: *visual analytics* and *discrete sciences*. This COE focuses its basic research in both of these areas. That research supports the CCI division's core activities in:

- knowledge management;
- threat assessment;
- surveillance and reconnaissance;
- cyber security; and
- communications interoperability and compatibility.

The objective of visual analytics is to enable people to make immediate sense of diverse data in the presence of uncertainty. Those data, however, are often complex and diffuse; for example, numeric data from sensors or computational models, unstructured language or text data from documents, reports, emails and phone conversations, images and videos, voice or other audio data, and structured data stored in traditional database management systems such financial or immigration records.

Milestones and Deliverables

FY 2009 – FY 2013:

- Establish a network of premier academic research universities as partners, identify niche roles for each, and establish a portfolio of multidisciplinary research projects, subject to periodic review and revision.
- Develop solicitation, hold competition and award a new C2I COE, with the following focus: advanced visualization methods; textual analysis; discrete math; geospatial data analysis; interoperability of communications; and cyber security.
- Successfully merge selective activities of the Institute of Discrete Sciences University Affiliate Centers and the DHS Regional Visualization and Analytics Centers.
- Develop extensive homeland security science, technology, engineering and mathematics (HS-STEM) curricula and research programs to train students in advanced C2I related research and analytical methods.
- Develop strategy for integration of C2I research and analysis with empirical data from other COEs and from DHS Directorates.
- Establish a portfolio of multidisciplinary research projects in: advanced visualization methods; textual analysis; discrete math; geospatial data analysis; interoperability of communications; and cyber security.
- From the portfolio of research projects, identify candidates for transition to advanced applications.

Center of Excellence for Maritime Island & Extreme/Remote Environmental Security – provides fundamental research to support DHS and other agencies' maritime security goals, including:

- improved interdiction capabilities;
- enhanced capacity to respond to catastrophic events particularly for U.S. islands and extreme environments; and
- improved (more secure and efficient) marine transportation system.

This COE was initiated in FY 2007 and aligns with S&T's Borders and Maritime Division. The National Strategy for Maritime Security, the Maritime Transportation Security Act, and the SAFEPORT Act all demonstrate the importance of these missions to DHS. This Center's customers will include DHS Preparedness Directorate/CMO,

DHS OIP, Federal Emergency Management Agency (FEMA), USCG, and State Homeland Security Agencies. The Center will conduct integrated policy, legal, scientific and engineering studies in detection, monitoring and control of people and goods moving through the U.S. maritime domain. It will also improve our ability to plan for and respond to natural and terrorist threats in the maritime realm. Finally, it will support long-term mitigation and recovery strategies for catastrophic events, particularly those that impact U.S. islands, territories and remote areas, as part of an integrated systems approach. DHS expects this new COE to develop meaningful courses of study for both graduate and undergraduate students, and for career professionals involved with these issues.

The specific research projects and related milestones will be finalized as part of the grant process; however, the following are some plans for FY 2008 to FY 2013.

Milestones and Deliverables

FY 2008 – FY 2013:

- Establish a network of premier academic research universities as partners, identify niche roles for each; and establish a portfolio of interdisciplinary research projects, subject to periodic review and revision.
- Develop a comprehensive framework for maritime security that accounts for multiple potential sources of vulnerability (e.g. staff, passengers, cargo, and port security).
- Re-compete award in FY 2012.
- Develop detection and surveillance technology for maritime security threats.
- Conduct integrated policy, legal, scientific and engineering studies in detection, monitoring and control of people and goods moving through the U.S. maritime domain.

Center of Excellence for Explosives Detection, Mitigation, and Response - conducts research to enhance the Nation's capabilities to prepare for, prevent, mitigate, respond to, and recover from terrorist attacks involving explosives. This COE was initiated in FY 2007 and aligns with S&T's Explosives Division. The COE will also develop relevant educational curricula for undergraduates, graduate students, and career professionals. The COE will collaborate with the Explosives Division, which manages a full-spectrum R&D program ranging from fundamental research to applied technologies. This COE will provide enabling basic research that will advance the technical tools and information that S&T's customers will need in the future. This COE's customers and end users will include DHS Preparedness Directorate/CMO, DHS OIP, DHS Policy Office, TSA, ICE, and State Homeland Security Agencies.

This COE will conduct basic and transformational research in explosives-related areas such as:

- The properties (e.g., chemical, physical, and material) and formulation of explosive materials (including precursors and homemade compounds), as well as materials and/or technologies to mitigate explosives effects (e.g., blast-resistant materials);
- Detection of explosives and explosive devices, including methods to screen people and containers and other potential conveyances of explosive materials;
- Unconventional approaches (e.g., alternative signatures) to identify indications of threats from explosives or bombers, to include algorithm development for improved detection and/or imaging capabilities and relevant human factors issues; and
- Other effective and efficient counter-measures, particularly ones that can be utilized or deployed in densely populated urban settings and transportation venues.

The specific research projects and related milestones will be finalized as part of the grant process; however, the following are some plans for FY 2008 to FY 2013.

Milestones and Deliverables

FY 2008 – FY 2013:

- Establish a network of premier academic research universities as partners, identify niche roles for each,

and establish a portfolio of multidisciplinary research projects, subject to periodic review and revision.
- Develop the platform, characterization plan, and methodology for assessing scientific properties of a variety of Home-Made Explosive (HME) and precursor compounds.
- Conduct workshops, to help guide future research directions, on: novel countermeasure concepts; human factors issues; and improved imaging algorithms.
- Develop multi-factor approach to detection that will improve technology and ability to prevent casualties and damage to property.
- Obtain first-generation scientific properties from available technical tools to characterize and test HME and precursor compounds.
- Establish an integrated sensor platform as a test bed for comparing the functionality of non-intrusive detection technologies.
- Recompete award in FY 2012.
- Conduct basic and transformational research on the properties (e.g., chemical, physical, and material) and formulation of explosive materials (including precursors and homemade compounds), as well as materials and/or technologies to mitigate explosives effects (e.g., blast-resistant materials).
- Conduct basic and transformational research on unconventional approaches (e.g., alternative signatures) to identify indications of threats from explosives or bombers, to include algorithm development for improved detection and/or imaging capabilities and relevant human factors issues.

Center of Excellence for Border Security and Immigration - provides fundamental research in support of DHS's goals of strengthening border security, interior immigration enforcement, and streamlining the immigration process. This was COE initiated in FY 2007 and aligns with S&T's Borders and Maritime Division. DHS and its component agencies have the responsibility to protect and control our borders against terrorist threats, criminal endeavors, illegal immigration and contrabands, while facilitating legal travelers and trade into the United States. DHS customers and end users of this COE will include ICE, U.S. Citizenship and Immigration Services, USCG, and State and local agencies.

The Center will conduct scientific and engineering investigations into high-payoff breakthroughs in detecting people and goods, legal or illegal, moving across our borders as part of a fully-integrated system-of-systems approach. S&T expects this Center to facilitate breakthroughs in the fundamental science needed to improve wide-area surveillance, screening and situational awareness along U.S. borders, particularly the northern forested and southwest desert borders.

The specific research projects and related milestones will be finalized as part of the grant process; however, the following are some plans for FY 2008 to FY 2013.

Milestones and Deliverables

FY 2008 – FY 2013:

- Establish a network of premier academic research universities as partners, identify niche roles for each, and establish a portfolio of multidisciplinary research projects, subject to periodic review and revision.
- Establish a portfolio of interdisciplinary research projects, subject to periodic review and revision.
- Analyze the organizational and human factors that constrain or facilitate the effectiveness of border security operators.
- Develop detection and surveillance technology for intentional and accidental border security threats.
- Conduct basic and transformational research on wide-area surveillance, screening and situational awareness.
- Develop a framework to inform DHS policymakers with empirical immigration research to increase the efficiency of immigration enforcement.

- Based on insights from research successes in both Border Security and Immigration, develop corresponding educational curriculum materials in topical areas of greatest promise for long-term research and enduring need.
- Identify the impact of immigration policy and law on population dynamics.

FAZD Program_– aligns with S&T's Chemical and Biological Division. Based at Texas A&M, FAZD's mission is to protect against the introduction of high-consequence foreign animal and zoonotic diseases in the United States, with an emphasis on:

- prevention;
- surveillance;
- intervention; and
- recovery.

Zoonotic diseases could have staggering economic impacts and threaten human health. FAZD is developing a scientific basis for detecting and preventing exotic and zoonotic diseases to help promote the Department's development of countermeasures and effective control strategies.

Milestones and Deliverables

FY 2008 – FY 2013:

- Develop rapid and accurate methods for detecting and diagnosing biological agents that could threaten U.S. livestock and poultry, such as
  - Rift Valley Fever (RVF);
  - Avian Influenza (AI); and
  - Foot and Mouth Disease (FMD).
- Develop vaccines, antiviral agents and means to increase resistance against threat diseases: FMD, RVF, Brucellosis and AI.
- Develop effective decision support systems to assess the biological, economic and environmental consequences of all feasible options to prevent/curtail disease.
- Develop methods for rapid and accurate detection of zoonotic diseases.
- Develop new vaccines and antiviral agents to protect animals.

NCFPD Program – aligns with S&T's Chemical and Biological Division. Based at the University of Minnesota, its mission is to defend the safety of the post-harvest food system by establishing best practices, developing new tools, and attracting new researchers to manage and respond to food contamination events. NCFPD's work in supporting system-wide food security, include:

- supply chain management;
- food processing protection;
- detection and diagnostics;
- public health;
- disposal and decontamination; and
- economic impact assessment and risk communication.

This work helps the Department in mitigating and countering threats to U.S. food and agriculture.

Milestones and Deliverables

FY 2008 – FY 2013:

- Develop dynamic, real-world food event models that can rapidly identify sources of contamination, food distribution and likely outbreak locations and also model interventions and responses using actual food distribution data; consumer consumption data, epidemiological data and novel communication systems.

- Develop novel detection and decontamination technologies through research on fundamental behavior of select agent/food complex.
- Establish innovative prevention, response and recovery strategies to minimize the probability and health/economic consequences of food system attacks.
- Develop food event modeling systems.
- Identify most critical vulnerabilities in the food supply chain and propose scientifically sound remedies.
- Establish a network of premier academic research universities as partners, identify niche roles for each, and establish a portfolio of multidisciplinary research projects, subject to periodic review and revision.
- Develop new risk communications approaches to minimize the potential impact of food contamination or disease spread.

START Program – aligns with S&T's Human Factors Division. Based at the University of Maryland, START provides strategies for intervention of terrorists and terrorist groups, while strengthening the resilience of U.S. citizens to terrorist attacks. The START consortium uses advanced behavioral and social science theories, methods and data to better understand the origins, dynamics, and impacts of terrorism. Applying this knowledge provides guidance on how to disrupt terrorist networks, reduce the incidence of terrorism, and enhance the resilience of American society in the face of terrorist threats and natural disasters.

Program activities include providing the world's largest open-source database of terrorist incidents, a Global Terrorism Database (GTD), which enhances our understanding about the occurrences and impacts of terrorism. START will link the GTD to a number of databases that will include data on terrorism using weapons of mass destruction, volatility around the world and illegal acts committed by extremists in the United States.

Milestones and Deliverables

FY 2008 – FY 2013:

- Create, collect, and organize the data needed by DHS to understand factors that influence the likelihood of terrorist attacks (or why terrorism occurs) and when and how groups decide to attack U.S. interests.
- Identify domestic and international sources of public support for terrorism.
- Provide guidance on enhancing societal resilience to terrorist events at the individual, community, and national levels.
- Use the GTD to explore factors that influence whether groups become engaged in terrorism.
- Deliver report on why and how U.S. interests are targeted by terrorist groups.
- Analyze survey data to identify the factors that can encourage or deter individuals from supporting or working with terrorist groups.
- Pilot, revise, and refine a Community Assessment of Resilience Tool. Conduct focus groups and interviews among diverse audiences regarding the impact of public communications about terrorist threats.
- Analyze survey data to identify the factors that can encourage or deter individuals from supporting or working with terrorist groups.
- Re-compete award in FY 2012.

Center of Excellence for Natural Disasters, Coastal Infrastructure, and Emergency Management – conducts research leading to profound and far-reaching improvements in the Nation's preparedness and ability to respond to, and recover from catastrophic natural events in coastal areas. This COE initiates in FY 2008 and will be aligned with the Infrastructure and Geophysical Division. DHS anticipates that these COE discoveries will ultimately save American lives, property, and economic activities, both nationally and regionally.

This COE will conduct basic and transformational research in areas related to Coastal region issues, including

but not limited to the following topics:

- Natural hazards of the coastal region (e.g., flooding from hurricanes or storm surges);
- Innovative, comprehensive, regional flood water management, to include technical approaches/options to preventing, mitigating, or recovering from flooding incidents, and better understanding of land-water interactions;
- Approaches to securing public-sector coastal infrastructure and meeting other public-sector needs in crisis incidents; and
- Coastal region planning, governance, resilience, and unified comprehensive risk-based decision support tools, particularly for natural disasters warranting emergency measures.

Milestones and Deliverables

FY 2008 – FY 2013:

- Establish a network of premier academic research universities as partners, identify niche roles for each, and establish a portfolio of multidisciplinary research projects, subject to periodic review and revision.
- Develop the platform and methodology for technical assessments of land-water interactions and coastal natural hazards.
- Identify land use options and opportunities for integrated emergency response activities in coastal regional planning.
- Sponsor an academic competition on land barrier technologies applicable to low-lying regions, and evaluate the effectiveness of forthcoming ideas.
- Sponsor the second annual academic competition on innovative concepts for other enabling technical tools, and evaluate the effectiveness of forthcoming ideas.
- Conduct basic and transformational research on natural hazards of the coastal region (e.g., flooding from hurricanes or storm surges).
- Conduct basic and transformational research on innovative, comprehensive, regional flood water management, to include technical approaches/options to preventing, mitigating, or recovering from flooding incidents, and better understanding of land-water interactions.
- Conduct basic and transformational research on approaches to securing public-sector coastal infrastructure and meeting other public-sector needs in crisis incidents.
- Conduct basic and transformational research on coastal region planning, governance, resilience, and unified comprehensive risk-based decision support tools, particularly for natural disasters warranting emergency measures.

PACER Program – aligns with S&T's Infrastructure and Geophysical Division. Based at Johns Hopkins University, PACER optimizes our Nation's preparedness in the event of a high-consequence natural or man-made disaster, as well as develops guidelines to best alleviate the effects of such an event. In the wake of the devastation inflicted by Hurricane Katrina, this Center assumes even greater relevance and urgency. The Center is planning to investigate issues relevant to the theory and practice of emergency preparedness and response to terrorism incidents and natural disasters to include:

- critical decision-making;
- regional integration of communication and response capabilities;
- surge capacity;
- informal and formal response networks;
- health systems integration;
- deterrence and prevention;
- infrastructure integrity; and
- sensor networks.

University Programs

DHS customers and end users include the Department's Chief Medical Officer (CMO) and Preparedness Directorate, hospitals, health departments, and emergency responders. PACER's work includes:

- analysis of critical decision-making;
- studies of formal and informal response networks; and
- investigations of infrastructure integrity (e.g., health system integration and surge capacity).

In addition, PACER will engage in joint projects with other DHS University Centers.

Milestones and Deliverables

FY 2008 – FY 2009:

- Develop metrics to measure surge capacity for preparedness relevant to planning and resource allocation.
- Determine the best means for formal networks (e.g., first responders) to harness the response and surge capacity of informal networks (e.g., volunteer groups).
- Identify decision-making approaches and decision support technologies that would improve catastrophic event response.

FY 2010 – FY 2013:

- Deploy a web-based, field-tested immersive leadership training module tailored to meet specific needs of each U.S. region and adaptable to localities.
- Identify and develop educational strategies to assist disaster management agencies to assist underserved populations.
- Develop metrics to measure surge capacity for preparedness relevant to planning and resource allocation.
- Determine the best means for formal networks (e.g., first responders) to harness the response and surge capacity of informal networks (e.g., volunteer groups).
- Deliver an index that measures medical response capability.
- Deliver standardized curricula for post doc and graduate level multidisciplinary higher educational training.
- Deliver medical surge capacity and computer simulation models.
- Join computer simulation and modeling outcomes with medical surge capacity efforts to develop products appropriate for end users.
- Generalize joint computer simulations and models for-medical surge capacity efforts to other catastrophic situations.

Center of Excellence for Transportation Security – addresses the technology and research needs associated with securing the Nation's infrastructure and protecting the people who use it. It will be an interdisciplinary COE involving seven institutions identified by Congress in FY 2007's HR-1. This COE will be cut across all six S&T divisions, but be responsive to the needs of TSA and its Federal partners. This COE will need to develop a significant collaboration with the Transportation Security Laboratory (TSL).

Milestones and Deliverables

FY 2008 – FY 2009:

- Develop a detailed and thoroughly reviewed work plan which addresses the three identified thrust areas (research, education, and training).
- Once the program has developed the work plan, establish detailed milestones for the FYHSP.
- Initiate research projects in accordance with the completed work plan.
- Develop extensive homeland security science, technology, engineering and mathematics (HS-STEM) curricula and research programs to train students in advanced science and technology related to transportation security.

- Develop and implement training programs for transportation security personnel.

Multi-Center Priority Projects – supports a strategic effort to link individual DHS University Centers with other Centers and DHS programs into an organized university-based system that serves the research needs of DHS. Program activities focus on strengthening communications and coordination of research among the DHS University Centers, national laboratories and DHS components.

Milestones and Deliverables

FY 2008:

- Invest in cooperative research projects, such as comprehensive research project to improve risk communication and understanding of public emotional and behavioral response to catastrophic events.

Education Programs Thrust Area – invests in U.S. citizens that are high-performing science and engineering students or professionals to inspire the next generation of homeland security leaders. S&T draws students, scholars and faculty from postsecondary, graduate and professional levels of science and engineering disciplines that directly support S&T's divisions and the Department's mission. The Education Programs thrust area includes:

- Scholarships and Fellowships;
- National Research Council (NRC) Postdoctoral Associateship;
- American Association for the Advancement of Science (AAAS) Fellows;
- Summer Research Team for Minority Serving Institutions (MSIs); and
- Visiting Scholars.

Over 100 institutions are represented by participants, including Historically Black Colleges and Universities and MSIs in more than 40 States, the District of Columbia and Puerto Rico.

Scholarships and Fellowships Program – provides scholarships for undergraduate and fellowships for graduate students pursuing degrees in fields relevant to homeland security. The program provides educational support and relevant experimental learning opportunities to diverse and highly talented individuals to enhance the scientific leadership in areas of importance to DHS. This program area focuses on building a high-quality and diverse talent pool of public-service-oriented scientists and engineers who will be committed to the Department's mission and working on homeland security problems and challenges at all levels. The program competitively selects science, mathematics and engineering undergraduate and graduate students and scholars from 6 major disciplines and over 40 fields-of-study. Program activities aim to increase participants' understanding and commitment to the homeland security mission. Participants gain exposure to homeland security science and technology through their research experiences and a student/alumni web-based network. Specifically, student and scholar researchers perform work at more than 28 DHS-affiliated venues, including DHS and national laboratories and DHS component agencies such as USCG and I&A.

Milestones and Deliverables

FY 2008 – FY 2013:

- Expand the number of well trained scientists and technologists dedicated to the Homeland Security science and technology research, development, demonstration, testing and evaluation mission through qualified curriculum development.
- Integrate MSI faculty and students into research and training.
- Develop advanced curricula and research programs to train students.
- Develop career placement pathways for graduates.
- Support the development of and expansion of HS-STEM curricula.
- Recruit students graduating from scholarships, fellowships and MSI Leadership programs into relevant HS-STEM venues.

University Programs

- Evaluate effectiveness of education programs and models. Transition educational curriculum to other institutions and agencies with similar training needs.
- Modify education programs to implement recommended improvements. Continue with successful elements, eliminate or modify unsuccessful elements, initiate innovative programs.

Minority Serving Institutions (MSI) Thrust Area – improves the capabilities of MSIs to conduct research in areas critical to homeland security and to develop a new generation of scientists capable of advancing homeland security goals. S&T will use competitive incentives to integrate the MSI program with the DHS University Centers.

Milestones and Deliverables

FY 2008 – FY 2013:

- Establish homeland security scientific leadership programs in areas critical to homeland security at MSIs.
- Provide MSIs with funds to support early career faculty to establish or expand education, research and training activities in homeland security science, technology, engineering and mathematics (STEM) areas.
- Provide scholarships for students of MSIs that will enable them to develop the necessary skills to become professionals in homeland security related fields.
- Continue to develop far-reaching and multi-faceted MSI programs that incorporate MSIs into the Centers of Excellence.
- Increase the profile and presence of MSIs in the network of COEs.
- Develop homeland security research and training capabilities at the MSIs.
- Expand the contribution of MSIs to the Homeland Security science and technology research, development, demonstration, testing and evaluation mission.
- Expand the professional opportunities for MSI homeland security science, technology, engineering and mathematics (HS-STEM) graduates in the workforce at DHS, State and local agencies, national laboratories and Centers of Excellence by increasing the number of MSI students in HS-STEM fields.
- Develop internship and career opportunities at a variety of venues.
- Continue to implement a Summer Research Team Program for MSI that provides a 10 to 12 week summer research experience for teams, consisting of a faculty member and up to two students, to perform research at a DHS University Center that aligns with the DHS mission.

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