Homeland
Security

June 13, 2007

The Honorable James R. Langevin
Chairman
Subcommittee on Emerging Threats, Cybersecurity, and Science and Technology
Committee on Homeland Security
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am submitting the Science and Technology (S&T) Directorate Strategic Plan, including the S&T Directorate Five-Year Research and Development Plan for Fiscal Years 2007-2011 which is submitted pursuant to the Department of Homeland Security (DHS) Appropriations Act for Fiscal Year 2007 (Conference Report 109-699).

An identical letter has been sent to the Ranking Member of the subcommittee, as well as the Chairman and Ranking Member of the Senate and House Subcommittees on Homeland Security, Committees on Appropriations.

If I can be of any further assistance, please contact the Office of Legislative Affairs at (202) 447-4412.

Sincerely,

Jay M. Cohen
Under Secretary for Science and Technology

Enclosure

Under Secretary for Science and Technology

U.S. Department of Homeland Security
Washington, DC 20528

Homeland
Security

June 13, 2007

The Honorable Bennie G. Thompson
Chairman
Committee on Homeland Security
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am submitting the Science and Technology (S&T) Directorate Strategic Plan, including the S&T Directorate Five-Year Research and Development Plan for Fiscal Years 2007-2011 which is submitted pursuant to the Department of Homeland Security (DHS) Appropriations Act for Fiscal Year 2007 (Conference Report 109-699).

An identical letter has been sent to the Ranking Member of the committee, as well as the Chairman and Ranking Member of the Senate and House Subcommittees on Homeland Security, Committees on Appropriations.

If I can be of any further assistance, please contact the Office of Legislative Affairs at (202) 447-4412.

Sincerely,

Jay M. Cohen
Under Secretary for Science and Technology

Enclosure

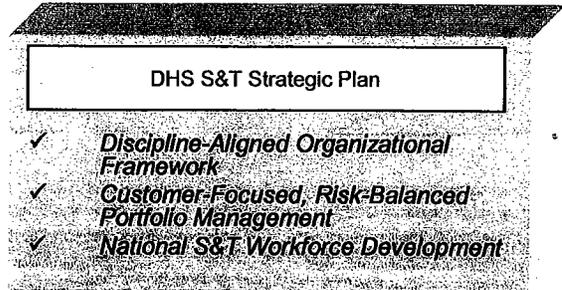# Department of Homeland Security

Science and Technology Directorate

Strategic Plan
With Attachments

May 2007

The *Homeland Security Act of 2002*, which established the Department of Homeland Security (DHS), gives the Science and Technology Directorate (S&T) the responsibility for advising the Secretary on research and development efforts and priorities to support the Department's mission, and conducting basic and applied research, development, testing and evaluation (RDT&E) activities relevant to the Department through both intramural and extramural programs.

DHS S&T Strategic Plan
- ✓ Discipline-Aligned Organizational Framework
- ✓ Customer-Focused, Risk-Balanced Portfolio Management
- ✓ National S&T Workforce Development

In fulfillment of the enabling and follow-on legislation, Secretary Chertoff articulated the following goals for the Department: protect the Nation from dangerous people; protect the Nation from dangerous goods; protect critical infrastructure; build a nimble and responsive emergency response system; build a culture of preparedness; and strengthen and unify DHS operations and management. Consistent with his goals, this strategic plan provides the strategy and planning framework to guide the Directorate's activities over the next five years to fulfill its responsibilities. The plan describes the S&T Directorate's organizational framework and the associated customer-focused, risk-balanced research portfolio management strategy that supports the Department's mission of making our Nation more secure. Also addressed is the importance of developing a strong homeland security science and technology national workforce through the professional development of the employees within the S&T Directorate, and through research and educational opportunities that will enable the long-term homeland security intellectual base.

Accompanying this version of the strategic plan are three attachments which provide more details on topics discussion in the plan:

Attachment 1: S&T Directorate Five-Year Research and Development Plan (FY 2007-2011)
Attachment 2: HIPS and HITS (S&T Directorate Homeland Innovative Prototypical Solutions and High Impact Technology Solutions)
Attachment 3: Capstone IPT Representative High Priority Technology Areas

INTRODUCTION

The S&T Directorate's mission is to improve homeland security by providing to our customers, the operating components of DHS and state, local, tribal and territorial emergency responders and officials, state-of-the-art technology that helps them accomplish their missions. A recent review of strategy and technology requirements resulted in a shift in the Directorate's focus to a new strategic approach. This new approach, reflected in a realigned organization and research portfolio management strategy, will allow us to better identify, enable, and transition new capabilities to our customers to better protect the nation. To that end, the S&T Directorate develops and manages an integrated program of science and technology, from basic research through technology product transition. The managers of this program are predominantly active scientists and engineers in the technical disciplines relevant to Homeland Security. They are guided by a risk-diverse, multi-tiered investment strategy based primarily on the stated needs of our customers balanced with emerging technology opportunities.

The programmatic priorities outlined in this Plan are the result of a process that is largely driven and led by our customers. The majority of the S&T Directorate's investment will favor lower-risk projects dedicated to addressing a customer-defined capability need within three years. About 10 percent of the

S&T investment will be targeted towards higher risk innovative prototypical demonstrations, which, if successful, will place advanced technology in the operating components hands much more quickly than the incremental improvements typical of most acquisition programs. About 20 percent of the S&T Directorate's investment portfolio will be focused on long-term, basic research conducted primarily in universities and laboratories in areas of enduring homeland security relevance that could lead to revolutionary changes in the way we approach homeland security challenges.

The S&T Directorate's long-term success is dependent on the development of our workforce and on our leadership of the homeland security research enterprise. The leadership principles and management initiatives outlined in this plan support the priority we place on hiring, retaining and motivating a quality workforce. The previous morale problems within the S&T Directorate have been well documented and are understood. Going forward, the S&T Directorate leadership is addressing this problem by placing a priority on treating our workforce with respect and honesty; employing them with meaningful, fulfilling work; and ensuring that they have the resources to effectively and efficiently accomplish their mission. In leading the homeland security research enterprise outside of the S&T Directorate, we are proactively engaged with universities, research institutions, government laboratories, and private industry that conduct research and development in areas important to addressing our customers' homeland security requirements.

THE S&T DIRECORATE – ALIGNED FOR SUCCESS

The Directorate's R&D functions are aligned into six technical divisions along enduring functional disciplines. This, along with additional offices, allows us to better meet the Department's strategic goals. These Divisions and disciplines for research, development, testing and evaluation (RDT&E) programs include:

- **Explosives** – Aviation Security; Mass Transit Security; Counter MANPADS
- **Chemical/Biological** – Chemical and Biological Countermeasure R&D; Threat Characterization; Operations; Agro-Defense; Biological Surveillance; and Response & Recovery
- **Command, Control, and Interoperability (C2I)** – Information Management; Information Sharing; Situational Awareness; Interoperability and Compatibility; and Cyber Security
- **Borders & Maritime Security** – Land Borders; Maritime; and Cargo Security
- **Human Factors** – Social-Behavioral Terrorist Intent; Human Response to Incidents; and Biometrics
- **Infrastructure Protection & Geophysical Science** – Critical Infrastructure Protection; Regional, State and Local Preparedness and Response; and Geophysics

These technical Divisions are linked to three research and development investment portfolio directors in a "matrix management" structure. These three portfolio directors – Director of Research, Director of Transition, and Director of Innovation/Homeland Security Advanced Research Projects Agency (HSARPA) – provide cross-cutting coordination of their respective elements (or thrusts) of the investment strategy within the technical Divisions. Each technical Division is comprised of at least one Section Director of Research who reports to the Director of Research in addition to the Division Director so that a crosscutting focus on basic and applied research capability is maintained and leveraged, and a Section Director of Transition who reports to the Director of Transition in addition to the Division Director to help the division stay focused on technology transition. The Director of Transition coordinates within the Department to expedite technology transition and transfer to customers. The Director of Innovation/HSARPA sponsors basic and applied homeland security research to promote revolutionary changes in technologies; 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 and works with each of the Division Heads to pursue game-changing, leap-ahead technologies that will significantly lower costs and markedly improve operational capability through technology application.

This cross-cutting coordination facilitates unity of effort. The matrix structure also allows the S&T Directorate to provide more comprehensive and integrated technology solutions to its customers by appropriately bringing all of the disciplines together in developing solutions.

OFFICE OF THE UNDER SECRETARY FOR SCIENCE & TECHNOLOGY
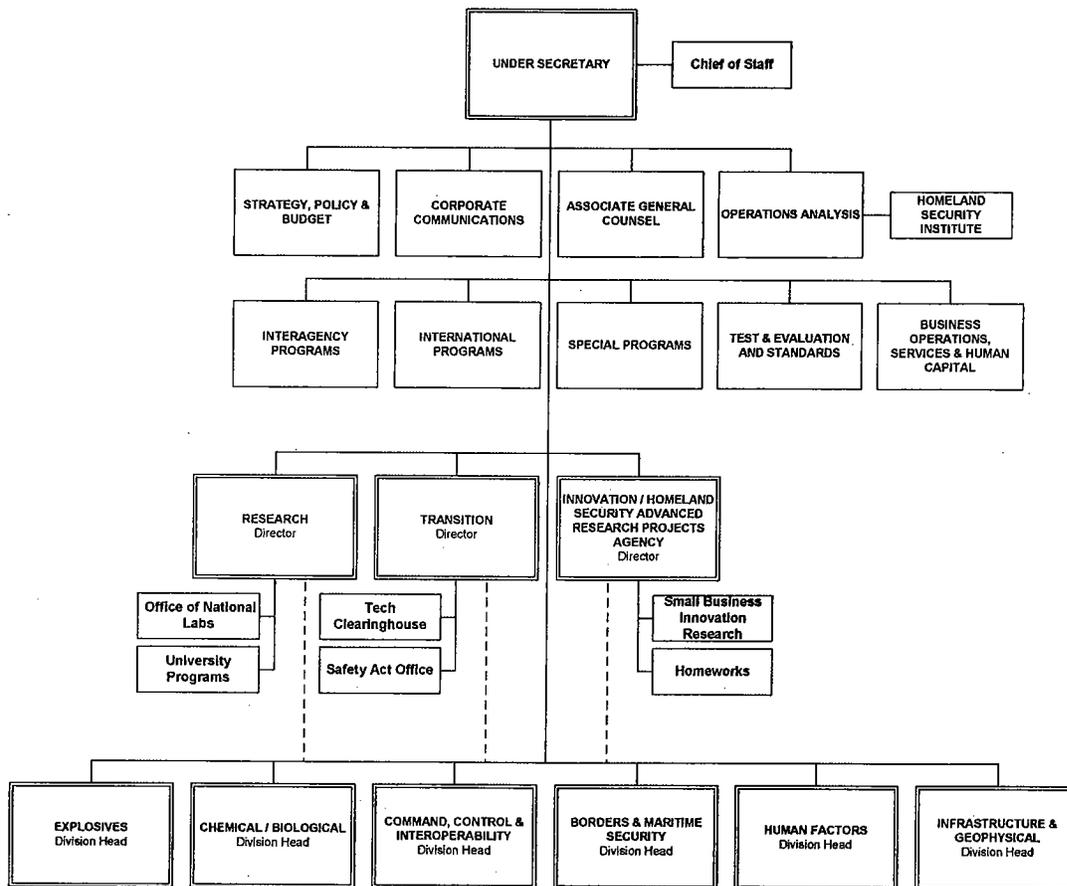
In addition to the six Divisions and the three Directors, the realigned organization features additional offices that support a range of critical missions. These include:

- The Test and Evaluation and Standards Division works to ensure independent objective testing of technology developments by the six Divisions and across DHS. Additionally, this Office oversees standards development for the effective operation and interoperability of technology;
- The Office of Special Programs coordinates highly classified projects executed by the six Divisions;

- The Office of Operations Analysis supports risk analysis and manages the Homeland Security Institute studies and analysis efforts which helps form the Department's basis for risk informed decision making; and
- The Interagency and International Programs Divisions facilitate government-wide science and technology coordination and provides outreach to U.S. allies.

BALANCING S&T DIRECTORATE INVESTMENT

Along with the organizational alignment discussed above, the S&T Directorate has also aligned its investment portfolio to create an array of programs that balance project risk, cost, mission impact, and the time it takes to deliver solutions. The S&T Directorate executes projects across the spectrum of technical maturity and transitions them in accordance with our customers needs. Our investment portfolio is balanced across long-term research, product applications, and leap-ahead "game-changing" capabilities while also meeting mandated requirements. This balanced portfolio ensures that the Directorate maintains a self-replenishing pipeline of future capabilities and products to transition to customers.

The S&T Directorate's five-year research and development plan details this investment portfolio, outlines the Directorate's activities and plans at the division level, and includes each division's research thrusts, programs, and key milestones. It supports the Department's strategic plan and priorities as well as the S&T's Directorate priorities. The five-year plan is our roadmap to achieving success; however, our planning process must be flexible and nimble to adjust to a changing homeland security environment. The plan will be updated annually to ensure it continues to address the correct set of priorities, fills our customer's homeland security capability gaps, and enables a safer homeland.

To ensure that we meet the needs of the Department and the Nation, the S&T Directorate's customer-focused and output-oriented approach requires that its investment portfolios balance across four investment portfolio categories. These categories along with the Under Secretary's desired investment targets are as follows:

DHS S&T INVESTMENT PORTFOLIO
Balance of Risk, Cost, Impact, and Time to Delivery

Product Transition (0-3 years)	Innovative Capabilities (2-5 years)
• Focused on delivering near-term products/ enhancements to acquisition • Customer IPT controlled • Cost, schedule, capability metrics Investment target→50%	• High Risk/High payoff • "Game-changer/Leap ahead" • Prototype, Test, and Deploy • HSARPA Investment target→10%
Basic Research (>8 years)	Other Spending (0-8+ years)
• Enables future paradigm changes • University fundamental research • Government lab discovery & invention Investment target→20%	• Laboratory Facilities • Test & Evaluation/Standards • Management and Administration Investment target→20%

Customer Focused, Output Oriented

Basic Research (> 8 years)

The S&T Directorate's basic research portfolio addresses long-term research needs in support of DHS mission areas that will provide the Nation with an enduring capability in homeland security. This type of focused, sustained research investment has great potential to lead to paradigm shifts in the nation's homeland security capabilities.

The S&T Directorate's basic research program enables fundamental research at our universities, government laboratories and in the private sector. It is vital that basic research be funded at reasonably consistent levels from year to year to ensure a continuity of effort from the research community in critical areas that will seed homeland security science and technology for the next generation of Americans.

The Director of Research is currently evaluating approaches to meaningfully and effectively measure performance in basic research using a process that can be uniformly and transparently applied across the six S&T divisions. The research program's success will be demonstrated, in part, by peer reviewed papers, patents, conferences and workshops attended, prizes awarded (e.g., professional, society, and honorary prizes). Additionally, there should be demonstrated progress in defining how research results will be transitioned into application.

Innovative Capabilities (2 to 5 years)

The S&T Directorate's Innovation/HSARPA portfolio supports a key goal of putting advanced capabilities into the hands of our customers as soon as possible. It has made important inroads in research areas aligned with our DHS customers. Toward this end, the S&T Directorate has introduced two important new initiatives. One of these, Homeland Innovative Prototypical Solutions (HIPS) is designed to deliver prototype-level demonstrations of game-changing technologies within two to five years.

The second initiative, High Impact Technology Solutions (HITS), is designed to provide proof-of-concept solutions within one to three years that could result in high-payoff technology breakthroughs. While these projects are very high-risk, they offer the potential for "leap-ahead" gains in capability should they succeed. While projects are separately budgeted in "Innovation/HSARPA" (based on moderate to high risk with a high payoff, if successful), all are executed within the six technical divisions. Because of the short timeline for HIPS and HITS, we anticipate that these projects could quickly provide solutions to fill DHS components' capability gaps.

The S&T Directorate also manages an active Small Business Innovative Research (SBIR) program on behalf of DHS. The Directorate issues two or more solicitations each year and generates multiple awards for the small business community. The solicitations address topics in areas that are aligned with the six technical divisions.
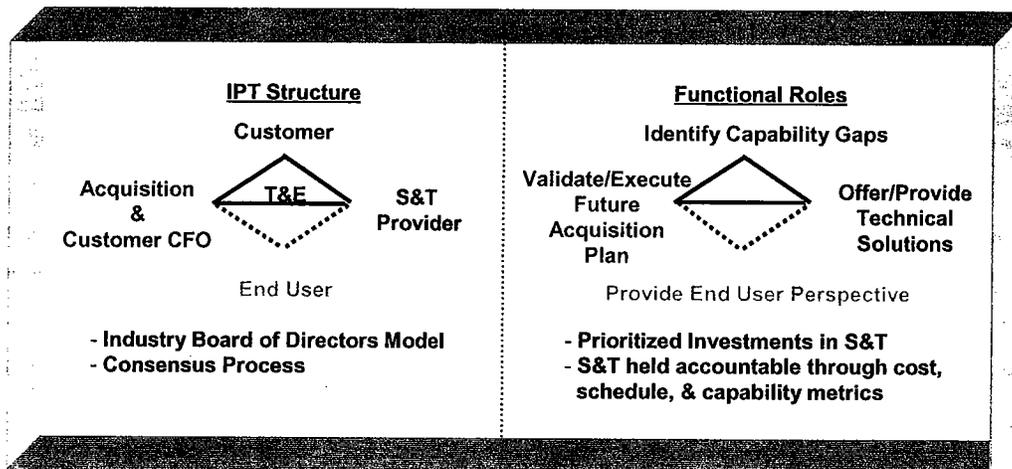
The HIPS and HITS portfolio is made up of projects that deliver either prototypes or proof-of-concept level demonstrations. To measure success, the Innovation portfolio will monitor the projects to ensure they are meeting cost, schedule, and performance goals through monthly technical and financial reports, quarterly reviews held by the program managers either at the vendor site or at DHS, and full program status briefings to the Under Secretary for S&T every six months.

Product Transition (0-3 years)

The S&T Directorate is committed to being customer-focused and to delivering capabilities that DHS components can rely on to meet their operational needs. To accomplish this, we facilitated customer-led Capstone Integrated Product Teams (IPTs) that are charged with identifying functional capability requirements across the Department. The products of these IPTs are used to influence and inform the research and development (R&D) efforts of the S&T Directorate, and enable the Directorate to identify

the highest priority needs and allocate resources to those programs that support the priorities established by the DHS customers.
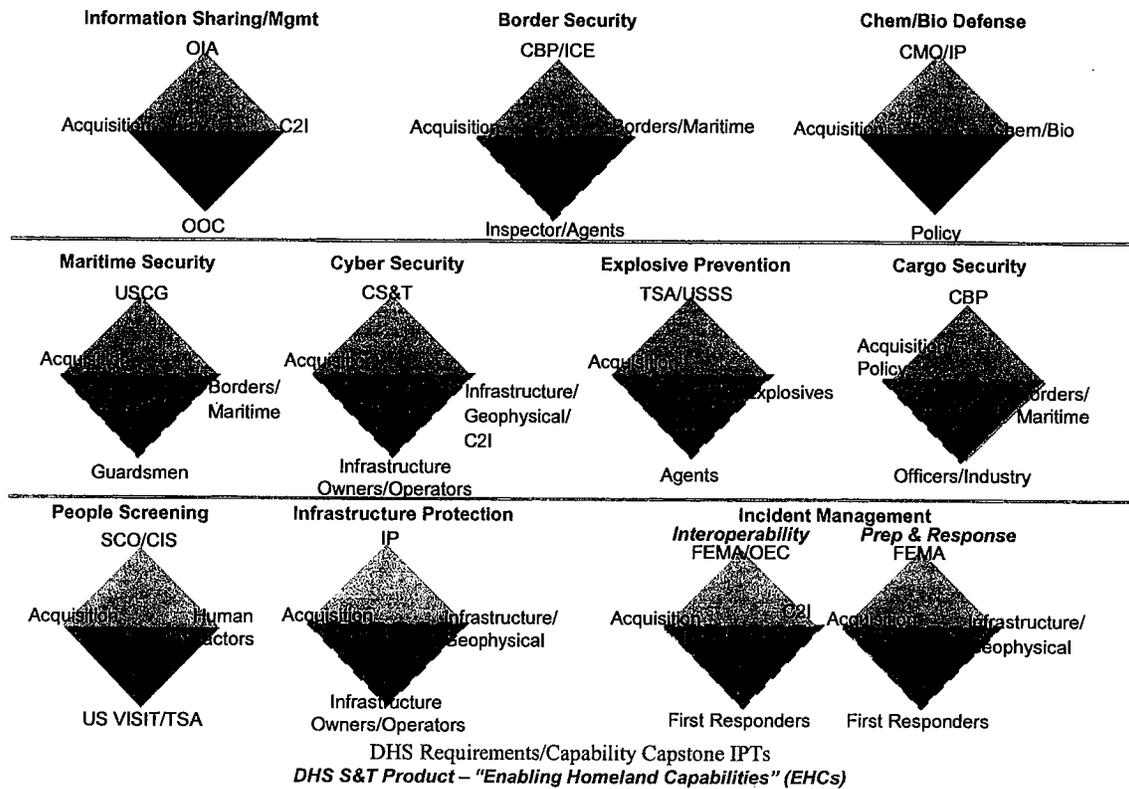
The S&T Directorate's new business model of structured Capstone IPTs ensures that product transition investments align to customer mission requirements. The Directorate facilitates the Capstone IPTs, providing subject matter expertise, administrative support and coordination.

IPT Structure

Customer

Acquisition & Customer CFO — T&E — S&T Provider

End User

- Industry Board of Directors Model
- Consensus Process

Functional Roles

Identify Capability Gaps

Validate/Execute Future Acquisition Plan — Offer/Provide Technical Solutions

Provide End User Perspective

- Prioritized Investments in S&T
- S&T held accountable through cost, schedule, & capability metrics

Capstone IPTs will identify, validate, and prioritize capability requirements for S&T Directorate customers to define IPT investments in Enabling Homeland Capabilities

Capstone IPTs have been established for 11 major Homeland Security functional areas: information sharing/management, cyber security, people screening, border security, chemical/biological defense, maritime security, explosive prevention, incident management, interoperability, cargo security, and infrastructure protection.

The Capstone IPTs are led by senior leadership from DHS Components that have major equities in the corresponding functional area. Planning along functional lines rather than organizational structure helps to ensure a more integrated approach to developing technologies that support multiple components within the Department. Each Capstone IPT works to identify, validate, and prioritize capability requirements across the Department (within a functional area) that the S&T Directorate can address. In addition to each division functioning as the technology provider, we include our other federal partners who also offer technology. Our customers use the IPT-generated information to define their acquisition investments in Enabling Homeland Capabilities (EHCs) – the S&T Directorate-proposed solutions are designed to meet identified capability requirements. The S&T Directorate's product transition process ensures that appropriate technologies are engineered and integrated into the DHS acquisition system for our customers.

Information Sharing/Mgmt
OIA
Acquisition · C2I
OOC

Border Security
CBP/ICE
Acquisition · Borders/Maritime
Inspector/Agents

Chem/Bio Defense
CMO/IP
Acquisition · Chem/Bio
Policy

Maritime Security
USCG
Acq · Borders/Maritime
Guardsmen

Cyber Security
CS&T
Acq · Infrastructure/Geophysical/C2I
Infrastructure Owners/Operators

Explosive Prevention
TSA/USSS
Acq · Explosives
Agents

Cargo Security
CBP
Acquisition Policy · Borders/Maritime
Officers/Industry

People Screening
SCO/CIS
Acq · Human Factors
US VISIT/TSA

Infrastructure Protection
IP
Acq · Infrastructure/Geophysical
Infrastructure Owners/Operators

Incident Management
Interoperability
FEMA/OEC
Acquisition · C2I
First Responders

Prep & Response
FEMA
Acquisition · Infrastructure/Geophysical
First Responders

DHS Requirements/Capability Capstone IPTs
DHS S&T Product – "Enabling Homeland Capabilities" (EHCs)

The S&T Directorate's product transition process ensures that appropriate technologies are harvested and integrated into the DHS acquisition system for our customers. Capstone IPTs coordinate closely with all DHS stakeholders to develop the best EHC proposals to respond to customer capability requirements. EHC proposals are evaluated and assessed in an annual formal process that culminates in DHS senior leadership approval of EHCs determined to be the highest priority for product transition investment. The venue for senior leadership review is a DHS-established Technology Oversight Group, chaired by the Deputy Secretary for Homeland Security. Upon DHS leadership approval of proposed EHC investments, Capstone IPTs monitor the progress of these programs through project-IPTs and during periodic program reviews. Project-IPTs coordinate the details associated with the technology transition as well as monitor the progress of individual efforts. The oversight process is transparent and includes provisions for: budget reviews; annual Capstone IPT transition status reports on all approved EHCs; and a detailed annual (at minimum) program review at the S&T Directorate level, which is open to the DHS community and other government and industry stakeholders at large.

One of the primary benefits of the Capstone IPT process is improved coordination across the Department to meet common functional missions through technology solutions. Additionally, the process of bringing together functional experts has identified promising solutions and opportunities for collaboration among components to meet the mission demands of the Department. The interaction of technologists and operators has improved the prioritization of efforts, and the focus on relevant, cost-effective solutions that make a significant difference. In addition, while the Capstone IPTs have the primary responsibility of overseeing and providing input to the Transition programs, the process also informs leadership about the challenges and concerns, and focuses both the Research and Innovation program areas.

S&T's Technology Clearinghouse and TechSolutions initiatives provide direct support to First Responders' technology needs to assist them in doing their jobs more rapidly, effectively and safely. The Technology Clearinghouse is designed to be a "one-stop shop" for access to technology information for

Federal, State, and local Public Safety and First Responder communities; it will assist First Responders in making informed procurement decisions based on performance testing, accelerate the development of standards, and provide best practice forums to share tactics, training and procedures. TechSolutions provides a web-based mechanism for First Responders to submit high priority capability gaps for rapid prototyping; the program responds by identifying existing technology that may meet the need, or if nothing is available, proceeding with the rapid prototyping of an appropriate solution to be fielded in less than one year.

A successful Transition portfolio requires sustained feedback from our customers to ensure our programs effectively address their capability gaps. Customer satisfaction surveys will allow the Components to communicate their overall level of satisfaction with the end-products/capabilities developed and transitioned from the S&T Directorate. The surveys will be tied to a measure that will be used to indicate the Directorate's outcome-based performance. Additional measures of success include Technology Readiness Levels (TRLs) that provide the needed capability in a timely manner at an affordable cost which ultimately enables the customer with mission capability.

ENABLING U.S. LEADERSHIP IN SCIENCE & TECHNOLOGY

In executing its portfolio of investments, the S&T Directorate will draw upon the research and development capability across the public enterprise, private sector, and academia to locate and promote the best R&D possible. This consortium of capability is referred to as the Homeland Security Research Enterprise. With the authorities provided in the *Homeland Security Act of 2002*, the S&T Directorate has the organic ability to leverage not only DHS laboratories, the Homeland Security Institute, and the DHS Centers of Excellence, but also the DOE National Laboratories to meet homeland security research requirements.
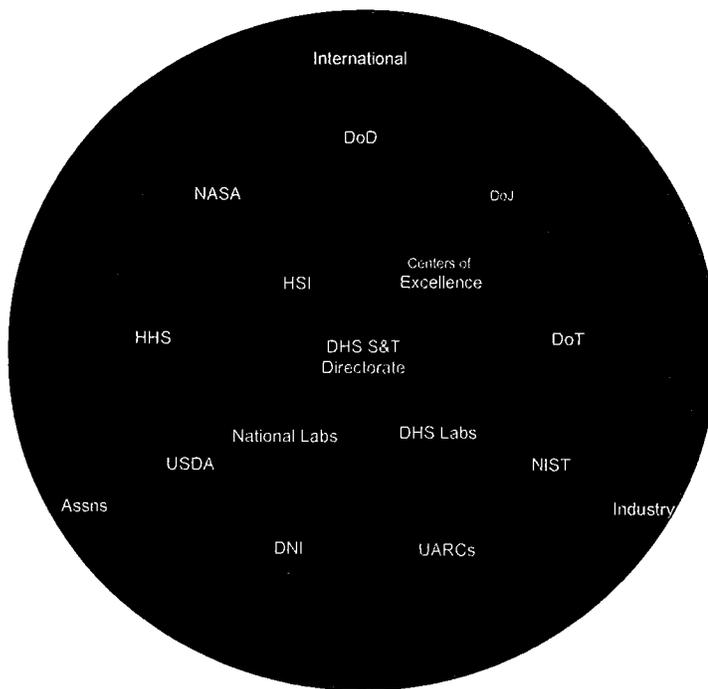
Additionally, to locate the best existing solutions or to find performers to develop appropriate homeland security technologies, the S&T Directorate has authority to use other government agencies' research resources including those of the Department of Defense

Homeland Security Research Enterprise

(DoD), the National Institute of Standards and Technology (NIST), the Department of Health and Human Services (HHS), the U.S. Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the Department of Justice (DOJ), the National Science Foundation (NSF), and DoD Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), as well as industry, international partners, and stakeholder associations

Within the S&T Directorate, the Interagency Programs Division is responsible for coordinating with other Executive Branch agencies to reduce duplication and identify unmet needs, and to help the Department tap into science and technology communities across the government for solutions to counter domestic terrorism. The DHS Under Secretary for S&T co-chairs the National Science and Technology Council's Committee on Homeland and National Security (CHNS) with the DoD Director, Defense Research and Engineering, and a representative from the Office of Science and Technology Policy (Executive Office of the President). This Cabinet-level Council is the principal means within the Executive Branch to coordinate science and technology policy across the diverse entities that make up the Federal research and development enterprise. DHS subject matter experts also are assigned to appropriate subcommittees of the CHNS focused on different aspects of science and technology and working to coordinate across the federal government.

Finally, we also know that we must look beyond our nation's borders for solutions in combating domestic terrorism. Since science and technology plays an ever-increasing role in global response to the threat of terrorism, the S&T Directorate is teaming with international partners. The diverse experiences and varied problem-solving strategies of other countries provide rich resources for U.S. efforts to seek solutions to the problems that exist irrespective of national boundaries and borders. To this end, the S&T Directorate has concluded numerous government-to-government Memorandums of Agreement (MOA) that provide an umbrella framework for cooperation to conduct joint research, development and evaluation; share data; leverage resources; and eliminate unnecessary duplication for the highest priority technologies. The S&T Directorate is continuing to move forward to negotiate additional MOAs with countries and international organizations of high priority.

The *National Strategy for Homeland Security* cites the Department as the lead for guiding the national research enterprise of companies, universities, research institutions, and government laboratories in conducting research and development on a broad range of issues. On behalf of the Department, the S&T Directorate will guide this Homeland Security Research Enterprise in fielding capabilities that support homeland security. In turn, the Directorate has access to the resources across the public and private sectors, improving its ability to address capability gaps. The following are examples of this valuable enterprise.

University Based Centers of Excellence
The S&T Directorate is reinventing a robust, results-oriented network of Homeland Security Centers of Excellence (COEs) to leverage the independent thinking and ground-breaking capabilities of the Nation's colleges and universities. The COEs are conducting multidisciplinary research and education, each focused on an area critical to homeland security. The Office of University Programs is providing the communications and infrastructure to produce, share, and transition the Centers' research results, data, and technology to customers and end users.

Currently, COEs connect experts and researchers at more than 80 colleges and universities, including several Minority Serving Institutions (MSI). More than 20 partners representing industry, laboratories, think tanks, nonprofit organizations, and other agencies also participate. University Programs is coordinating COE efforts with other S&T Directorate-sponsored, university-based initiatives. Under the new S&T Directorate organizational construct, existing COEs are being strategically aligned with at least one Directorate division or to Directorate-wide activities, such as Operations Analysis and the Homeland Security Institute, in a structure that will best support the Divisions' fundamental research and development activities and other requirements.

The S&T Directorate will establish additional COEs over the next two fiscal years to help round-out the Directorate's need for university-based research. The new COEs will combine the research missions of

some existing COEs and add new research areas under the division-aligned construct to meet DHS needs. We will establish new COEs in the areas of explosives detection, mitigation, and response; border security and immigration; maritime, island, and extreme/remote environment security; and natural disasters, coastal infrastructure and emergency management.

A competitive selection process ensures that diverse institutions of high quality and academic merit participate from as many geographical areas of the United States as practicable. Once the COEs are aligned, one third of the COEs will be re-competed every two years for a six-year term.

DHS Scholars and Fellows Program

DHS education programs are helping to attract and nurture future scientific leaders for the homeland security workforce and to strengthen the expertise of our existing labor pool. University Programs is engaging high-performing students through the DHS Scholars and Fellows program. Increasingly, the S&T Directorate's scholarships and fellowships will become aligned to the Centers of Excellence and to the DHS mission. During this period of transition, we will honor our commitments to all currently participating Scholars and Fellows. Summer internships at DHS and National Laboratories between sophomore and junior, and junior and senior years will help reenergize our Nation's S&T workforce. Government service "pay back" after graduation may be a feature of the Scholars and Fellows program.

Office of National Laboratories (ONL)

In carrying out its mission, the S&T Directorate works to develop, sustain, and renew a coordinated network of DOE National Laboratories, Federal laboratories and University Centers needed by multi-disciplinary teams of scientists, engineers and academics to discover, develop and transition homeland security capabilities to operational end-users.

ONL provides the Nation with a coordinated, enduring core of productive science, technology and engineering laboratories, organizations and institutions, which can supply knowledge and technology required to secure our homeland. In addition to oversight of laboratory operations in direct support of the Department and its missions, ONL also has the specific responsibility for coordinating homeland security-related activities and laboratory-directed research conducted within the DOE National Laboratories.

Just as the university-based Centers of Excellence have been aligned to the DHS S&T Directorate organizational structure, DHS, DOE and other National Laboratories have been aligned to support one or more of the S&T six technical divisions. The S&T Directorate has coordinated with the Directors of the National Laboratories to develop a new governance model that will leverage the validated core competencies of the Laboratories in support of the Directorate's basic research, transition and innovation priorities, and do so in competitive environment which best engages intra- and inter-Laboratory performers to address S&T's current and emerging needs.

Industry Participation in DHS Science & Technology

Industry is a valued partner of the S&T Directorate and its continued participation in developing solutions for homeland security applications is vital to our effort to safeguard the nation. Consistent with the Directorate's new structure, our Innovation/HSARPA portfolio and six technical divisions will proactively seek industry participation to address specific challenges in their respective areas. For example, Innovation/HSARPA has recently posted Broad Agency Announcements (BAAs) seeking expertise in tunnel detection technologies, container security, and a mobile screening laboratory to support human screening research and development in the field. Many more are being announced on an ongoing basis.

The Support Anti-terrorism by Fostering Effective Technologies (SAFETY) Act of 2002, administered by the S&T Directorate, is proving to be a valuable tool in expanding the creation, proliferation and use of cutting edge anti-terrorism technologies throughout the United States. The Office of SAFETY Act Implementation (OSAI) has made significant strides in reducing application processing time and providing more Qualified Anti-Terrorism Technologies (QATTs) that could save lives. Through increased efficiencies and process improvements, the average time to process SAFETY Act applications has been reduced from 233 days in the early days of the program to less than 140 days in FY 2007.

As part of our outreach efforts to encourage greater industry participation, the Directorate plans to host two yearly Homeland Security Science and Technology Stakeholders Conferences in the U.S. (east and west coasts), and one international event. These conferences will inform government, industry and academia of the direction, emphasis, and scope of the research investments by the S&T Directorate, and provide information about business opportunities. The conference will provide visibility into new and emerging technologies through an Innovation Gateway Marketplace. The Marketplace, held during the Stakeholders Conferences, gives industry the opportunity to meet with S&T staff, ask questions about our activities, see and show new technologies, submit ideas, and to discuss concepts that may support the Department's mission and goals.

DEVELOPING OUR PROFESSIONAL WORKFORCE

As a knowledge-based organization, the S&T Directorate's most valuable resource truly is its people. We must have a professional team that can help us meet the dynamic challenges of science and technology research and education. Recruiting the highest quality workforce and the stability that results from an appropriate retention rate is vital to the long-term success of the S&T Directorate. To that end, we have developed an effective blend of highly qualified permanent government and visiting personnel (e.g., detailees from other government agencies, individuals assigned under the authority of the *Intergovernmental Personnel Act* (IPA), etc.), as well as a dedicated team of contract support employees. All of these categories of employees are important to the effective and efficient operation of the S&T Directorate. We have defined the needed positions based on our mission and organizational structure, and we plan to be fully staffed by the end of 2007.

A world-class Federal S&T management workforce is the foundation of the S&T directorate. They determine program scope, goals, milestones and deliverables, and manage the research providers associated with their projects to ensure that the government and the American people get top value for every precious S&T dollar. This level of responsibility requires that most S&T Federal employees be senior (GS-13/14/15 or equivalent). Because there is limited upward mobility within the S&T Directorate for these relatively senior employees, and because we are dedicated to their continued education and professional development, we expect that S&T employees will become highly desired and potentially be recruited for positions of increased responsibility across DHS and the rest of the government. In order to retain them, it is incumbent upon S&T leadership to create a work environment and culture that makes an individual's decision to accept employment elsewhere very difficult. However, if an employee determines that it is in his or her best personal interest to leave S&T, S&T leadership will champion that cause; as S&T develops a reputation as a place where "good things happen to good people," more good people will follow, and the Directorate will remain strong.

The S&T Directorate's utilization of the IPA is consistent with the Federal government's policy as detailed in guidance provided by the Office of Personnel Management (OPM) with particular attention to strict adherence to ethics, standards of conduct and conflict of interest provisions. S&T will generally use a broad and competitive process in an effort to select the best-qualified applicant for a vacant position.

The authorities provided in the IPA allow S&T to complement the career Federal workforce with diverse, high-quality candidates possessing a wide variety of academic and professional backgrounds and demonstrated leadership skills. Absent extraordinary circumstances, we will not fill a career-reserved Senior Executive Service (SES) position using an IPA assignee. Career-reserved SES positions generally involve program management of grants and contracts that are often problematic for IPA assignees because of potential or perceived conflicts of interest as a result of their employment with their parent organizations or institutions.

Contract support employees are utilized within S&T to efficiently supplement the government staff in roles that are not inherently governmental, particularly in cross-organizational functional support areas. They work as an integral part of the S&T team, and are focused on developing a specific end-product based on their specific skills. They will exercise independent judgment and analysis while following the instructions in the Statement of Work of the relevant contract or task order.

We must ensure that our personnel have the skills and competencies required to succeed in a technologically changing environment, that we continuously develop our employees so that their skills never become outdated, that we acknowledge the very direct link between the job they do and the capabilities their work enables, and that we maintain an environment in which their contributions towards that end are recognized. Additionally, our world-class employees deserve a world-class work place environment that will be the standard: advancement based on merit; reward for creativity and innovation; sub-par performance effectively addressed; a team motivated by leadership; recognition for a job well done; and information about what is going on within the organization.

The S&T Directorate supports the Department's initiatives, shown above, to enhance employee satisfaction and motivation. Consistent with the Department's goals, the Directorate is committed to a management approach that achieves the following goals within S&T:

- *Recruit, train, and retain a workforce skill set mix focused on research and transition*

- *Maintain a personnel evaluation system that is based on performance and is fair*

- *Recognize the contributions by personnel at all levels*

- *Ensure S&T team members understand their roles in articulating and pursuing a successful customer-based investment strategy*

We have embarked upon a strategy that will allow us to achieve our goals. Several examples of specific activities demonstrate that commitment.

The STORM. The Under Secretary has issued the first S&T Organization and Requirements Manual (STORM) that clearly defines functions, duties and responsibilities for the administration and management of the Directorate. The STORM also tells our customers who we are and how we function so they may better understand the capabilities we can bring to bear in support of their protective missions.

Improved Communications.

All-Hands. To keep our staff informed of the plans for organizational realignment and provide a forum for asking questions and expressing their views and concerns, the

Directorate holds "All Hands" meetings at regular intervals, normally every four to six weeks, to brief all Directorate staff, including teleconference links with staff in other locations such as the Transportation Security Laboratory in Atlantic City, the Plum Island Animal Disease Center, and the Environmental Measurements Laboratory in New York City. These meetings are also a forum to recognize staff achievements, answer questions, solicit input, and express gratitude for their excellent work and their cooperation.

Small-Group Discussions. To complement the All-Hands meetings, the DHS S&T Directorate Chief of Staff meets with smaller groups of the Directorate (a division or office – 10-25 people) biweekly in an informal setting. This provides an additional opportunity to pass information to the employees (such as how their efforts fit into DHS accomplishments), but more importantly it provides a forum for employee interaction with senior leadership at a more personal level than is possible at the All-Hands meetings. The primary goal of these gatherings is to allow employees to highlight resource shortfalls or cumbersome work practices that are impeding them in accomplishing their missions.

"S&T Snippets". The S&T Corporate Communications group puts out, by e-mail, a mini-newsletter every few days called "S&T Snippets". It includes news of general interest regarding the S&T Directorate.

Process Improvement Teams. To address organizational and process inefficiencies, appropriately constructed workforce teams analyze and implement process improvement in various functional areas. These teams have a common goal: remove organizational and procedural obstructions that hinder the Directorate's ability to accomplish its mission.

Career Progression Planning. To ensure our S&T workforce has viable career opportunities within the Federal Service, we are developing individualized career plans for each Federal employee based on their interests, talents, and potential. These plans will incorporate necessary educational and professional development opportunities as well as professional certifications that will enhance their opportunity for advancement, and make the S&T Directorate a more effective and efficient organization.

Family Involvement. Our workforce spends a significant portion of their daily lives at work. It is important that they understand the S&T leadership recognizes they are more than employees, they are also husbands, wives, fathers, mothers, sons and daughters. The Directorate periodically conducts events (holiday parties, picnics, etc.) that include family members to help them gain a better appreciation for the contribution their loved one is making to our Nation's safety.

SUMMARY

Our nation's advantage in science and technology is a key to securing the homeland. To ensure we fully use this competitive edge, the S&T Directorate has undertaken major organizational changes designed to break down organizational barriers and foster greater inter-reliance among innovation, research, and transition programs. The strategy is to remain customer-focused and output-oriented – empowering customers to set priorities to meet the needs of tomorrow's homeland security – while proactively pursuing technology that could offer our DHS customers revolutionary means to better secure our Nation. With this focus, we can define what we will do for our customers, how we will do it, and how we will measure success.

Most importantly, we recognize our most valuable asset is not new equipment or technology, but rather our dedicated, flexible, and agile cadre of knowledgeable workers. Our workforce embraces personal characteristics of integrity, diversity, challenge to the ordinary, and brings diverse skill sets to the Directorate's mission. We must therefore create a work environment in which our people are encouraged and rewarded for using initiative to anticipate and improvise to changing circumstances or sudden opportunities. This is a culture of organizational excellence that promotes a common identity, innovation, mutual respect, accountability and teamwork to achieve efficiencies, effectiveness and operational synergies.

This strategic plan outlines the four cornerstones of our strategic approach – our organization, our people, our financial systems, and the mixture of capability- and opportunity-based content of our programs that come to bear on fulfilling our responsibilities as established by the *Homeland Security Act of 2002*. They are the components of a business model and a strategy that allow us to address our customers' needs and pursue technology opportunities that eventually lead to capabilities that will make our Nation safer.

Department of Homeland Security

Science and Technology Directorate

Five-Year Research and Development Plan
Fiscal Years 2007-2011

May 2007

TABLE OF CONTENTS

PURPOSE OF THIS REPORT

The Fiscal Year 2007 Appropriations Conference Report 109-699, which accompanied the *Department of Homeland Security (DHS) Appropriations Act, 2007*, states the following: "The conferees expect S&T to greatly improve its research strategic plan and its budget documents. These documents should reflect the new vision for S&T as proposed by the Under Secretary. The conferees direct the Under Secretary to develop a five-year research plan, which outlines its priorities, performance measures for each portfolio and resources needed to meet its mission. This plan should also incorporate a business model for its output of services and technologies to its end user. The conferees expect the Under Secretary to brief the Committees on Appropriations no later than 180 days after the date of enactment of this Act." Additional language from the House Appropriations Committee report (109-746), requires the following:

- "As noted previously in this report, the Committee is concerned that component managers seem unaware that S&T is performing work on their behalf. The Committee believes that component needs should be incorporated into Conventional Missions activities to provide customer-oriented, requirements-based research. The Committee directs S&T to include such criteria in the business model described previously in this report."

- "The Department is directed to report to the House Committee on Appropriations, the House Homeland Security Committee and the House Science Committee no later than 180 days after enactment of this Act on the status of its efforts to develop and implement a business model to enable it to: employ its countermeasure activities to combat weapons of mass destruction; lead and coordinate homeland security research and cultivate the next generation of scientists; provide research and consulting services to the component agencies; deliver new, validated technologies to first responders and those who need them most; and other activities deemed necessary by the Secretary."

Developing this Five Year R&D Plan is one of many steps the S&T Directorate has taken as part of its new structure and business approach. We are pleased share this with Congress in response to these requests.

FIVE-YEAR RESEARCH AND DEVELOPMENT PLAN

The following narratives highlight the S&T Directorate's activities and plans for each Division for the next five years. Each section provides a description of the Division, its research thrusts, programs, and key milestones. There is also a table that provides an at-a-glace overview of planned spending in each area. Plans and activities are presented in the same order as the S&T Directorate budget. Sections are as follows:

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

S&T based the out-year milestones and deliverables presented in this five year plan on the most up to date customer requirements, Departmental priorities, available technologies and projected resource levels. Annually, S&T will review the plan and make adjustments as necessary to reflect current risk projections, requirements, priorities, technologies and resources levels.

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)
Border Watch	Border/Maritime Technologies	16,811	14,882	9,828	7,557
	Border Officer Tools and Safety	1,300	-	3,851	6,224
Cargo Security	Cargo & Conveyance Security	13,734	9,949	16,825	15,627
HSI	HSI	559	457	529	509
SBIR	SBIR	1,032	648	660	673
Borders/Maritime Total		33,436	26,536	31,693	30,590

Overview

The Borders and Maritime Security Division 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. The division works closely with its operational customers to identify and generate the best technologies for securing U.S. borders, including ports-of-entry as well as vast stretches of remote terrain and waterways, with the ultimate goal of stopping threats before they enter the United States. The division carries out its activities through two thrust areas: Border Watch and Cargo Security.

Border Watch Thrust Area: This thrust area develops and applies technologies and tools that:
  o increase detection of illegal border activity;
  o reduce manpower; and
  o improve agent response times and increases officer safety.

Activities in this thrust area include developing a network of advanced sensor and communication technologies that will provide law enforcement officers crucial information about illegal activities along the United States border. Currently, border operations, both at and between ports-of-entry, depend highly on a professional's institutional knowledge and aging technology. Through Border Watch technologies, law enforcement officers will have access to information about events in progress from wherever they operate, even in remote areas.

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 migration, and Command 2010, an initiative to enhance command-and-control capabilities for the Coast Guard. The thrust area is composed of the following programs that address different aspects of the border security mission: Border/Maritime Technologies and Border Officer Tools and Safety.

Border/Maritime Technologies Program – This program delivers technologies to provide advanced detection, identification, apprehension and enforcement capabilities along land and maritime borders. The program focuses on developing:
  o detection, classification, and localization sensor technologies to monitor illegal border activity with a wider range and greater accuracy than present-day technologies;
  o command and control systems that deliver a much greater amount of information about events-in-progress to different levels of law enforcement; and
  o 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 when they need it. Starting in FY 2009, the program plans to initiate an activity called BorderTech for the development of sensor technologies and their integration and testing in an operational environment, providing in-the-field capabilities to improve mission effectiveness and agent safety. BorderTech will develop, demonstrate and test unproven technologies as a risk

reduction activity for the Secure Border Initiative Network (SBI*net*). Border/Maritime projects will include the following:

Border Detection Grid - Border Detection Grid will provide a grid of advanced sensors and detection, classification, and localization technologies to detect and classify cross-border movement (e.g., friendly forces, animals, weather, or illegal activity).

Milestones and Deliverables

FY 2007:
- Investigate and report on advanced power sources and energy storage methods for sensors in remote locations.
- Develop a buried fiber optic tripwire system to both sense intrusions and provide communications to remote locations.
- Prototype a radar design specifically for border applications.
- Evaluate electro optic (daytime/visual) camera technologies.

FY 2008:
- Pilot a fiber optic tripwire that can locate activity anywhere along many kilometers of fiber optic cable (on the order of 30 kilometers).
- Conduct an integrated concept test along the Southern Border.

FY 2009:
- Transition activities to operational end-users.

BorderNet - Border Network (BorderNet) is a wireless data network that will connect law enforcement officers in the field to real-time tactical scene awareness information, including geographic features, sensor data, and agent location data; as well as provide access to law enforcement databases.

Milestones and Deliverables

FY 2007:
- Expand BorderNet capabilities in the southwest border by expanding access to multiple law enforcement databases.
- Deploy an in-the-field, 10-fingerprint reading system.
- Leverage the DHS-Unmanned Aerial Vehicles (UAV) surveillance data; improving radio direction and locating individuals conducting surveillance in support of illegal activity.
- Add a law enforcement asset-location tracking capability (blue force tracking).

FY 2008:
- Provide a Northern Border testbed demonstration in a northeast Border Patrol sector that will provide technology insertion and lessons learned to SBI*net*. The testbed will include:
  - multi-sensor fusion;
  - field-level scene awareness; and
  - law enforcement data base query.

FY 2009:
- Transition activities to operational end-users.

SBI Systems Engineering and Modeling and Simulation - Secure Border Initiative (SBI) Systems Engineering and Modeling and Simulation is a set of systems engineering tools and models to 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 2007:

- Develop a full SBI operational architecture that combines:
  - Operational systems and data standards;
  - Comprehensive sensor system trade-offs for detection, identification and tracking; and
  - A comprehensive SBI test and evaluation project.

FY 2008:

- Create full-fidelity, integrated simulation of all aspects of border security to support:
  - decision making;
  - development of investment strategies; and
  - formulation of policy and programs.

FY 2009:

- Review the System of Systems model and ensure it correctly represents the Secure Border Initiative.

FY 2010 and FY 2011:

- Expand model to include smuggling activity, Customs Immigration Services' needs, and SBI evolutionary needs.

BorderTech – BorderTech develops sensor technologies and their integration and testing in an operational environment, 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 (SBI*net*). The project will include:

- o BorderTech Testbed, which provides a test platform for the evaluation of technologies in an operational environment, enabling agent training and tactics development;
- o Tunnel Detection, which takes 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;
- o Advanced Sensor Technologies, which will investigate technologies and methodologies for improving operational performance of unattended ground sensors, Electro-Optical/Infrared devices and associated sensor signal processing; and
- o Advanced Ground Surveillance Radar, which will assess active/passive technologies and demonstrate a system for detecting and tracking humans.

Milestones and Deliverables

FY 2009:

- Conduct technology demonstration and insertion into SBI*net*.

FY 2010:

- Begin the development of Advanced Sensor Technologies.
- Conduct source selection recommendation for Advanced Ground Surveillance Radar.
- Conduct BorderTech demonstration and insertion into SBI*net*.

FY 2011:

- Conduct testing of initial round of Advanced Sensor Technologies.
- Conduct test and evaluation of Advanced Ground Surveillance Radar.

Sensors/Data Fusion and Decisions Aids – The Sensors, Data Fusion, and Decision Aids project develops systems to enable law enforcement officers and commanders to have full situational awareness, enabling effective decision making and execution in a complex and

dynamic operational environment. Current operations rely mostly on verbal coordination for real-time operational knowledge and situational awareness. This project will:
- o provide the capability to fuse tactical information from multiple data sources such as sensors and databases (both law enforcement and commercial databases);
- o provide real-time situational awareness;
- o eliminate scene clutter;
- o automatically identify and automatically track high-risk targets (people/vehicles/vessels);
- o provide decision aids; and
- o facilitate multi-agency coordination for rapid response.

For example, combining information from different types of sensors (sensor fusion) provides more reliable detection and tracking than if the sensors provided individual alarms.

Additionally, in response to a Customs and Border Protection (CBP) request, the S&T Directorate is installing NorthGuard, a western Lake Erie pilot project that demonstrates the operational utility of coupling advanced sensor fusion and tracking technology with a common operational picture for detecting and apprehending border violators. This effort will provide insight into operational issues such as the effectiveness of the Trusted Traveler program and whether other individuals are reporting arrival in the U.S. as required.

Milestones and Deliverables

FY 2007:
- Conduct Northern Border Maritime Data Fusion/Situational Awareness Pilot Development and Demonstration.
- Perform Data Fusion Assessment and Development.

FY 2008:
- Begin Automated Scene Understanding (ASU), and Visualization Tools Initial Development.

FY 2009:
- Develop ASU/Automated Target recognition (ATR) to include recognition of humans and vehicles and demonstrate the system.

FY 2010:
- Initiate development of Advanced Fusion Technologies (AFT).
- Develop ASU/ATR to include over-the-horizon sensors for vessel detection and demonstrate the system.

FY 2011:
- Perform AFT development testing in an operational environment.
- Perform Analysis of Alternatives for pattern discovery and prediction.
- Conduct Analysis of Alternatives for Advanced Situational Awareness and Collaboration Tools.
- Conduct ASU/ATR demonstration of system improvements in an operational environment.

Border Officer Tools and Safety Program – This program provides tools and technologies to enable border security law enforcement perform their mission more efficiently and effectively with a higher level of safety. This program will leverage technologies from other Departments that can potentially be adapted to fit the operational environment and functions of DHS border security components. For example, the program will provide the CBP and Coast Guard officers with the tools they can use to perform inspections of vehicles and vessels.

Boarding/Border Officer Tools - Starting in FY 2009, the program plans to expand on the legacy of Boarding Officer Tools to include land and maritime law enforcement efforts. This Border Officer Tools program activity will improve Border Agents' and Coast Guard 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 (voice & data) between field operators, and between field operators and their command centers. The program will deliver intrusive (requires contact) as well as non-intrusive, non-destructive technologies to aid in the identification of contraband.

Milestones and Deliverables

    FY 2007:
- Develop tools to:
  - communicate among boarding team members;
  - rapidly search vessels;
  - locate hidden compartments;
  - discriminate legitimate cargo from contraband;
  - remotely obtain a positive identification of a person; and
  - accurately determine the contents of shipping containers.

    FY 2008:
- Develop team-to-ship line-of-sight gateway communications for USCG boarding teams.
- Develop maritime biometrics ID prototype for USCG boarding teams.

    FY 2009:
- Complete the development of a team-to-command center over-the-horizon gateway communication capability for USCG boarding teams.
- 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:
- Conduct a study for Covert Illegal Contraband Tracker (CICT) of feasible solutions that can potentially communicate with existing/planned tracking systems for CBP and USCG.
- Evaluate man-portable chemical, explosives, and drug detectors.
- Demonstrate technologies applicable to the border environment and test potential solutions.
- Recommend technical solution to Real-Time Image Transmission.

    FY 2011:
- Conduct testing and evaluation of limited proof-of-concept pilot for man-portable chemical, explosives, and drug detectors.
- Demonstrate technology performance and capability of the Hidden Compartment Inspection Device.
- Investigate current and emerging counter surveillance technologies.
- Select three CICT prototype solutions for development and testing.

Border Officer Safety - Also starting in FY 2009, the program plans to integrate technologies that will enable border security law enforcement agents to more safely perform their mission. These technologies include, but are not limited to:
- o Enhanced Ballistic Protection, which will deliver lighter weight, more durable and higher strength materials and equipment that will increase the level of a field agent's ballistic protection while reducing his equipment load;

- o Automatic Facial Recognition, captures images of individuals and compares them to law enforcement databases;
- o Hidden Compartment Inspection Device, which 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
- o Pursuit Termination-Vehicle/Vessel Stopping, which provides for 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/technologies.
- Conduct a covert transmission market survey to identify viable solutions.
- Develop gun-fire location requirements for law enforcement officers.
- Conduct operational test of project hostile intent using middle-eastern models.

FY 2010:
- Generate ballistics protection specification.
- Upgrade the hidden compartment inspection device design for vessels and vehicles.
- Investigate electromagnetic pulse approaches for stopping vehicles and vessels.
- Conduct market survey to identify potential solutions for less lethal compliance measures.
- Generate gunfire location specifications and conduct field demonstration.
- Conduct operational test project hostile intent using Asian models.
- Perform market survey on potential solutions for under vehicle inspection test.

FY 2011:
- Develop and evaluate covert transmission technologies.
- Develop and evaluate less-lethal compliance prototype.
- Demonstrate technology performance and capability of hidden compartment inspection device.
- Investigate and test potential solutions for less-lethal pursuit termination technologies for vehicles/vessels.
- Conduct operational test of project hostile intent using cross-cultural models.

Cargo Security Thrust Area: This thrust area develops technologies to ensure the integrity of cargo shipments and enhance the end-to-end security of the supply chain – from the manufacturer of goods to final delivery. One of the most significant potential terrorist threats to the Nation is the vast numbers of shipping containers that flow through our borders each year, most of which enter without physical inspection. This thrust area will deliver technological capabilities that address supply chain vulnerabilities – reducing the risk that cargo conveyed across various transit modes in the international supply chain can be manipulated as an avenue for terrorist activity. This includes the ability to communicate container status as well as security information that will assure government customs agents and shippers of the integrity of containers and cargo. Private industry has expressed interest in the cargo security technologies being developed within this thrust area, based on their added commercial value in increasing business efficiency. This thrust area conducts its activities through the Cargo and Conveyance Security Program.

Cargo and Conveyance Security Program – This 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) - This project is developing an advanced sensor system for monitoring the container's integrity. The ACSD is a small unit that 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 an intrusion, breach or door opening or human, 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 2007:
   - Deliver twenty ACSD prototypes each from two vendors for government.
   - Conduct ACSD critical design reviews.
   - Integrate MATTS global communications system.

   FY 2008:
   - Complete prototype system testing and develop 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.

Marine Asset Tag Tracking System (MATTS) - This project will establish a remote global communications and tracking network to be used in conjunction with the ACSD. The MATTS is designed to communicate world-wide, as well as when stacked in a yard in a densely-packed metallic environment that can cause communication blockage. DHS S&T is developing MATTS technology to overcome these issues and to ensure that container alarm conditions are reliably communicated to CBP Aside from the security benefit of 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 2007:
   - Test MATTS prototypes domestically and internationally (including a port-to-port demonstration test and an in-bond shipment tracking test) to demonstrate that they can work in real-life operational environments.

   FY 2008:
   - Transition product industry with the release of final technical requirements.

Advanced Screening and Targeting (ASAT) - This project provides 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. DHS S&T will incrementally transition ASAT to DHS targeting systems and will significantly improve targeting the containers for inspection. This phase of the project will end in FY07. The next phase of the project, starting in FY09, will allow CBP and Transportation Security Administration (TSA) to identify and prioritize which containers to search and provide dynamic targeting patterns that adjust to changes in cargo movement patterns over time. Additionally, government and industry can use MATTS technology for other purposes.

Milestones and Deliverables

FY 2007:

- Audit ASAT software evaluated and tested by CBP cargo analysts.
- Transition validated software and supporting documentation to CBP for operational use by their cargo analysts.
- Conduct design reviews and beta test of desktop anomaly detection software.

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) - This program maps out the international supply chain including:

- o all the various nodes (e.g., point of stuffing, port of entry);
- o participants (e.g., shippers, CBP, foreign Customs); and
- o information flow (e.g. container manifest is provided to CBP 24 hours before the container is loaded on a ship).

This security architecture also provides the framework for how DHS will incorporate near-term (CSD) and future container security technologies (ACSD) into supply chain operations. Alarm information will be transmitted to CBP through the architecture's information backbone. The architecture defines the standards that technology with which vendors must comply to ensure that 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.

Milestones and Deliverables

FY 2007:

- Conduct Departmental review of SCSA prior to releasing it for industry reviews, ensuring the architecture is acceptable to industry, and that it works in actual operations.

FY 2008:

- Complete technology proof-of-concept pilot, which will show the architecture's utility, and generate feedback for further refinement.
- Transition product to industry.

Composite Container - This program is developing a potential next-generation 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% lighter than current shipping containers. Weight savings can benefit shippers by allowing them to load more goods per container to meet the weight limit than they would ordinarily be able to. Also, composites are easier to repair therefore decreasing their overall life cycle costs over existing steel containers.

Milestones and Deliverables

 FY 2007 – 2008:
 * Build two full size ISO-compliant composite container prototypes.
 * Conduct a full-scale design review.
 * Perform a scanning test.
 * Conduct prototype testing of composite containers.
 * Conduct requirements and critical design reviews amongst the air cargo community.
 * Complete security sensor system development.
 * Complete structural system design and weight optimization.

Automatic Target Recognition (ATR) - The project will develop an automated imagery detection capability for anomalous content (e.g. persons, hidden compartments, contraband) 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.

CanScan – This project will develop capability enhancements to existing secondary non-intrusive inspection (NII) systems to detect or identify terrorist contraband items (e.g., drugs, money, illegal firearms) or humans. 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 IPT's 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:
 * Design and develop system upgrade designs.
 FY 2011:
 * Develop system approach to existing non-intrusive inspection systems.

Air Cargo Composite Container –The air cargo element of this project will expand upon 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.
- Test in an operational environment.
- Transition to industry.

Container Security Device (CSD) - The project is developing a device whose sensor(s) can detect the opening of container doors. Since the ACSD will not complete development for three to five years and the current generation of mechanical seals can be easily circumvented, the CSD will focus solely on monitoring the status of container doors as a stop-gap measure until ACSD is available. The CSD is a small, low-cost device, mounted on or within a container. It detects the opening or removal of a container door and reports to CBP if the door is opened once the device has been armed. CBP Officers can then interdict the container 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 they will couple with an overall concept of operations to ensure interoperability with DHS targeting systems and ease of integration with commercial systems. CSD vendors will submit systems for assessment against these requirements. This will provide a marked increase in the security of shipping containers and provide an additional layer of security for CBP.

Milestones and Deliverables

    FY 2007:
- Conduct critical design review and draft technical requirements.
- Develop and test three CSD prototype solutions.
- Complete CSD Technical Requirements for industry use in the manufacture of CSD systems.
- Integrate MATTS global communications system.
- Develop operational test report.

    FY 2008:
- Develop qualified vendors list for CSDs applicable for use by Customs Trade Partnership Against Terrorism (C-TPAT) Tier III participants.
- Evaluate CSD solutions submitted to meet CSD requirements.

    FY 2009 through FY 2011:
- Evaluate CSD solutions submitted to meet CSD requirements.
- Conduct operational field testing of CSDs.
- Transition CSD solutions.

Domestic High Threat Cargo -Develop a capability to track domestic high-threat cargo. DHS-designated Toxic Inhalation Hazardous (TIH) Cargos in domestic transit will be tracked via a remote and adaptive real-time multi-modal communications tag that leverages existing communications networks (cell/RF/satellite) and is interoperable with intermodal applications

(rail, truck). This project provides continuous, uninterrupted, tracking of TIH in transit throughout the domestic supply chain to ensure full and complete delivery to proper and authorized final destinations.

Milestones and Deliverables

    FY 2011:
- Develop requirements analysis for MATTS application to tracking Toxic Inhalation Hazards (TIH).

Secure Carton – This project will leverage and further develop 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 tamper event 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 stuffing, and is scalable and applicable across various shipping modalities including maritime and air cargo. The development phase of this project will end in FY08 and field testing (new funding) will start in FY09.

Milestones and Deliverables

    FY 2009:
- Conduct prototype field testing.
- Perform testing in an air cargo environment.

    FY 2010:
- Perform testing in an air cargo environment.
- Perform testing in a maritime environment.

Secure Wrap – DHS S&T will initiate this project in FY10. This project will leverage and further develop 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 modalities (e.g. air, maritime, land). Secure wrapping material will have the capability to detect tampering through visual indication through 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.

The primary Federal customers for the Borders and Maritime Security Division are the Department's Customs and Border Patrol (CBP), Immigration and Customs Enforcement (ICE), and U.S. Coast Guard (USCG), who represent end-users. Successful transition of these technologies will substantially improve DHS components' performance and support the Secretary's goals of:
- Protecting the Nation from dangerous people;
- Protecting our Nation from dangerous goods.

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Agriculture	Foreign Animal Diseases	15,509	19,382	21,170	21,237	26,011
Biological	System Studies and Decision Tools	9,841	6,754	9,001	7,330	7,114
	Threat Awareness	24,352	25,002	28,370	28,348	29,265
	Surveillance and Detection - R&D	30,055	34,061	37,360	37,562	38,548
	Surveillance and Detection - Operations	84,768	65,496	38,099	39,529	46,920
	Forensics	2,962	4,649	4,934	6,849	6,960
	Response and Restoration	77,527	13,818	-	-	-
Chemical	Analysis	9,468	9,799	12,712	13,237	11,264
	Detection	31,964	25,217	21,021	23,181	25,706
	Response and Recovery	14,664	15,014	21,198	20,671	14,376
HSI	HSI	4,372	4,033	3,322	3,421	3,571
SBIR	SBIR	8,069	5,724	5,471	5,588	5,703
Chem/Bio Total			226,949	202,658	206,053	216,438

Overview

The Chemical and Biological Division works to increase the Nation's preparedness against chemical and biological threats through improved threat awareness, advanced surveillance and detection, and protective countermeasures. The division carries out its activities through three thrust areas: Agriculture, Biological, and Chemical.

Agriculture Thrust Area: This thrust area primarily responds to the President's *Defense of the U.S. Agriculture and Food,* Homeland Security Presidential Directive (HSPD-9). This thrust area plays a major role in leading the expansion of current and new agricultural countermeasures and developing a plan to provide safe, secure, state-of-the-art biocontainment laboratories for researching foreign and zoonotic diseases. The thrust area also supports work related to the research conducted at the Plum Island Animal Disease Center (PIADC). Another area of focus is support to the Joint Agro-Defense Office (JADO), which is being established to coordinate, integrate and oversee the National Science and Technology Council's (NSTC) interagency agrodefense R&D program.

Foreign Animal Diseases Program – In partnership with the U.S. Department of Agriculture (USDA), this program plays a significant role in defending against the natural and intentional introduction of selected foreign animal diseases (FAD). This program develops the next-generation veterinary vaccines and countermeasures and models the spread of FADs and their economic impact to better inform decision makers in the identification and selection of various intervention strategies. Program activities include:

<u>FAD Modeling – Near & Long Term</u> – a national scale model that couples the spread of foreign animal disease with their economic impacts to evaluate strategies for controlling outbreaks.

Milestones and Deliverables

    FY 2007:
- Transition foot-and-mouth (FMD) model to Biodefense Knowledge Center (BKC).

    FY 2008:
- Deliver FMD model for operational interagency use.

    FY 2009 - 2010:
- Extend the FMD model to support analysis of additional FADs.

    FY 2011:
- Transition 2nd generation FAD models to the operational JADO modeling center for implementation.

FAD Vaccine and Diagnostics – Near & Long Term – provides research and diagnostics on FAD, with an initial focus on developing more effective vaccines and biotherapeutics for FMD, the top-priority pathogen.

Milestones and Deliverables

FY 2007 – 2011:
- Pilot test next generation of FMD vaccines for one new serotype per year (e.g. A24, Asia, O1).

FY 2008:
- Conduct enhanced characterization and efficacy (onset & duration of immunity) tests of current-generation FMD vaccines (multiple serotypes).

FY 2010:
- Transition next-generation FMD vaccines to the National Veterinary Stockpile (NVS).

FY 2011:
- Deploy second-generation FAD models to Operational Modeling Center
- Complete licensure for a second FMD Differentiate Infected from Vaccinated Animals (DIVA) vaccine.
- Test pivotal animal safety and efficacy on commercially produced pre-licensing lots of FAD vaccines for at least one other FAD variant.

Joint Agro Defense Office (JADO) – is an S&T led interagency office providing coordination and oversight of the integrated agro-defense program formulated under the National Science and Technology Council.

Milestones and Deliverables

FY 2007 - 2011:
- Coordinate, integrate, and provide oversight of an interagency agrodefense R&D program. This program works to develop an integrated roadmap for modeling, vaccine and diagnostic efforts.

FY 2008:
- Establish and oversee joint Operation and Research Modeling Centers.

Ag Screening Tools – 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.

Biological Countermeasures Thrust Area: This 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 places its greatest emphasis on those biological attacks that have the greatest potential for 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. This thrust area supports the President's *Biodefense Strategy for the 21st Century*, Homeland Security Presidential Directive (HSPD-10), which provides a comprehensive framework for our Nation's biodefense.

The thrust has six main programs:
- o Systems studies and decision support tools;
- o Threat awareness;
- o Surveillance and detection research and development;
- o Surveillance and detection operations;
- o Forensics; and
- o Response and restoration.

This work encompasses activities related to the development of BioWatch, a bio-aerosol monitoring system designed to provide cities the earliest possible detection of a biological attack, and the National Biodefense Analysis and Countermeasures Center (NBACC), which supports the assessment, characterization and forensic analysis of biological agents.

Systems Studies and Decision Tools Program – This program provides the analysis and tools that help 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. In addition, Federal, State, and local emergency responders use tools developed in this thrust, such as Biological Warning and Incident Characterization (BWIC) operational models.

<u>Biodefense Net Assessments</u> – addresses fundamental questions about the Nation's overall biodefense strategy (e.g., can deterrence play a more significant role than it currently does in biodefense).

Milestones and Deliverables

FY 2007:
- Deliver initial two topic answers to Homeland Security Council (HSC).

FY 2008:
- Complete the first round of Biodefense Net Assessments (BNAs) and transition to HSC. The first round of BNAs will examine 8-10 fundamental assumptions made in HSPD-10.

FY 2009-2011:
- Conduct a second BNA will be completed in FY12 and will develop a longer term strategic view of our and our adversaries' competitive strengths and tipping points.

<u>System Studies</u> – reference scenarios to assess the capability of the Nation's current biodefense, identify critical gaps, and perform cost-benefit tradeoffs of different alternatives addressing those gaps.

Milestones and Deliverables

FY 2007:
- Complete preliminary Gen3 BioWatch systems tradeoffs.

FY 2008:
- Transition the final Gen 3 BioWatch systems architecture design and deployment strategy to the Office of Health Affairs (OHA).

FY 2008 – FY 2010:
- Further simulation and refinements of CONOPS/Red-teaming for BioWatch operations.

<u>Decision Support Tools</u> – robust fully integrated operational tools to support surveillance, detection, incident characterization, and response systems.

Milestones and Deliverables

FY 2009:
- Provide data to support subway model validation.

FY 2010:
- Complete development of decision support tool to support BWIC upgrades.

FY 2011:
- Complete development of decision support tools for real-time detection systems.

Threat Awareness Program – Threat Awareness Program – This 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 attack by chemical, biological, radiological, or nuclear weapons. It assigned DHS the lead in conducting threat analyses to determine what constitutes a significant material threat to public health and national security. The primary output is an intelligence-informed, scientific characterization and prioritization of the bio-terrorist risks to be used by the DHS Office of Health Affairs (OHA), White House Homeland Security Council (HSC) and partnering agencies (e.g. DHHS, EPA, USDA, and the Intelligence Community).

FY 2007—Complete Project BioShield material threat determinations for all traditional biothreat agents of significant public health concern. These determinations are required before the President and Office of Management and Budget (OMB) will authorize use of the BioShield Special Reserve Fund to procure new medical countermeasures.

FY 2008--Complete 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).

<u>*Biological Threat Characterization Center (BTCC)*</u> – conducts biennial systematic end-to-end risk assessments on both traditional and engineered biological agents, including tailored assessments for the biodefense community; and conducting laboratory studies to close major scientific gaps that could have a large impact on how the nation structures its defenses.

Milestones and Deliverables

FY 2007 - FY2008:
- Deliver the second Bioterrorism Risk Assessment (BTRA) report and tool that will include enhanced threat agents, agricultural agents and their economic impacts.
- Prepare laboratory study reports that close key knowledge gaps for traditional agents.

FY 2009 – FY 2010:
- Deliver the third BTRA report and tool, to include emerging and enhanced agents.
- Perform laboratory studies to determine the approach for defending against enhanced and advanced threats.

<u>*Biodefense Knowledge Center (BKC)*</u> – is responsible for providing
- analysis and operational support including 24/7 S&T reachback 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.

FY 2007:
- Provide analysis and operational support, to include delivering all high-priority biological Population Threat Assessments (PTAs), to OHA and HHS.
- Pilot web-based Biodefense Knowledge Management System (BKMS).

FY 2007 – FY 2011
- Continue to provide 24/7 operational support, awareness bulletins, and technology assessments.

FY 2009:
- Provide an improved BKMS with additional curated data sources and enhanced analysis capabilities.

FY 2011:
- Complete the pilot for operational genomic data monitoring.

Surveillance and Detection R&D Program – This program develops next-generation detectors for biological threat agents. The program develops fully autonomous (and therefore much faster and at a lower cost) detection capabilities for the BioWatch system. Such detectors will significantly increase the portion of the U.S. population that we can protect, including critical infrastructure such as airports and transportation hubs. The program also develops the assays (signatures or fingerprints of biological agents) that detectors need to recognize a biological agent. Additionally, the program develops detection systems to protect agriculture and food products and industries.

BioWatch Generation 3 Detection System – develops Gen 3 BioWatch detection system, which includes development of

- o 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 system; and
- o 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 2007:
- Field prototype demonstration of DACS and BAND.

FY 2008:
- Transition BAND systems and initial assays to OHA for operational Gen 3 BioWatch pilot.

BioAssays – Near Term – develops evaluated bioassays (signatures of fingerprints of biological agents) to improve the ability to identify and characterize and incidence of human or agriculture bioterrorism.

Milestones and Deliverables
FY2007:
- Develop signatures for top 10 biothreat assays.

FY 2008:
- Develop signatures for next 10 biothreat assays.
- Pilot the Public Health Actionable Assay process (PHAA).

FY 2009:
- Transition next 10 bio threat assays for Gen 2 BioWatch to OHA.

- Establish the initial operational capability for PHAA process.

FY 2010:
- Transition top 20 bio threat assays for Gen 3 BioWatch to OHA.

FY 2011:
- Develop functional assays for markers of virulence, drug resistance, viability, and emerging and genetically-engineered threats.

BioAssays – Next Generation – focuses on new approaches for detecting the broad range of possible future threats emphasizing basic biological building blocks e.g., virulence pathways and other novel detection approaches.

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.

Detect to Protect (DtP): Triggers and Confirmers – develops low cost bio-aerosol point triggers to detect biological agents within a minute (acting as reliable 'bio smoke alarms') for protection of high value facilities and their occupants. These systems provide rapid, high confidence confirmation to validate a detection event from a trigger within minutes of alert, and provide real-time information for first responders.

Milestones and Deliverables

    FY 2007:
- Independently verify comprehensive system and modeling designs at a government standardized testbed

    FY 2008:
- Develop prototypes suitable for extended field testing.

    FY 2009:
- Deploy and test sensors in operational environments.
- Transition sensors to private sector through commercialization, SAFETY Act certification, and designation as allowable grants expenditure.

Detect to Protect (DtP): Remote Sensors – develops rapid bio-aerosol remote sensing systems to detect biological agents within a minute (acting as reliable 'bio smoke alarms') to protect high value facilities and their occupants. These remote sensors will detect suspicious aerosols in large, open spaces at the time of release, before the aerosol cloud dissipates throughout the space.

Milestones and Deliverables

    FY 2007:
- Independently verify comprehensive system and modeling designs at a government standardized testbed.
- Deliver system-level prototypes.

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 2007:
- Deliver FBADS pre-production models for independent testing and evaluation (completion of Phase Ib).
FY 2008:
- Complete FBADS Phase II including independent testing and evaluation and system flexibility demonstration.

National BioSurveillance Integration System (NBIS) – S&T supports OHA's operation of NBIS by providing subject matter expertise and developing modeling tools. NBIS provides decision-makers early identification of biological events of national significance, including disease outbreaks, use of biological agents, and emergent 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.

Milestones and Deliverables
FY 2007:
- Provide Subject Matter Expert (SME) support for customer requirements task force.
FY 2007:
- Provide SME support for bioinformatics and information technology systems.
FY 2008 – 2010:
- Continue model development within Project Hyperion to bring system to operating capability.

Next Gen Biological Detection – develops technologies and systems to identify enhanced and advanced biological threats. DHS 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:
- Begin technology feasibility demonstration and component analysis.
FY 2010:
- Down-select most promising technologies.
FY 2011:
- Demonstrate breadboard prototype.

Surveillance and Detection Operations Program – This program operates 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). By the end of FY 2007, responsibility and associated funding requirements for operating these systems will transfer to the Office of Health Affairs.

---

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.

BioWatch – a 24/7/365 operational bio-terrorism detection system in more than 30 of the top threat cities across the country.

Milestones and Deliverables

> **FY 2007:**
> * Transition operations and maintenance of the Gen 2 BioWatch system to OHA.
> * Pilot BWIC in three BioWatch cities.

BioWatch Gen 3 Procurement - this project purchases the initial units for field tests and BioWatch Gen 3 pilot.

Milestones and Deliverables

> **FY 2008:**
> * Purchase Gen 3 BioWatch pilot systems.
> * Initiate acquisition for approximately 125 LRIP Gen 3 BioWatch systems.

Forensics Program – In fulfillment of the President's *Biodefense for the 21st Century* (HSPD-10), this 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. 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 – a resource that did not exist at the time of the anthrax attacks in the fall of 2001.

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 2007:**
> * Earn NBFAC accreditation from International Standards Organization (ISO) 17025 for sample handling, tracking, and analyses procedures.
> * Validate assays for the top 20 threat agents.
>
> **FY 2008:**
> * Transition NBFAC facility to new NBACC facility.
>
> **FY 2009:**
> * Validate forensic assays for top 30 biological threat agents.
>
> **FY 2010 - 2011:**
> * Transition bioforensic assays for enhanced and engineered threats to NBFAC.
>
> **FY 2011:**
> * Transition bioforensic assays for genetically modified organisms.

Bioforensics R&D – Near Term & Long Term – develops improved methods for extracting genetic materials and proteins from samples. Provides scientific foundation for material attribution, develops protocols for the characterization and identification of Biological Threat Agents (BTAs), and develops a robust sample management, molecular signatures and physical/chemical analysis research program to address FBI/NBFAC requirements.

Milestones and Deliverables

> **FY 2007:**
> * Transition assays for top 20 BTAs from bioforensics R&D to NBFAC operations.
>
> **FY 2008:**
> * Transition assays for top 30 BTAs from bioforensics R&D to NBFAC operations.

- Draft BioForensics R&D plan for forensics assays of engineered threats.
FY 2010:
- Transition methods for analyzing enhanced threats to NBFAC.

Response and Restoration Program – Biological agents have the potential to contaminate large portions of a city, covering multiple city blocks and the facilities therein. The program provides advanced planning, develops concepts-of-operation, and funds exercises and training for responding to and recovering from a large-scale biological attack. The objective is to provide a more rapid and less expensive post-attack cleanup or restoration in such situations. DHS S&T partners with the Environmental Protection Agency (EPA), who has the overall lead in this area. 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.
Milestones and Deliverables
    FY 2010:
- Demonstrate and deliver a validated sampling plan for anthrax.
    FY 2011:
- Extend validated sampling plan to 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 2007:
- Develop restoration plans and templates, technology readiness assessments and user requirements, policy and implementation guidance.
    FY 2009:
- Exercise and demonstrate decontamination methods and restoration system tools.
- Conduct tabletop and field exercises, and workshops.
- Exercise and demonstrate (through tabletop and field exercises) decontamination methods and restoration systems tools.
    FY 2011:
- Validate wide-area restoration systems approach architecture within additional urban areas and extend the results nationally, thus completing transition.

Chemical Countermeasures Thrust Area: This thrust area focuses on reducing the Nation's vulnerability to chemical warfare agents (CWAs) and commonly used toxic industrial chemicals (TICs) as well as providing countermeasures to emerging non-traditional chemical threats (NTAs). The program's objectives are to:
- provide a comprehensive understanding and analyses of domestic chemical threats;
- develop pre-event assessment, discovery, and interdiction capabilities for chemical threats;

o develop capabilities for warning, notification, and timely analysis of chemical attacks; optimize technologies and processes for recovery from chemical attacks; and
o enhance our capability to identify chemical attack sources.

The S&T Directorate 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 where they have relevant impact against 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 – This program develops a robust and enduring analytical capability in support of chemical countermeasures. It supports development of the required fundamental understanding of toxic chemical threat properties and conducts risk and vulnerability assessments based on these properties. The program also develops and sustains expert reach-back capabilities to provide rapid support in domestic emergencies. The chemical analysis program develops and validates forensic analytical tools and methodologies for attribution, including the development and validation of new chemical signatures. Researchers develop new signatures through literature searches and consultations with SMEs regarding various synthesis methods for the production of the type of threat agents terrorists and criminals will most likely use. In addition, DHS S&T must maintain infrastructure, consisting of receival, laboratory, and storage spaces to accommodate highly toxic chemicals and associated evidence, to provide a fully operational capability. This includes scientific and technical staff that are available, trained and fully certified to process this type of evidence. To ensure a cohesive effort to describe threats and countermeasures, key analytical assessments, including Population Threat Assessments and systems studies, formerly supported under the Architectures program, will be conducted by the Chemical Security Analysis Center (CSAC), sustained by funding from the Analysis program. The I&A is a primary customer for the CSAC, interagency partners will probably use the data provided by the CSAC. Population Threat Assessments are provided to DHHS to fulfill BioShield requirements.

> *CSAC* – supports development of the fundamental understanding of toxic chemical threat properties and conducts risk and vulnerability assessments based on these properties. Activities include developing and executing R&D efforts at the DHS CSAC, a national resource for chemical threat awareness and assessment, and developing and sustaining expert reach-back capabilities to provide rapid support in domestic emergencies.
> **Milestones and Deliverables**
> **FY 2007:**
> - Deliver the first Chemical Terrorism Risk Assessment (CTRA) to HSC.
> - Deliver the Chemical Source Book II: Organophosphorus Pesticides to I&A.
> - Transition all high priority chemical PTAs to HHS.
> **FY 2009:**
> - Deliver biennially updated CTRA to OHA.
> **FY 2009 - 2011:**
> - Deliver end-to-end systems studies to the Office of Infrastructure Protection (OIP).
> - Deliver capability assessments to OIP.
> **FY 2010:**
> - Deliver Integrated Chemical reactions Database to I&A.
> **FY 2011:**
> - 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:**
> - Improve models and determine 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 2007:**
> - Validate forensic analytical methodologies for G-series nerve agents.
>
> **FY 2008:**
> - Validate forensic analytical methodologies for H-series blister agents.
>
> **FY 2009:**
> - Validate forensic analytical methodologies for V-series nerve agents.
>
> **FY 2010:**
> - Validate forensic analytical methods for emerging chemical threat agents and Non-Traditional Agents, prioritized by risk and intel.

Detection Program – This program develops technology for warning and notification of a chemical threat release. It includes technologies responders need to survey potentially contaminated scenes, while limiting their exposure to chemical agents. The program will develop technologies that can, in a single package, sense chemical agents, as well as more commonly monitored chemicals, at costs that will support dual-use application. This capability requires a leap forward in technology for next-generation systems. Activities focus on development of five detection systems, described below. OIP is a primary DHS customer and will be responsible for supporting transition of many detection programs to local communities. The different physical properties associated with detecting high-vapor pressure versus low-vapor pressure chemical threats require different technologies that can adequately address the full spectrum of chemical hazards.

Autonomous Rapid Facility Chemical Agent Monitor (ARFCAM) – develops a low-cost, fully autonomous, networkable chemical monitor that will "detect-to-warn" of the presence of up to 20 CWAs and high priority TICs simultaneously within a single device.

Milestones and Deliverables

> **FY 2007:**
> - Provide a report on the testing of lab prototypes.

FY 2008:
- Refine the ARFCAM algorithm in WMATA Metro testbed.

FY 2009:
- Perform independent lab test and evaluation of prototypes.

FY 2010:
- Report on OT&E of field prototypes.

FY 2011:
- Deliver operational test articles, and a technical data package.
- Transition, through commercialization, SAFETY Act certification, and designation as allowable grants expenditure.

Integrated CBRNe Detection System – develops an architecture that integrates reporting from disparate chemical, biological, radiological, and explosive (CBRNe) detection/collection systems. This system provides timely CBRN(e) detection, identification, and assessment of the threat and enables appropriate response actions by local, state and federal officials.

Milestones and Deliverables

FY 2008:
- Conduct two-city pilot of the chem/bio portions of the integrated CBRNe Detection.

FY 2009:
- 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 2007:
- Provide a report on the testing of lab prototypes.

FY 2008:
- Evaluate LACIS systems prototype in an operational testbed.

FY 2009:
- Conduct independent lab test of prototype.

FY 2010:
- Conduct OT&E of field prototype.

FY 2011:
- Deliver operational test articles, and a technical data package.
- Transition through commercialization, SAFETY Act certification, and designation as allowable grants expenditure.

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 2007:
- Demonstrate LVPCDS concept breadboard.

FY 2008:
- Test and evaluate prototypes in laboratory.

FY 2009:
- Testing and Evaluation field prototypes in operational environment.

FY 2011:
- Complete technical data package.

Next Gen LVPCDS – develops an aerosol facility monitor, an autonomous facility monitor which will detect and identify the release of suspended or aerosolized toxic, persistent compounds having very low vapor pressures. DHS S&T will assess technologies for detection capability of bio aerosols.

Milestones and Deliverables

FY 2011:
- Initiate concept exploration.

Next-Gen ARFCAM & LACIS – develops an autonomous, networked, continuously running facility monitor that will "detect-to-warn" of the presence of up to 40 high-priority TICs and CWAs, including conventional and non-traditional agents, in under one minute. Next-Gen LACIS will be a hand-portable, networked chemical detection system that detect and identify the presence of up to 40 TICs & CWAs in less than one minute.

Milestones and Deliverables

FY 2010:
- Initiate concept exploration.

FY 2011:
- Undergo an initial technology downselect.

Non-Intrusive Container Monitor - Investigates technology capable of rapid and efficient determination of the contents of suspicious containers in cargo or passing through security portals of various types.

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.

Rapidly Deployable Chem Detection System (RDCDS) - develops a rapidly deployable chemical monitoring system that consists of airborne and ground based elements that can monitor special events and emergency situations for 7 chemical warfare agents and all 19 toxic industrial chemicals on the DHS chemical threat list. This project transitions to OHA in FY07.

Milestones and Deliverables

FY 2007:
- Complete RDCDS technical data package and transition operations to OHA.

Response and Recovery Program – This program provides technologies for returning a chemically contaminated area to a normal condition. This work primarily supports the development of technologies and guidelines for decontamination and the analysis of contaminated areas both before and after restoration processes. Activities include:
- o development of a mobile laboratory;
- o development of fixed-site chemical analysis laboratories for CWAs; and

o development and demonstration of facility restoration and decontamination technologies and guidelines.

Taken together, these efforts will substantially diminish the currently unacceptably long duration of cleanup efforts after attack with a persistent chemical on key infrastructure.

Facility Restoration Demonstration – will demonstrate 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.

Milestones and Deliverables

   FY 2007:
- Provide report on Validation of Sampling Approaches.

   FY 2008:
- Complete final restoration plan.

   FY 2009:
- Complete final demonstration.

Fixed Laboratory Response Capability – develop prototype environmental laboratories to assist with 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 2007:
- Establish three initial prototype labs in NE region.
- Establish ultradilute CWA standards program.

   FY 2008:
- Establish labs for prototyping in the West and Southeast regions.

   FY 2009:
- 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 2007:
- Complete final design, fabrication and initial demonstration of capability.

FY 2008:
- Complete documentation, in manual form, detailing Standard Operating Procedures, maintenance, and Cost of Ownership.
- Transition final prototype and technical data package to EPA.

Integrated Detection/Decon 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/decon 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

NTA Mobile High-Throughput Laboratory – demonstrates a mobile chemical laboratory system that can be rapidly deployed in the field 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.

Chemical Decontamination R&D - prototype technologies for decontaminating NTAs, including: identifying receptors that will selectively bind to agents and their surrogates and integrate them into an appropriate system, field test, and refine the approach

Milestones and Deliverables

FY 2007:

- Complete screening against surrogates to demonstrate proof of principle.

FY 2008:

- Conduct laboratory testing of prototype decontamination technologies.

FY 2010:

- Perform a full scale field test.

FY 2011:

- Transition first-generation NTA decontamination technologies.

Oil Spill - Develop the capability to more effectively and efficiently respond to oil, chemical, or hazardous material (HazMat) spills, either accidental or intentional (i.e., terrorism-related). Develop the capability to identify, detect, track, contain, and recover heavy oils on or below the maritime surface, oil in extremely cold conditions, oils from submerged wrecks at extreme depths, as well as chemical agents.

Milestones and Deliverables

FY 2010:

- Identify user needs and complete analysis of alternatives (AoA).

FY 2011:

- Develop a plan to integrate advanced concepts towards user needs and begin laboratory testing and evaluation of less mature technologies identified in the AoA.

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 2009:
- Develop an interagency plan for validation of methods used in detection of anthrax contamination in facilities.

 FY 2010:
- Integrate lab response networks with NBIS.

 FY 2011:
- Validate chemical and radiological sampling strategies and methods.

The primary Federal customers for the Chemical and Biological Division are the Department's Office of Infrastructure Protection and Office of Health affairs, who represent end-users. Successful transition of these technologies will substantially improve DHS components' performance and support the Secretary's goals of:

- o Protecting our Nation from dangerous goods; and
- o Building a nimble and responsive emergency response system.

COMMAND, CONTROL, AND INTEROPERABILITY

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Cyber Security	Information Infrastructure Security	2,803	4,625	5,200	6,013	6,078
	Cyber Security Research Tools and Techniques	4,908	7,100	6,971	6,700	7,200
	Next-Generation Technology	3,544	3,156	-	-	-
Communications, Interoperability and Compatibility	OIC	19,800	12,951	11,084	11,427	10,878
	IFSL Information Sharing	2,080	3,061	-	-	-
Knowledge Management Tools	Knowledge Frameworks	11,089	11,211	16,273	15,476	17,804
	Analytical Research	4,487	5,199	4,536	4,744	4,813
	Collaborative Information Sharing	-	-	9,133	10,004	8,636
Surveillance, Reconnaissance & Investigative Technologies	USSS Support	1,190	1,158	-	-	-
Threat Assessment	WME Capability Assessments and Atribution	3,062	3,761	-	-	-
	Countermeasures Development	1,568	1,490	1,800	1,836	1,872
	Futures R&D	2,641	2,993	300	306	313
	Identification	2,136	4,185	2,400	2,448	2,497
HSI	HSI	1,162	1,120	976	1,003	1,041
SBIR	SBIR	2,144	1,590	1,618	1,653	1,685

Overview

The Command, Control, and Interoperability Division's (CID) objectives focus on:
- o operable and interoperable communications for emergency responders;
- o security and integrity of the Internet; and
- o knowledge management tools and development of capabilities to recognize potential threats.

The Division transforms new and promising concepts into an operational capability through the judicious blending of new technologies and current capabilities. CID supports partners in Federal, State, local, and tribal emergency response; DHS operational components (in predicting, detecting, and responding to all hazards); and private sector partners who own, operate, maintain, and utilize much of the Nation's cyber infrastructure.

CID's main thrust areas include:
- o Cyber Security;
- o Communication, Interoperability, and Compatibility;
- o Knowledge Management Tools;
- o Reconnaissance, Surveillance, and Investigative Technologies;
- o Threat Assessment; and
- o Emergent Threat Assessment.

Cyber Security Thrust Area: This thrust area leads cyber security research, development; testing and evaluation to secure the Nation's critical information infrastructure, through coordinated efforts that improve the security of existing and future 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 are dependent upon information technology and the information infrastructure. Information networks directly support the operation of all sectors of our economy:
- o energy (electric power, oil and gas),
- o transportation (rail, air, merchant marine),
- o finance and banking,
- o information and telecommunications,
- o public health,
- o emergency services,

- o water,
- o chemical,
- o defense industrial base,
- o food,
- o agriculture, and
- o postal and shipping.

Computer networks also control physical objects such as electrical transformers, trains, pipeline pumps, chemical vats, and radars. Cyber attacks on U.S. information networks could have serious consequences like disrupting critical operations, causing loss of revenue and intellectual property, or loss of life.

Activities in this thrust area are carried out in three programs:
- o Information Infrastructure Security;
- o Research Tools and Techniques; and
- o Next Generation Technologies.

Information Infrastructure Security (IIS) Program – The S&T Directorate initiated the IIS program as a step toward coordinating and implementing the President's *National Strategy to Secure Cyberspace*. Through the IIS program, the S&T Directorate engages with industry, government, and academia to ensure that the core functions of the Internet develop in a secure manner and will benefit all owners, operators and users of the Internet. In addition, the IIS program addresses economic assessment, risk analysis, and modeling requirements that focus on current issues related to the implementation and deployment of cyber security technologies that support both internal DHS customers and external partners.

<u>*Secure Protocols*</u> - (In FY09, combined with the Domain Name System Security (DNSSEC)) engages with private-sector Internet infrastructure owners and operators as well as government agencies to develop more secure routing infrastructure for Internet communications, including security for Domain Name System (DNS) communications.
Milestones and Deliverables
    FY 2007:
- Develop secure domain resolvers (the mechanism that DNS uses to find the correct IP address), associated end-system resolvers and DNSSEC-aware software applications. This new class of software addresses required changes for Internet servers to deliver and respond to signed DNS entries.
- Secure Protocols will develop software tools for network operators to support initial deployment and ongoing operations of DNSSEC.
- Insert DNSSEC standard protocol into the Federal Information Security Management Act, which requires that government agencies deploy the DNSSEC standard protocol.

    FY 2008:
- Complete the modification of end-user applications, such as web browsers and e-mail clients, to make them DNSSEC-aware, providing end-to-end security for Internet users to assure authenticity and integrity of information coming to the end system.
- Provide step-by-step operator guidance documentation tailored to 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 DNSSEC query data, with the goals of further analyzing DNS security, and initializing transition from sparse to dense deployment.
- Continue deployment of the routing PKI with global registries in addition to ARIN deployment.

FY 2010:
- Conclude PKI deployment activities
- Develop and deploy standards for secure routing.
- DNSSEC project will query data for testing purposes.

FY 2011:
- Develop a document consisting of draft secure routing protocols.

Process Control Systems – This project will focuses on improved security for process control systems (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.
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 a Process Control System architecture document and a PCS model for the oil and gas sector. The result will be a consistent architecture for the sector. It is a guiding document provided to vendors so they can produce products that create and/or maintain interoperability.

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
Milestones and Deliverables
    FY 2008:
- Develop a national research agenda to provide a framework for dealing with cyber conflict

Cyber Security Research Tools and Techniques (RTT) Program – This program provides secure facilities and methods for testing cyber security technologies under real-life conditions. Neither existing research network infrastructures nor the operational Internet provides adequate means for testing defense technologies. Over the last decade, the network security research community has also been stifled by the lack of real network data to test their research prototypes and prove the utility of their research in large-scale network environments. In order to accelerate research, development and deployment of effective defenses for U.S.-based computer networks, CID 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.

The RTT program focuses on underlying methods and techniques to support the development and use of cyber security technology and will create, operate and support a researcher-and-vendor-

neutral experimental infrastructure that is open to a wide community of users. Ultimately, CID will produce scientifically rigorous testing frameworks and methodologies to provide a testing infrastructure that will support national-scale experimentation. The program has three main projects:

- o Experimental Research Testbed (formerly Cyber Security Testbed);
- o Research Data Repository (formerly Large Scale Datasets);
- o Experiments and Exercises; and
- o Internet Route Monitoring.

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

Experimental Research Testbed (formerly Cyber Security Testbed) – Provides a cyber security testbed that is used to evaluate mechanisms to defend against attacks on the infrastructure and support the mitigation of attacks.

Milestones and Deliverables

FY 2007:

- Combine several other government-funded testbeds to increase capabilities – and to create a realistic model of the internet on which to test cyber security technologies.
- Finalize Certification of the Protected Repository for the Defense of Infrastructure against Cyber Threats (PREDICT) Dataset Portal and Process.
- Create a Linking the Oil and Gas Industry to Improve Cyber Security (LOGIIC) consortium.

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 2011:

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

Research Data Repository (formerly Large Scale Datasets) – CID will initiate this project in 2009 to develop a repository of real, network-and system-traffic datasets that researchers can use to validate their technology and products.

Milestones and Deliverables

FY 2009:

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

FY 2010:

- Increase the large-scale data sets applications to 250.

FY 2011:

- Increase the large-scale data sets applications to 300

Experiments and Exercises – addresses cyber security requirements from internal Department customers in support of the DHS's operational missions in critical infrastructure protection.

Milestones and Deliverables

FY 2007:

- Experiments and Exercises will demonstrate a framework for assessing risks and evaluating new technologies to reduce vulnerabilities in oil and gas sector process control environments.

FY 2008:

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

Internet Route Monitoring – CID will initiate this project to identify critical Internet resources, incorporating an understanding of geographic and topological mapping of Internet hosts and routers.

Milestones and Deliverables

    FY 2010

- Complete Geographic router level maps.

    FY 2011:

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

Next-Generation Technologies (NGT) Program – This program addresses cyber security R&D needs in support of DHS mission component requirements in a variety of topic areas aimed at preventing, protecting against, detecting, responding to, and recovering from large-scale, high-impact cyber attacks. Through long-term research efforts, CID will provide novel, next-generation secure information technology concepts and architectures. This program 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 the S&T Directorate. An integral part of the NGT program is fostering the necessary partnerships to accelerate the transition of new technologies into commercial cyber security products and services in order to ensure that the latest technology is available for deployment into the national information infrastructure. End-users for these technologies include first responders, critical infrastructure providers, the banking and finance sector, private industry, and government.

Milestones and Deliverables

FY 2007:

- Expand IP network vulnerability and compliance assessment software (VCAS) trials, expanding from three sites in FY 2006 to six sites in FY 2007. VCAS analyzes proposed network configuration changes for vulnerabilities and compliance issues before the change is implemented.
- Develop the tools to detect software vulnerabilities and will continue to analyze widely-used open source projects.

FY 2008:

- Transition technology and infrastructure for secure government data and video communication and coordination capabilities using hand-held devices. With this technology, DHS users will be able to ensure secure communications wherever they are located.

Communications, Interoperability and Compatibility Thrust Area: Work in this thrust area works to strengthen interoperable wireless communications, improve effective information sharing, and develop tools to enhance overall coordination and planning at all levels of government. Currently, the Nation's capacity for interoperable communications is hindered by poor and fragmented planning and coordination.

The Communications, Interoperability and Compatibility thrust area is comprised of the following programs: Office for Interoperability and Compatibility (OIC) and Integrated Federal, State and local (IFSL) information sharing.

OIC Program – DHS S&T established the OIC program to strengthen and integrate interoperability and compatibility efforts to improve preparedness and response efforts among Federal, state and local tribal governments. OIC addresses the myriad complexities of improving interoperable communications, including:

- o spectrum allocation;
- o use of incompatible proprietary systems and infrastructure;
- o lack adequate standard operating procedures (SOPs); and
- o multi-jurisdictional, multi-disciplinary governance structures.

OIC maintains an aggressive program to promote and achieve both near- and long-term interoperability through the following research, development, testing, evaluation (RDT&E) and standard efforts to develop technology; tools, best practices, and methodologies that emergency response agencies can implement to improve interoperability:

- o Technology Demonstration Pilots;
- o Public Safety Architecture Framework (PSAF);
- o Statement of Requirements (SoR);
- o Standards and Modeling;
- o Interoperability Migration Model;
- o Compliance Assessment;
- o Outreach;
- o SAFECOM Transition;
- o Emergency Data Exchange Language (EDXL) Data Standards;
- o IP Backbone Test & Evaluation;
- o P25 Interfaces; and
- o Wireless Broadband Production.

Technology Demonstration Pilots – Conduct pilot programs across the nation that will test and demonstrate communication technologies in real-world environments, including data and video (ends in FY 2008).
Milestones and Deliverables
    FY 2007:
- Conduct pilot programs to assess and demonstrate data and video technologies in real-world environments.

    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 (ends in FY 2008).
Milestones and Deliverables
    FY 2007:
- Populate the PSAF and conduct a pilot with multiple emergency response agencies to test and validate new functionality.

    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 (ends in FY 2008).
Milestones and Deliverables
    FY 2007:
- Publish SoR Volume I Version 1.2 and complete video quality measures for SoR Volume II.
- Fully integrate voice, video, and data requirements of the SoR.

- Publish the results of the landmark National Interoperability Baseline Survey, which provides detailed statistical information on the current state of interoperability across the Nation.

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 (ends in FY 2008).
Milestones and Deliverables
    FY 2007:
- Complete the first round of LOGIIC consortium projects and demonstrate the results at numerous oil and gas venues.

    FY 2008:
- Test and model broadband standards

    FY 2009:
- Expand messaging standards to work seamlessly with the health field in emergency related exchanges.
- Develop a certification process to ensure industry implementation of standards.

Interoperability Migration Model – Provides emergency response agencies with a standardized method to measure their interoperability capacity (funding ends in FY 2007).
Milestones and Deliverables
    FY 2007:
- Complete the first round of LOGIIC consortium projects and demonstrate the results at numerous oil and gas venues.

    FY 2008:
- Improve interoperable communications by showing how and where OIC tools can help emergency response agencies meet their targets and complete project.

Compliance Assessment – Evaluates existing and emerging technology to ensure operational effectiveness and conformance to standards (ends in FY 2010).
Milestones and Deliverables
    FY 2007:
- Complete the first round of LOGIIC consortium projects and demonstrate the results at numerous oil and gas venues.

    FY 2009:
- Initiate VoIP testing and start data messaging verification.

    FY 2010:
- Complete VoIP testing and start data messaging verification.

Outreach – Provides guidance, tools, templates, publications, and media updates on communications-related issue (ends in FY 2008).
Milestones and Deliverables
    FY 2007:
- Sponsor an OIC Industry Roundtable.
- Develop and distribute OIC's quarterly newsletter, Interoperability Technology Today to first responders and other key stakeholders.

- Conduct Project 25 (P25) Standards Outreach and Education to key stakeholders.

FY 2008:
- Develop and distribute OIC's quarterly newsletter, Interoperability Technology Today to first responders and other key stakeholders.
- Sponsor the "9th 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.

SAFECOM Transition – Supports interoperability projects that are transitioning to the Office of Emergency Communications (funding ends in FY 2007).
Milestones and Deliverables
 FY 2007:
- Transition SAFECOM operations to the Office of Emergency Communications

Emergency Data Exchange Language (EDXL) Data Standards – In response to the Interoperability IPT, CID will initiate this project in FY 2009 to facilitate RDT&E of practitioner-driven information-sharing standards and encourages their implementation into disparate 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.

 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.

IP Backbone Test & Evaluation – Researches IP enabled backbones and evaluates promising solutions.
Milestones and Deliverables
 FY 2009:
- Initiate testing and evaluation of IP solutions.

P25 Interfaces – Beginning in FY 2009 this project will accelerate the development and testing of P25 IP based interfaces by developing test procedures.
Milestones and Deliverables
FY 2009:
- Launch a demonstration version of VoIP Gateways to P25.

 FY 2011:
- Complete the development of network management interfaces

Wireless Broadband Production – In response to the Interoperability Capstone IPT, CID will initiate this project in 2009 to test and evaluate technologies on commercially available and emergent wireless broadband data.

FY 2010:

- Pilot and demonstrate standardized deployments of wireless broadband solution

FY 2011:

- Document findings and implement recommendations to transition wireless broadband solutions

Integrated Federal, State, and Local (IFSL) Information Sharing Program – This information sharing program focuses on developing techniques and processes in support of the DHS Office of Intelligence and Analysis (I&A) to discover new and secure methods for dissemination of threat information among government entities – Federal, State, local, and tribal - responsible for securing the homeland. The activities extend to operational demonstrations and deployments of the technologies and information being developed at DHS or in other government agencies.

Milestones and Deliverables

FY 2007:

- Establish an inter-state governance board to provide policy and operational oversight as required for joint operations and information sharing.
- Develop an operational prototype, and implement a tool-kit solution in four regions of the country. Through this effort, DHS demonstrated the effectiveness of leveraging existing public safety networks and regional initiatives as the conduit for nationwide sharing of public safety information.

FY 2008:

- Evaluate the federated query capabilities, (use of a single query to access multiple, different databases, using handheld wireless devices) for all jurisdictions 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 and add a multi-level secure information sharing capability, which enables information to be securely managed and shared among the Federal, State, and local jurisdictions.

Knowledge Management Tools Thrust Area: The objective of this thrust area is to provide knowledge management capabilities to reduce the risk of terrorist attacks and to prepare for and respond to natural and man-made disasters. The thrust area is preparing new capabilities for I&A and the DHS information enterprise for the integration, management, analysis, and dissemination of actionable information from multi-type, multi-source data to our national, State, local and tribal leaders and decision makers. This knowledge management research provides tools and methods to handle massive amounts of information that is widely dispersed in a great variety of forms. Being able to find such 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* is the best way to save lives. Work in this thrust area is collaborative and complements efforts in the intelligence, law enforcement, and homeland security communities. It focuses on applied R&D in visualization and information analytics, as they are critical to the usability and effectiveness of automation for the information value chain.

This thrust area conducts its activities through the Knowledge Frameworks, Analytical Research, and Collaborative Information Sharing programs.

Knowledge Frameworks Program – This program area establishes architectures and frameworks to develop and test technologies that can rapidly integrate threat information and provide targeted

and actionable information to all agencies that perform 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. It develops the architecture for inserting computationally based tools and methodologies for the Department's Office of I&A, and Immigration and Customs Enforcement (ICE). The program conducts its activities through the following projects:

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

Architecture and Framework – Develops and deploys technologies to analyze masses of data (funding ends in FY 2010).
Milestones and Deliverables
 FY 2007:
- The Architecture and Framework project will develop and improve algorithms for relationship extraction and semantic tagging.
- Transition enhanced data management capabilities.

 FY 2008:
- Deliver upgrades to the 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 2009).
Milestones and Deliverables
 FY 2007:
- Provide modeling and simulation support for FEMA to begin integration of the nation's Public Alert and Warning Systems.
- Define requirements and provide technology support to ICE's Cargo Tracking and Tagging Program
- Partner with local law enforcement agencies to assess surveillance and remote data access capabilities.

 FY 2008:
- Evaluate the five highest priority technology needs, identified in the community research agenda (produced by the S&T Directorate and the Office of the Director of National Intelligence Science and Technology Office).
- Conduct DHS system integration tests and evaluations.

Collective Situational Awareness – Develop architecture for accessing and exchanging situational awareness information among across the disparate National System security networks.

Milestones and Deliverables

    FY 2009:

- Develop collective situational awareness architecture design specification.

    FY 2010

- Perform and analysis of laboratory and commercial technologies for collective situational awareness.

    FY 2011

- Conduct cross domain situational awareness systems interface design and technology pilots.

    FY 2012

- Collective situational awareness architecture development test and evaluation.

Common Operating Picture (COP) Data Fusion Technologies – CID will initiate this project in FY 2009 to respond to the Information Sharing IPT; work in this project will develop sensor integration technologies to fuse massive volumes of data on potential hostile surveillance activity from multiple systems.

    FY 2009:

- Define operator requirements for hostile surveillance sensor fusion.

    FY 2010:

- Conduct sensor fusion and integrated data analysis pilot demonstrations.

    FY 2011:

- Develop hostile surveillance activity sensor fusion standards for the COP.

Integrated Data Processing and Analysis – In response to the Information Sharing IPT, CID will initiate this project to develop a framework for the integrated analysis of free text, database records, audio, and sensor information. (FY 2009 new start)

Milestones and Deliverables

    FY 2009:

- Assess and document user requirements to include design specifications.
- Analyze laboratory and commercially available data processing and analysis technologies.

    FY 2010:

- Establish and validate integrated data processing and analysis performance metrics.
- Conduct integrated data analysis technology pilots.

Law Enforcement and Intelligence Sensor Fusion – This project provides comprehensive sensor fusion standards and communications protocols for sharing sensor information and responds to DHS Information Sharing IPT gaps (FY2009 start).

Milestones and Deliverables

    FY 2009:

- Conduct standards and policy assessments for data exchange with law enforcement and intelligence partners.

    FY 2010:

- Design specifications for sensor fusion standards and exchange protocols.

    FY 2011:

- Conduct pilot sensor fusion standards and protocols in development environment.

Network Identity Management – CID will start this project in FY 2009 to build architecture for managing identities, rights, and authorities used within and external to an organization's network.

Milestones and Deliverables
> **FY 2009:**
- Conduct standards and policy assessments

> **FY 2010:**
- Execute cross agency identity management systems interface design and technology demonstrations.

Real-Time Data Processing and Visualization – In response to the Information Sharing IPT, CID will initiate this project in FY 2009 to develop a lightweight technology suite for the dynamic, real-time processing and visualization of information from multiple sources.

Milestones and Deliverables
> **FY 2009:**
- Assess and document user requirements to include design specifications.

> **FY 2010:**
- Data processing and visualization technology pilot.

> **FY 2011:**
- Perform technology integration suite design, including test and evaluation framework.

Analytical Research Program – This program provides new methods by which analysts and operators can discover, comprehend, and apply information. It does so by presenting large, diverse, and dynamic datasets in easy-to-use visual forms. Such data sets will enable end users to understand and visualize the risks and vulnerabilities of critical infrastructures, ports, other areas related to trade and immigration by means of computational and visual analytic technologies. The analytical research program consists of the following two projects:
- o Visualization Analytics and Physics-based Simulation; and
- o Data-Intensive Computing, Privacy, and Forensics

Visualization and Analytics – Visually based mathematical methods and computational algorithms for discovering, comprehending, and manipulating diverse data and applying the resulting knowledge to anticipate terrorist incidents or catastrophic events

Milestones and Deliverables
> **FY 2007:**
- Develop applications that include:
  - predictive analysis;
  - strategic visualization capabilities for critical infrastructure protection;
  - visual analytics for social and behavioral analysis of terrorist threats;
  - geospatial and temporal analytics tool set;
  - information sharing and collaboration; and
  - pandemic visual analytics.

> **FY 2008:**
- Deliver algorithms and capabilities to ICAHST for research evaluation.
- Develop and install extensive enhancements for common knowledge management architecture, which include interactive full-text analytical visualization capabilities for up to one million documents simultaneously.
- Develop and pilot sophisticated visual analytics tools suitable for mobile and hand-held devices; and significantly advance in-core capabilities to include:

- streaming foreign news;
- interactive touch-screen display to provide simplified access to topic specific text queries;
- analyst predictive concept steering in text supports blending statistical and personal models of key topics for analysis;
- privacy-preserving foundation for visual analytics; and
- affect analysis in text techniques measure the emotional 'charge' of a document.

FY 2009:
- Develop a multi-modal common visual analytics framework.
- Integrate the Regional Visualization Analytics Center with National Visualization Analytics Center.
- Develop a multi-model Common Visual Analytics Framework

FY 2010:
- Support the 2010 Olympics Common Operating Picture.
- Conduct a Federal, State, and Local Visual Analytics Pilot.
- Perform incident-scale physics-based simulation capability.

FY 2011:
- Integrate Visual Analytics with SCOPE.
- Conduct data-intensive architecture for physics-based simulations

Data-Intensive Computing, Privacy, and Forensics – Simpler, more efficient software algorithms and hardware architectures for extracting and managing data, assessing threats and consequences, and ensuring telecommunications interoperability (starts in FY 2009).

Milestones and Deliverables

    FY 2009
- Develop design parameters for data-intensive computation.

    FY 2010:
- Design data-intensive computing architecture.
- Research and incorporate privacy ensuring elements.

    FY2011:
- Conduct data-intensive architecture for physics-based simulations.

Collaborative Information Sharing Program – In 2009, in response to the Information Sharing Integrated Process Team (IPT), CID will initiate this program to focus on the development and deployment of advanced technologies to support inter-organizational and multi-level dissemination of information and intelligence products. This includes:
- o pattern recognition and correlation technologies for creating broad threat awareness;
- o operational support capabilities for protecting infrastructure, and providing relevant, actionable intelligence to operators;
- o development and sustainment of strategic analysis capabilities to recognize, track, and accurately assess the significance of patterns and trends in suspicious activity reports; and
- o development of advanced encryption and redaction tools, digital rights management technologies, and automated destruction capabilities to increase the multi-level security of distributed products.

Specific project within the Collaborative Information Sharing Program include:
- o Data Privacy Technologies;
- o Multi-Level Information;
- o Suspicious Activity Reporting; and
- o Threat Dissemination Standards

Data Privacy Technologies – to enable lawful use of U.S. Persons Data for counter terrorism intelligence analysis.

Milestones and Deliverables

FY 2009:

- Perform Privacy Act and DHS intelligence policy assessments for use of U.S. Persons Data.

FY 2010:

- Develop markup specs and exchange standards for US Persons Data.

FY 2011:

- Conduct assessments and prototype demonstrations of data purge and anonymization techniques for Data Privacy Technologies.

Multi-Level Information Dissemination – supports the distribution of intelligence products to state, local, and private sector security partners.

Milestones and Deliverables

FY 2009:

- Assess and document requirements for external intelligence product dissemination.
- Evaluate multi-level security technologies.

FY 2010:

- Perform multi-level dissemination technology pilots.

FY 2011:

- Conduct DHS system integration tests and evaluations.

Suspicious Activity Reporting – cross-agency, suspicious-activity reporting system to track, in real-time, all encounters with individuals on government watch lists.

Milestones and Deliverables

FY 2009:

- Conduct system design and integration review

FY 2010:

- Perform technology assessments, system interface specifications, and software development for Suspicious Activity Reporting.

FY 2011:

- Execute DHS system integration tests and evaluations for Suspicious Activity Reporting.

Threat Dissemination Standards – information sharing standards and communications protocols for rapidly sharing terrorist attack mitigation strategies within and between homeland security sectors.

Milestones and Deliverables

FY 2009:

- Define open standards and policy assessments for data exchange with CIP government and industry partners.

FY 2010:

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

FY 2011:

- Pilot information exchange standards and protocols in development environment

Surveillance, Reconnaissance and Investigative (SRI) Technologies Thrust Area: Work in this thrust area develops and evaluates individual sensor technologies, the fusion of multiple sensors, and examination of new sensor technologies to support the high-priority needs of Federal, State and local law enforcement agencies, including the Office of Intelligence and Analysis (I&A) at DHS. Under SRI Technologies, CID initiates R&D partners with other organizations in the intelligence and defense communities on behalf of the DHS Intelligence Enterprise.

USSS Support Program – This program area provides agents, uniformed division officers, and support personnel with select technology solutions to protect individuals, including the President, Vice President, their families, visiting heads of state, and other designated individuals. In addition, the program provides forensic scientists, investigators, and engineers with technology to investigate financial crimes, terrorism, and computer fraud.

Milestones and Deliverables

FY 2007:

- Develop speaker identification tools currently used in investigative casework.
- Deliver tools that allowed USSS investigators to compress the time required to analyze speech evidence from days to hours.
- Initiate follow on effort to provide the first step in classifying dialects of American English to assist investigators in determining suspects' nationalities.
- Provide technology to "unlock" virtual containers of information that criminals or terrorists have stored on computers (Project "Safe-Cracker).

FY 2008:

- Develop a Man Portable Tracker to track criminal and terrorist suspects in cluttered signal environments, such as hotels and office buildings, that tracks signals for investigations and protection.
- Transition Advanced Live Scan Import Software (ALIIS) to USSS, which will enable fingerprint cards, palm print cards, and mug shots to be scanned remotely.

Emergent Threat Assessments Thrust Area: The threat assessment thrust area performs all-source assessments of chemical, biological, cyber security, and advanced explosives threats. The goal is to understand terrorist group capabilities and intentions in each area, and develop an overall understanding of the types of threats and tactics likely to be used against the United States. This thrust area also provides components of DHS, the Intelligence Community and other government agencies programmatic and technical expertise in emerging threats, risk sciences and other areas applicable to homeland security that may be especially sensitive, classified or deserving of extraordinary security protection. This thrust area relies on national laboratories to develop a broad and deep understanding of terrorist threats, especially the threat from Weapons of Mass Effect (WME), in direct support of DHS strategic goals. This initiative will assess WME risks and devise effective detection, protection, and response measures.

This thrust area works closely with other elements of the intelligence community to provide threat perspectives, and, in particular, to help advance the use of tools in the analysis process that may help State, local, and tribal public safety and emergency management officials.

Weapons of Mass Effect (WME) Capability Assessment and Attribution Program – This program focuses on providing assessments of foreign and domestic terrorist groups' ability to develop and deploy weapons of mass effect (WME). The program delivers:

- o robust technical analysis of terrorist efforts to acquire, develop, and use chemical, biological, and explosive agents for weapons of mass effect; and

o   ongoing technical assessments of WME threats to support risk analysis and countermeasure development.

Milestones and Deliverables

FY 2007:

- Expand analysis to provide more precise and comprehensive information for WME risk assessments. Including:
    - sources of and access to WME materials, reliance on or training of technical experts; and
    - acquisition of specialized equipment and connection to services of other illicit networks, such as drug trafficking and money laundering.
- Expand the capability to identify possible or putative terrorist groups or organizations, and to discern their plans for an attack.

FY 2008:

- Build a comprehensive system for assessing the capabilities of known terrorist groups to develop and deploy weapons of mass effect. This includes:
    - a database;
    - a set of tools for processing, analyzing, and discovering threat data; and
    - a secure process and technologies for disseminating such information to the Federal, State, and local partners involved in preventing attacks.

Countermeasure Development Detection Program This program focuses on developing capabilities to counter emergent threats for which countermeasures capabilities do not yet exist. It addresses mission support technology development, mass transit mitigation, and small aircraft/unmanned aerial vehicle defense.

Milestones and Deliverables

FY 2007:

- Develop countermeasures prototypes in two ongoing mission support projects and turn over to DHS component(s) for operational test and evaluation.
- Conduct testing to determine feasibility of a specific mass transit mitigation strategy.
- Assess current state of countermeasure development for identified high priority emerging threats.

FY 2008:

- Complete operational development of three countermeasures in ongoing mission support projects and turn over to DHS component(s) for field deployment.
- Participate in conducting live fire test of small aircraft and unmanned aerial vehicle defense system
- Complete testing for determination of feasibility of a specific mass transit mitigation strategy.
- Assess current state of countermeasures development for identified high priority emerging threats.
- Initiate countermeasures development for identified high priority emerging threats.

FY 2009:

- Assess current state of countermeasures development for identified high priority emerging threats.
- Initiate countermeasures development for identified high priority emerging threats.

FY 2010:

- Assess current state of countermeasures development for identified high priority emerging threats.
- Initiate countermeasures development for identified high priority emerging threats.

FY 2011:
- Assess current state of countermeasures development for identified high priority emerging threats.
- Initiate countermeasures development for identified high priority emerging threats

Future Capabilities Research and Development Program – This program focuses on conducting high-risk, high-payoff basic research in areas relevant to emerging threats to homeland security. Activities include research on risk assessment methods and research collaboration with external agencies and international partners on emerging threats. Specific products are classified

<u>Milestones and Deliverables</u>
FY 2007:
- Classified report on the Australian-United States 4th Bilateral Conference on Emerging Technologies

FY 2008:
- Complete risk assessment methodology testing

FY 2007 – FY 2011:
- Classified reports resulting from studies conducted under PLG.

Identification and Assessment Program – This program focuses on anticipating and defining potential threats arising from new scientific and technological advances as well as evaluating terrorist use of existing capabilities in new or unexpected manners. It includes the transit security project, emerging threat assessments, globalization of biotechnology, future bio-agent assessment, and threat/vulnerability analysis. Several projects use a structured "red team" process in which imaginative capabilities and ingenuity of potential terrorists are captured and potential threat scenarios are analyzed for feasibility, vulnerability and consequence.

<u>Milestones and Deliverables</u>
FY 2007:
- Complete initial draft of Synthetic DNA Screening.
- Complete JASON's Summer Study of the vulnerability of the nation's electric power grid.
- Complete Joint S&T/ NCTC Conference "Assessing Progress on the War on Terror" summary report.
- Transition Transit Security Project to Infrastructure and Geophysical Division.
- Draft report on Globalization of Biotechnology.

FY 2008:
- Issue JASON's summer study report.
- Complete JASON's winter study.
- Deliver report on the Synthesis DNA Screening study.
- Complete report on the Globalization of Biotechnology.
- Deliver Third Emerging Threats study to U.S. Secret Service.
- Issue Future Bioagents Phase II threat study.

FY 2009:
- Complete Future Bioagents Phase III.

FY 2008 – FY 2011:
- Conduct one PLG "red team" exercise each year.

The primary Federal customers for the Command, Control and Interoperability Division are the Department's Office of Intelligence and Analysis, Customs and Border Patrol, the U.S. Secret Service, Federal Emergency Management Agency (FEMA), 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 Secretary's goals of:

- o Protecting Critical Infrastructure;
- o Building a nimble and responsive emergency response system; and
- o Strengthening and unifying DHS operations and management.

EXPLOSIVES

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Explosive Detection	VBIED/SBIED	-	-	22,251	25,784	29,753
	HomeMade Explosives	-	-	7,000	5,800	4,100
	Cargo	4,512	2,250	3,450	3,450	2,500
	CheckPoint	30,965	28,407	11,850	9,550	10,300
	Checked Baggage	19,060	20,000	12,641	12,630	4,445
Response	Bomb Assessment	900	900	-	-	-
	Render Safe	600	600	2,140	2,550	1,950
	Detection and Neutralization Tools	-	-	800	1,000	1,900
Mitigation	Conveyance Protection	2,300	3,200	1,500	2,000	1,500
Counter-MANPADS	DIRCM	38,160	1,500	-	-	-
Research	Algorithm	1,000	1,225	-	-	-
	Chemical	1,201	1,225	-	-	-
	Materials	500	500	-	-	-
	Physical	1,500	1,225	-	-	-
	Explosives Research	-	-	8,423	8,717	9,113
HSI	HSI	1,593	1,123	1,212	1,235	1,128
SBIR	SBIR	2,940	1,594	1,620	1,655	1,690
Explosives Total		105,231	63,749	72,887	74,371	68,379

Overview

The Explosives Division develops the technical capabilities to detect, interdict, and lessen the impacts 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;
- integrated protective systems for high-value facilities;
- Suicide Bomber Improvised Explosive Devices (SBIED) and Vehicle Borne IED (VBIED) defeat (predict, detect, defeat (response, neutralize, & mitigation), and destroy; and
- Home Made Explosives (HME) characterization and detection.

These areas incorporate the requirements of the Transportation Security Administration (TSA), U.S. Secret Service (USSS), U.S. Coast Guard (USCG), and first responders.

The Explosives Division carries out its activities through five thrust areas: Explosive Detection, Response, Mitigation, Counter-MANPADS, and Research.

Explosives Detection Thrust Area: This thrust area develops advanced technologies to detect explosives threats to the Nation's aviation, rail and ship transportation systems. Activities in this thrust area aim to improve existing explosive detection methods and develop new ones for screening people, baggage and cargo, while ensuring freedom-of-movement for people and commerce.

Vehicle-Borne Improvised Explosive Devices/Suicide Borne Improvised Explosive Devices (VBIED/ SBIED) Program – The S&T Directorate will establish a dedicated Vehicle Borne Improvised Explosive Device (VBIED)/Suicide Bomber IED (SBIED) program in FY 2009 to address DHS customer capability gaps developed during S&T Directorate's Capstone IPT. This program will support the ongoing effort of the Explosives Division to counter the VBIED/SBIED explosives threat and will investigate all potential technologies capable of detecting and distinguishing these types of explosives threats. The program focuses on two major areas:

- VBIED—Detecting or imaging the physical IED within a vehicle and fusing multiple technologies to provide a level of automation for VBIEDS detection.
- SBIED—Non-intrusive sampling and detection of explosive residues and components.

Vehicle Borne Bomb Detection – The DHS S&T Vehicle Borne IED (VBIED) Detection projects have been developed around three major components. Included are (a) an Explosive Device Detection Component focused on detecting or imaging the physical IED within a vehicle, (b) an Explosives Detection Component geared toward non-intrusive sampling and detection of explosive residues, and (c) an Integration and Algorithm Development Component focused on fusing multiple technologies and providing a level of automation for VBIEDS detection.

Milestones and Deliverables

    FY 2009:

- Report on spectroscopic and trace technology research and development (R&D) for remote or standoff detection.

    FY 2010:

- Report on feasibility study for portable, external screening system of vehicle compartment contents.
- Report on feasibility study for VBIED detection via explosives residues.
- Report on the feasibility study on integrating multiple, distinct technologies.

    FY 2011:

- Report on feasibility study for using spectroscopic techniques for standoff VBIED residue detection.
- Develop advanced standoff (and/or remote) detection capabilities for explosives and explosive devices.

SBIED—Standoff Suicide Bomb Detection – The DHS S&T Suicide Bourne IED (SBIED) Detection Projects have been developed around three major components. Included are (a) an Explosive Device Detection Component focused on detecting or imaging the physical IED on an individual, (b) an Explosives Detection Component geared toward non-intrusive sampling and detection of explosive residues, and (c) Integration and Algorithm Development Component focused on fusing multiple technologies and providing a level of automation for SBIEDS detection.

Milestones and Deliverables

    FY 2009:

- Development of a stand alone imaging prototype using Backscatter technology
- Coordinate with local Law Enforcement to conduct a National Security Special Event (NSSE) technology field demonstration involving:
  - developmental testing;
  - evaluation and pre-deployment certification of technologies;
  - safety reviews; and
  - logistical planning

    FY 2010:

- Development of a stand alone imaging prototype using Passive Terahertz technology

Home Made Explosives (HME) Program – The HME Program supports the ongoing effort of the S&T Directorate to counter the Novel, Liquid and Home Made Explosives threat. The program will investigate all detection technologies capable of detecting and distinguishing explosives and flammable liquids from benign liquids (drinks, lotions, hygiene products, contact lens solutions, etc. Program activities include:

    Home Made Explosives Characterization – This project will determine the impact, friction, and electrostatic discharge sensitivities of home made explosives threats. This information will provide a better understanding of the vulnerability to aircraft and the damage potential of

home made explosives, in order to determine the needed technologies to counter this threat. This data will also allow the safe handling and storage of volatile materials to not only DHS S&T researchers involved with developing explosive detection systems but our customers as well.

Milestones and Deliverables

FY 2007:

- Conduct detonation assessment tests for first group of HME formulas and analyze results for test report.

FY 2008:

- Conduct detonation assessment tests for second group of HME formulas and analyze results for test report.

FY 2009:

- Conduct detonation assessment tests for third group of HME formulas and analyze results for test report.

Home Made Explosives– This project is in support of the ongoing effort by S&T Directorate to counter the recent increase from the home made explosives threat. The goal is to investigate all potential detection technologies capable of detecting and distinguishing explosives and flammable liquids from benign liquids (drinks, lotions, hygiene products, contact lens solutions, etc. The goals also include improving products and systems capable of detecting homemade explosives; support the research and development of next generation, novel technologies, algorithms or prototypes for the detection of homemade explosives; and address potential operational venues, including airport and mass transit checkpoints for passengers and carry-on baggage (not cargo or checked baggage).

Milestones and Deliverables

FY 2007:

- Complete test and evaluation of commercial-off-the-shelf (COTS) devices.

FY 2008:

- Complete COTS technology demonstrations and produce final report for TSA.

FY 2009:

- Complete new technology T&E and provide information to TSA.

Home Made Explosives Technology Integration – This project will provide an integrated detection capability for HME or novel explosive 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 include an increasing number of HME threats.

Milestones and Deliverables

FY 2011:

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

FY 2013:

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

Home Made Explosives Stand Alone Detection – This project will provide 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 include an increasing number of HME threats.

FY 2008:

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

FY 2010:

- Complete COTS detection assessments for second group of HME formulas and produce technical Report for TSA.
- Complete spiral upgrades to COTS equipment for second group of HME formulas.

Cargo Program – This program focuses on identifying and developing 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 screening of 100-percent of air cargo with very few false alarms and reduced operational costs.

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, CBP, USSS and Infrastructure Protection (IP) to meet new threats and increased demand for canine inspections. The program will also continue research, development, testing and evaluation (RDT&E) of the next generation of air cargo screening systems. Activities include:

Air Cargo – This program focuses on identifying and developing 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 screening of 100-percent of cargo, including break bulk screening, with very few false alarms and reduced operational costs.

Milestones and Deliverables
FY 2007:

- Test and evaluate the performance of cargo optimization EDS systems for break bulk cargo.
- Provide Congress detailed reports of results and findings from the airport pilots.

FY 2008:

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

FY 2009:

- Complete technology demonstrations and transition project to TSA.

Canine Explosives Detection – Activities in this area will optimize canine explosive detection to enable DHS canine user agencies such as TSA, CBP, USSS and IP to select and breed the best canines for their needs. 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 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.

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

- small improvised explosive devices (IEDs) or homemade explosives that could be detonated in passenger cabins; and
- weapons that could be used in the hostile takeover of mass transit.

The program focuses on developing passenger and carry-on-baggage screening systems (for use at mass transit check points) that meet TSA requirements for automation, efficiency, and cost reduction.

The Check Point Program will develop a next-generation check point that will enable passengers to travel seamlessly from public areas to secure areas via a high-tech corridor that will automatically identify threats. The corridor would contain an integrated system of detectors (sensors, biometrics, radio frequency identification technologies) networked with command control operations. Program activities include:

Automated Carry-On Detection – This project will further develop advanced capabilities to detect explosives and concealed weapons, including small improvised explosive devices (IEDs) or homemade explosives that could be detonated in passenger cabins and weapons that could be used in the hostile takeover of mass transit. 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 development contract to allow for the detection of Novel explosives in the new generation checkpoint detection system.

FY 2011:

- Complete certification for the detection of novel explosives in the new generation checkpoint detection system.

Next Generation Carry-On Detection – This project will support automated carry-on bag detection system demonstration, system requirements, and performance goals to allow for test and evaluation. This is needed to increase security effectiveness by having an automated detection of weapons and explosives at airports and other mass transit facilities. This project will focus on the new emerging threats and integrating them into a complete system including the wide variety of liquid- and gel-based explosives.

Milestones and Deliverables

FY 2007:

- Test and evaluate the carry-on bag detection system.
- Complete T&E for automated system and produce final report.

FY 2008:

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

FY 2010:

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

FY 2011:

- Transition new-generation Checkpoint detection system to TSA.

Next Generation Passenger Checkpoint – This project will develop the next generation detection system to screen passengers at mass transit checkpoints for explosives. This work

will involve initial concept framing, to include setting parameters of domain, operations, and policies to ensure identification of streamlined, innovative, risk-based solutions. This project will also focus on the new emerging threats and integrating them into a complete system including the wide variety of liquid- and gel-based explosives.

Milestones and Deliverables

    FY 2007:

- Conduct systems study on the passenger checkpoint technology.

    FY 2008:

- Conduct technology demonstration on 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.

Explosive Trace Detection – This project will develop advanced capabilities to detect explosives through trace residue technologies to include improvised explosive devices (IEDs) and homemade explosives. This project will develop 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 2011:

- Complete contamination study report with threat on Explosive Trace Portal systems.

Checked Baggage Program – This program supports continuous improvements toward the Congressionally-directed goal of 100-percent screening of aviation checked baggage by electronic or other approved means, with minimum or no impact to the flow of people or commerce. The Checked Baggage Program will reduce the rate of false alarms and lower operating costs. TSA is the primary customer for this program, while end users are the aviation industry and the traveling public. Activities include:

Improvements to Deployed Check Baggage Technology – This project will provide operational qualification of systems in accordance with customer-established verification of usability, reliability, maintainability, and operability metrics. In order to increase efficiencies of these systems, and reduce the number of false alarms, the root cause of false-alarm rates in EDS need to be understood. The project will certify EDS for reduced threat mass to detect smaller amounts of explosives, based on aircraft vulnerability.

Milestones and Deliverables

    FY 2007:

- Complete a system false alarm analysis and produce final report for TSA.
- Complete EDS certification for reduced threat mass and transition systems to TSA for deployment.

Manhattan II – This program's overall objective of the multi-phased Manhattan II Program is to stimulate commercial development of next generation systems which provide the "best value" combination of performance and affordability for screening checked baggage. Performance is to be measured by a number of criteria including probability of detection, level of false alarms and

throughput. Affordability is to be measured by another set of criteria including initial purchase and operating costs, maintainability, and other components of the full life-cycle costs. TSA, of course, will establish the final acquisition criteria. However, as a direction for the research and development program described in this paper, sensitivity to all of the performance and affordability categories is important. The R&D program will initiate and support the key leveraging capabilities to influence market competition toward a system or systems tradeoff analysis and design process by all industry participants. The research progress should illuminate the tradeoffs among these criteria such that TSA possesses better information upon which to specify its ultimate acquisition criteria to acquire the "best performance and affordability" screening systems.

Manhattan II – This project plans to conduct system development and integration of the Manhattan-II checked baggage program, complete the preliminary system architecture test and evaluation, and conduct 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 2007:
* Conduct a study that will identify the significant tradeoff issues for future architecture and detection technology demonstrations.

FY 2008:
* Completion of architecture gathering, image database, and produce final report for TSA.

FY 2009:
* Completion of detection technology demonstrations and produce final report for TSA.

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

Response Thrust Area: This thrust area focuses on responding to situations involving IEDs, manmade, or natural disasters where explosions occur. Although DOD has funded significant technology development efforts to respond to IEDs, DHS has a fundamental requirement to respond to IEDs found in civilian scenarios, such as a bomb detected in a transportation terminal. In keeping with the DHS mission to provide first responders with effective tools, the Explosives Division broke this thrust area into two primary programs: Bomb Assessment and Render Safe. These two programs aim to provide the tools needed to assess explosive threats once they are detected, and then render them safe for disposal.

Bomb Assessment Program – Activities in this area develop technologies to access and analyze improvised terrorist devices to facilitate timely response and prosecution. Once a bomb has been detected, the bomb squad will have to gain access to it and conduct diagnostic analysis of the bomb in order to formulate the render safe procedure. The program is developing a system capable of obtaining an internal image of the target item (e.g., a vehicle or container) without requiring the user to place a sensor or source behind the target to obtain the image. This system will preclude the current need to have a sensor on opposite sides of the target. Activities include:

Bomb Assessment Technologies and Integration – This project will investigate enabling technology and/or advanced prototypes to provide a single-sided imaging capability for IED Assessment. The system will be capable of obtaining an internal image of the target item

without requiring the user to place a part or component of the system behind the target of interest to obtain the image.

Milestones and Deliverables

> **FY 2007:** Identify critical technology and demonstrate capability to bomb squads.
> * Produce developmental design documents and models for the system.
>
> **FY 2008:**
> * Complete vetting and analysis of bomb Squad Operational Requirements.
> * Complete prototype single-sided backscatter x-ray imaging system for robotic platforms.
>
> **FY 2009:**
> * Complete standardized Tactics, Training and Procedures (TTP) development and refinement for new technology solutions.
> * Complete user's manual for prototype system and provide to customer for review and T&E with prototype system.

Render Safe Program – Once the bomb squad performs access and diagnostics procedures, they must render the bomb safe to transport for disposal. The Explosives Division designed this program to include projects that:

> o increase standoff capabilities, reduce collateral damage; and
> o provide precision disruption and disablement capabilities and techniques.

Projects emphasize developing low-cost solutions that are readily available to the bomb squad community.

Detection and Neutralization Tools – This project develops technologies and tools to detect secondary explosive devices or booby-traps by bomb squads and first responders. Currently there are no technologies to quickly search for and detect secondary devices or booby traps from a distance. New jamming technologies are needed in order to inhibit the RF hazardous device while allowing the bomb squad to maintain the RF capabilities of their robot and communications system during an emergency.

Milestones and Deliverables

> **FY 2007:**
> * Conduct a proof-of-concept study and produce developmental design for a reliable, counter-IED device that will eliminate detonating devices and causing collateral damage.
>
> **FY 2008:**
> * Complete a prototype and user's manual.
> * Begin to transition the device to private industry for further development and production.
> * Transition database of mechanisms for defeating IEDs to Federal, State, local responders (bomb squads).
>
> **FY 2009:**
> * Deliver a complete IED tool characterization guide to bomb technicians for tactical decision making in disabling the threat device.
> * Begin development of a multi-shot disruptor that can attack multiple IEDs so bomb technicians aren't required to go back downrange and reload.
> * 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:
- Standardize procedures for Bomb Squad response to VBIEDs and Suicide Bombing incidents

FY 2011:
- Develop advanced standoff (and/or remote) detection capabilities for explosives and explosive devices and provide interim reports on imaging technology R&D for standoff IEDs.

Mitigation Thrust Area: Mitigation focuses on reducing 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).

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

TSA is the primary customer for this program, while the end-users are the aviation industry and the traveling public. 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 – This project addresses the risk of catastrophic loss of passenger aircraft, resulting from small IEDs detonated in the passenger cabin or cargo hold. Under this project, measures to harden the passenger cabin and cargo hold against blasts will be developed for incorporation into aircraft design and build or for use by airline employees. 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.

Milestones and Deliverables

FY 2007:
- Develop the Explosive Test Database and the Explosive Effects on Composite Materials Database to assess the vulnerability of aircraft to various quantities and types of explosives at different locations of the vessel.

FY 2008:
- Complete enhanced version of composite materials database and user manual.

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 – This Project will conduct multiply vulnerability assessments of narrow and wide body aircraft subject to detonation of Home Made Explosive (HME), Standard Explosives, and Novel Explosive threats at various locations within the passenger cabin and cargo hold. This data will provide detailed knowledge necessary to understand the damage effects of this threat, the minimum quantities of this threat to cause catastrophic damage to various aircraft types, and determine the detection limits necessary for detection systems.

Milestones and Deliverables

FY 2007:
- Complete testing of wide-body aircraft vulnerabilities and blast testing of overhead bin prototypes.

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 Home Made Explosive (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 this threat 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 Home Made Explosive (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-belt; and
  - wide body and narrow body lavatory.

FY 2011:
- Transition the aircraft vulnerability assessments for each type of aircraft and test scenario to TSA.

Counter-MANPADS Thrust Area: Counter-Man-Portable-Air-Defense-Systems (MANPADS) looks at the viability of equipping commercial transport aircraft with defense systems for mitigating shoulder-fired, surface-to-air missile attacks. When equipped on an aircraft, these countermeasures detect and divert possible incoming MANPADS, protecting the host aircraft from possible hits. 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 – This program looks at the feasibility of equipping commercial transport aircraft with defense systems for countering MANPADS attacks. To evaluate feasibility, this program 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 – This Project will conduct develop a laser-based directed infrared countermeasure 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 2007:
- Conduct an operational service evaluation of the installed Counter-MANPADS technology.
   FY 2008:
- Provide a report to Congress at 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 – This Project will conduct develop a laser-based directed infrared countermeasure 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 2007:
- Conduct an operational service evaluation of the installed Counter-MANPADS technology.
   FY 2008:
- Provide a report to Congress at 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.

Research Thrust Area: The Explosives Division has developed Basic Research program objectives and an investment strategy that support an integrated approach to execution of the overall Division resources. In order to mitigate the programmatic planning risks for development of various next generation screening systems, this Basic Research plan has been developed independent of the recently completed Explosives Prevention Capstone Integrated Product Team (IPT) between S&T and one if its primary customers, TSA. The Capstone IPT identified several high priority customer 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 be supportive of the future customer needs.

Explosives Research Program – This program area seeks to improve 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. Projects in this program are:

- Fundamental Particle Physics;
- Algorithm and Analysis of Raw Images;
- Liquid and Home Made Explosives Characterization; and
- Detection Technology and Materials Science.

Fundamental Particle Physics – The purpose behind investigating the fundamental science behind explosive particle behavior is to improve our comprehension of the energy barriers involved in the adhesion, desorption and transport of particles can provide invaluable insight into how technology can be used to best exploit particle behavior and properties. This can lead to the development of new sampling technologies, as well as enhancement of currently used devices. It is envisioned that the next generation of sampling technologies would spring from advances made in the fundamental understanding of particle behavior.

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.

FY 2010:

- Complete research and data analysis and produce report for potential customer transition.

FY 2011:

- Complete laboratory proof=-of-concept testing and produce test data and analysis results for potential customer transition.

Algorithm and Analysis of Raw Images – The primary focus of this project is to collect and consolidate images from commercial vendors and 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 coordinate development of 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\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 and image data analysis and produce report.

Liquid and Home Made Explosives Chemical Characterization – This Project is in support of the ongoing effort by the S&T Directorate to counter the recent increase from the Home Made Explosives threat. The goal of this project is to qualify and quantify the Physical and Chemical properties of home made explosives threats. Properties that will need to be identified include density, CT number, dielectric constant, chemical composition of products, molecular structure, thermal decomposition rates, etc.

Milestones and Deliverables

   FY 2007:

   • Complete data collection and analysis for the first group of Home Made Explosives physical and chemical properties and provide test results report to the user community.

   FY 2008:

   • Complete data collection and analysis for the second group of Home Made Explosives physical and chemical properties and provide test results report to the user community.

Detection Technology and Material Science – This project will employ the latest advances in high performance materials development to provide a basis for enhanced aircraft survivability in the event of an onboard blast. The project will focus on blast resistant materials and to 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). The main goal is to enhance the survivability of the aircraft and limit casualties in the event of a blast.

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.

The primary Federal customers for the Explosives Division are the Transportation Security Administration (TSA), U.S. Secret Service (USSS), U.S. Coast Guard (USCG), who represent end-users including first responders; Federal, State, and local first responders; and the aviation industry. Successful transition of technologies that will substantially improve DHS components' performance and support the Secretary's goals of:

   o Protecting the Nation from dangerous people;

   o Protecting our Nation from dangerous goods; and

   o Protecting Critical Infrastructure.

HUMAN FACTORS

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Human Research & Engineering	Human Optimization	-	-	228	1,567	1,964
	Personal Identification Systems	767	3,258	3,400	3,200	3,470
	Technology Acceptance and Integration	215	350	350	350	350
	Transportation Technology and Human Integration	-	1,500	-	-	-
Social-Behavioral Threat Analysis	Community Preparedness, Response, and Recovery	933	2,137	1,575	1,700	1,866
	Motivation & Intent	4,617	4,818	4,050	2,131	2,400
	Suspicious Behavior Detection	-	-	5,487	6,336	4,378
HSI	HSI	95	222	262	265	250
SBIR	SBIR	175	315	294	303	308
Human Factors Total		6,802	12,600	15,646	15,852	14,986

Overview

The Human Factors Division applies social and behavioral sciences to improve detection, analysis, and understanding of threats posed by individuals, groups, and radical movements; it supports the preparedness, response, and recovery of communities impacted by catastrophic events; and it advances homeland security by integrating human factors into homeland security technologies.

Human Research and Engineering Thrust Area: This thrust area focuses on integrating human factors into the development and use of homeland security technologies, with the goal of achieving high levels of system effectiveness, safety, and acceptance. The Division works across the S&T Directorate to ensure that human factors are appropriately integrated into the development and use of technologies – in some cases, directly managing programs or the relevant portions of programs that are funded by other divisions, and by providing guidance and tools where needed. The Division anticipates helping homeland security customers identify critically needed human systems integration initiatives.

Human-System Optimization Program – Human Factors Division plans to initiate this program in FY 2009. The objective of this effort is to develop and validate 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. To achieve this objective, this effort will build 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

- o task analyses;
- o modeling and simulation;
- o structured experimentation and operations research;
- o functional- and participatory-based design and testing; and
- o operator-based effectiveness evaluations.

Milestones and Deliverables

FY 2009:

- Establish a technical baseline of existing human systems integration technologies and a concept of operations for testing such technologies

FY 2010:

- Demonstrate the effects of task analysis technologies upon system requirements

FY 2011:
- Demonstrate the effects of conducting trade-off analysis through modeling and simulation and operations research technologies prior to system design

Personal Identification Systems Program – This 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 Source
- Mobile Biometrics

<u>Biometrics</u> – This project will develop biometric tools to accurately identify, without physical contact, known terrorists and criminals (via fingerprints, iris scans/images, or face recognition), while allowing the unconstrained movement of legitimate travelers.

Milestones and Deliverables

FY 2007:
- Refining existing multi-modal biometric framework for test and evaluation activities

FY 2008:
- Complete a multi-modal (finger, face and iris) biometrics system design.
- Enhance capture of face and iris images for multi-modal systems

FY 2009:
- Deliver an enhanced multi-modal (Face, Iris, Finger) biometrics T&E framework for government-sponsored multi-modal vendor test
- Initiate development of a contactless multi-modal biometrics identification prototype
- Create multi-modal biometrics reference datasets

FY 2010:
- Perform demonstration and test of prototype.

FY 2011:
- Expand prototype to include voice and other modalities.

FY 2011:
- Deliver a high-throughput multi-modal test system.

<u>Credentialing</u> – This project will develop tamper-proof credentialing systems that incorporate biometric information; for example, a biometrics-based, card-and-reader system. This work 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 2007:
- Support development of test and evaluation plan.
- Conduct control test of TWIC card-and-reader prototypes in support of LA/LB port demonstration

FY 2008:
- Initiate requirements efforts for a phase IV, non-contact, biometrics card-and-reader-system.

FY 2009:
- Initiate research efforts for secure contactless technologies.

FY 2010:
- Initiate development of a contactless prototype.

FY 2011:
- Perform demonstration and test of contactless prototype.

Commercial Data Source – This project begins in FY 2009 and will focus on improvement of the screening and interviewing processes at the borders.

Milestones and Deliverables

FY 2009:
- Define requirements for a system that will improve the screening and interview processes for CIS, CBP and TSA.
- Develop demonstration design
- Demonstrate prototype.

FY 2010:
- Test operational prototype.
- System demonstration.
- Transition system to multiple operational users within DHS (e.g., CIS, CBP, and TSA).

Mobile Biometric Systems – This project will develop mobile biometrics systems to be used at remote sites along U.S. borders, during disasters and terrorist incidents, or even 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 2009:
- Define system requirements for mobile biometrics systems.
- Develop design and demonstration plans for multiple implementations

FY 2010:
- Perform a biometrics capture and telecommunications demonstration.

FY 2011:
- Complete capture and telecommunications prototypes.
- Conduct integrated system prototype demonstration

Technology Acceptance and Integration Program – This program addresses issues of user acceptance and application of new technologies. Areas of research include the examination of 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 Acceptance of Technology (CAT) Panel to bring together industry, public interest, and community-oriented organizations, often with divergent views, to better understand and integrate their perspectives and issues in the development, deployment, and public acceptance of technology.

Milestones and Deliverables

FY 2007:
- Develop CAT Panel structure and technology identification/prioritization process.

FY 2008:
- Identify initial technologies to be vetted by CAT Panel.

FY 2008-FY 2013:
- Coordinate three to five meetings per year with members of the CAT Panel, resulting in the delivery of specific issue papers and recommendations on vetted technologies

Transportation Technology – Human Integration Program – This program addresses issues critical to the integration of human-in-the-loop technology systems used by transportation screeners. The program's objectives include 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, for which significant data on screeners' perceptual and cognitive processes already exists.

Milestones and Deliverables

FY 2008:

- Characterize screener-performance issues
- Propose new screener technologies and procedures
- Develop training curricula to optimize security effectiveness and reduce human fatigue and injury, while reducing training requirements and overall cost

Social Behavioral Threat Analysis (SBTA) Thrust Area: This thrust area focuses on applying 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 inform 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 – This 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's ability to

- o prepare for catastrophic events, and
- o respond and recover from such 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:

- o Enhancing Public Response and Community Resilience
- o Quantitative Psycho-Social Impacts Index
- o Risk Perception, Public Trust, and Communication

Enhancing Public Response and Community Resilience – This project will examine shortfalls in responding to the public during and after catastrophic events. It will also identify ways to enhance community resilience and include actions that may be taken by government, the private sectors, communities and individuals.

Milestones and Deliverables

FY 2007:

- Develop a database of public needs that were unmet during Hurricanes Katrina and Rita
- Make recommendations to address public needs during future emergencies

FY 2008:

- Report on temporal 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 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

FY 2011:
- Deliver a detailed report describing the impact on preparedness at the individual, family, group, and community level and on which types of interventions are most effective at increasing preparedness at these various levels of organization

Quantitative Psycho-Social Impacts Index – In FY 2008, this project will begin development of a quantitative index of the psychological, social, and indirect and long-term economic impacts of extreme events to better inform the "consequences" aspect of DHS's risk assessments.

Milestones and Deliverables

FY 2009:
- Complete and deliver an interim report detailing theories, constructs, and indicators (candidate measures) for inclusion in the index

FY 2010:
- Deliver a database on psychological, social, and indirect/long-term economic impacts of Hurricane Katrina
- Deliver a second interim report on reliability, sensitivity, and validity of candidate measures

FY 2011:
- Deliver draft of final index and supporting evidence

Risk Perception, Public Trust, and Communication – This project takes results from homeland security exercises to establish 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 DHS communications during the Top Officials 4 (TOPOFF4) practical exercises in October 2007.

Milestones and Deliverables

FY 2008 and FY 2009:
- Identify effective messaging (pre-event, during, and post-event) for diverse audiences (such as varying socioeconomic status, non-English speaking community members, diverse ethnic and cultural backgrounds, and others),
- Quantify the differential impact of messaging on diverse audiences, and effective media for transmitting messages to diverse audiences

FY 2009:
- Develop a report with recommendations detailing which message strategies and message content are most effective in communicating with diverse groups within the larger population

FY 2010:
- Provide a report with recommendations detailing the differential impact of messaging on diverse audiences (e.g. single parents, various socioeconomic levels, etc.)

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

Motivation and Intent (M&I) Program – This program area 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:

- o Group Violent Intent Modeling
- o Global Terrorism Database
- o Open-Source Modeling Applicability
- o Radicalization Deterrence

Group Violent Intent Modeling – This project develops a computerized analytical framework focused on determining whether radical groups are likely to engage in violence, and what ideological, organizational, and contextual factors may influence this decision or spark action.

Milestones and Deliverables

FY 2007:
- Deliver group-level modeling and simulation capability, version 1.
- Complete integrated group-level analytical framework/system (relevant data, ontology of terms and concepts, modeling and simulation, etc.), version 1.

FY 2008:
- Complete integrated group-level analytical framework/system, version 2, implemented at user site.

FY 2009:
- Complete modeling capabilities, and content analysis and information extraction.

FY 2010:
- Deliver final group-level analytical framework to the Office of Intelligence and Analysis.
- 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 – This project funds the yearly update of the Global Terrorism Database (GTD), housed at the DHS Center of Excellence for the Study of Terrorism and Responses to Terrorism (START). Currently, this project funds yearly updates of this database; however, starting in FY 2009, START will secure alternate funding to support the continual update of the GTD.

Milestones and Deliverables

FY 2007:
- Release GTD Phase I data to U.S. Government
- Deliver data on all terrorist incidents in the U.S. from 1980 through Q2-2007 to START

FY 2008:
- Develop enhanced database user interface
- Release GTC Phase I data to broader research community
- Complete coding of terrorist incidents occurring form 1970 through Q3 2008

FY 2009:
- Release GTD Phase II data to U.S. Government

FY 2010-2011:
- Release GTD Phase II data to broader research community

Open-Source Modeling Applicability – This project will start work in FY 2008 to analyze the applicability of social and behavioral science data, models, and theories that have been developed with open source materials (i.e. academic research) to intelligence analyses.

Milestones and Deliverables

    FY 2008:
- Initiate work in Open Source Modeling Applicability

    FY 2009:
- Complete report comparing the findings from open source academic research on levels of support for terrorism among the American public with the findings from FOUO and classified analytical studies on levels of support for terrorism among the American public.

Radicalization Deterrence – In FY 2008, this project will support studies of terrorist mobilization, recruitment, and operations to inform the policy, intelligence, and operational functions of DHS. This initiative directly addresses and supports the research priorities outlined by the DHS Radicalization and Engagement Working Group, which is responsible for coordinating DHS activities that prevent and counter radicalization.

Milestones and Deliverables

    FY 2009:
- Report on survey results of U.S. residents on levels of support for terrorism

    FY 2010-2011:
- Deliver additional results on survey of U.S. residents on levels of support for terrorism

    FY 2010:
- Deliver data and report on the drivers of radicalization and support for terrorism among immigrant communities in the United States

    FY 2010:
- Deliver data and report analyzing all known individuals from the United States who have participated in, or attempted to participate in, violent global Islamic activism post-2001 to understand transition from radicalization to overt participation in global terrorist activity

Suspicious Behavior Detection Program – Starting in FY 2009, this program will focus on building the capability to detect suspicious behavior that indicates the intent to cause harm. This program's activities include:
- Hostile Intent Detection – Automated Prototype
- Hostile Intent Detection – Suspicious Passenger by Observation Technique (SPOT)
- Hostile Intent Detection – Stand-off Training
- Insider Threat Detection

Hostile Intent Detection – Automated Prototype – this project will demonstrate real-time auto intent detection and transition expanded multi-cultural intent indicators. S&T will eventually transition the indicators identified through this work to the Transportation Security Administration for integration into their operational and training programs.

Milestones and Deliverables

    FY 2007
- Transition Baseline Behavior-Based Indicators

    FY 2008
- Demonstrate Near Real-Time Intent Detection

    FY 2008
- Transition Multi-Cultural Intent Indicators

FY 2009:
- Demonstrate real-time auto intent detection
- Transition expanded multi-cultural intent indicators

FY 2010:
- Transition Multi-Modal Auto Intent Detection

FY 2011:
- Transition Cross-Cultural Intent Indicators

Hostile Intent Detection – SPOT – This project will provide cross-cultural validation of behavioral indicators, contained within the Transportation Security Administration's Suspicious Passenger by Observation Technique (SPOT), currently used operationally to support screening at air portals. The project will incorporate this enhanced capability into courseware to support computer-based training simulation used by the Transportation Security Administration.

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

FY 2011:
- Insert Cross-Cultural Indictors into Stand-Off Hostile Intent Training Courseware
- Evaluate Training Effectiveness
- Transition Validated Cross-Cultural SPOT Courseware

Hostile Intent Detection – Stand-off Training – This project will develop computer-based simulation to train behavior-based stand-off detection for future hostile intent from the indicators of both the interactive environment (Hostile Intent Detection – Automated Prototype) and the observational environment (Hostile Intent Detection – SPOT) to support screening and interviewing interactions at air, land, and sea 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 Operational Delivery and Testing
- Evaluate Training Effectiveness
- Transition Validated Courseware

Insider Threat Detection – The project will include behavioral research and pattern extraction technologies to detect insider behavior that is likely to present or lead to a physical threat to critical infrastructure, and will produce enhanced tools to identify behavior patterns and characteristics identifiable during pre-employment screening related to such threats.

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.

The primary Federal customers for the Human Factors 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. Successful transition of these technologies will substantially improve DHS components' performance and support the Secretary's goals of:
- o Protecting the Nation from dangerous people;
- o Protecting our Nation from dangerous goods;
- o Protecting Critical Infrastructure;
- o Building a nimble and responsive emergency response system; and
- o Strengthening and unifying DHS operations and management.

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Critical Infrastructure Protection	Protective Technologies	-	-	8,579	8,200	9,048
	Modeling, Simulation and Analysis	8,413	3,000	3,050	3,520	3,580
	National CIP R&D Plan	800	1,000	650	650	650
	Advanced Surveillance and Detection Systems	-	-	4,587	5,261	5,647
	Response and Recovery Technologies	-	-	4,635	6,061	3,732
	Community Based CIP Institute	20,000	-	-	-	-
	Risk Reduction Technologies	3,000	7,000	-	-	-
Prepareness and Response	Incident Management Enterprise	4,601	6,977	11,303	9,534	12,583
	Preparedness & Response Technologies	-	1,000	-	-	-
	Preparedness & Response Advance Concepts and Systems	-	2,000	-	-	-
	Regional Technology Integration	10,000	2,000	-	-	-
	Emergency Responder Technologies	-	-	4,000	6,000	6,080
	Integrated Modeling, Mapping, & Simulation	-	-	2,500	2,800	4,000
Geophysical	Southeast Regional Research Initiative	25,000	-	-	-	-
HSI	HSI	1,043	423	679	731	785
SBIR	SBIR	1,924	600	888	908	925
Infrastructure/Geophysical Total		74,781	24,000	40,871	43,885	47,030

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 superior situational awareness, emergency response capabilities, and critical infrastructure protection. The Division develops technical solutions and reach-back capabilities to improve State, local, tribal, and private sector preparedness for and response to all-hazards events impacting the population and critical infrastructure. The Division also models and simulates the Nation's 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 various catastrophes. The primary Federal customers for the Infrastructure and Geophysical Division are the Department's Office of Infrastructure Protection (OIP), National Protection and Programs Directorate and the Federal Emergency Management Agency (FEMA), who represent end-users including first responders; Federal, State, and local emergency managers; and private sector infrastructure owners and operators.

The Infrastructure and Geophysical Division carries out its activities through three thrust areas:
- o Critical Infrastructure Protection;
- o Preparedness and Response; and
- o Geophysical.

Critical Infrastructure Protection (CIP) Thrust Area: The CIP thrust area focuses on the 17 Critical Infrastructures/Key Resources (CI/KR) sectors identified in the *National Infrastructure Protection Plan* (NIPP). This meets the requirements of the Office of Infrastructure Protection in the Preparedness Directorate, and those that the President set forth in 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:
- o agriculture and food;
- o the defense industrial base;
- o energy;
- o public health and healthcare;
- o national monuments and icons;
- o banking and finance;

- o drinking water and water treatment systems;
- o chemical;
- o commercial facilities;
- o dams;
- o emergency services;
- o commercial nuclear reactors, materials, and waste;
- o information technology:
- o telecommunications;
- o postal and shipping;
- o transportation systems; and
- o government facilities.

Protective Technologies Program – IGD focuses technology development within this area on sector-specific or region-specific needs, as identified by OIP, or 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. DHS S&T will add other high priority physical threats in future years. This will enable owners and operators of those 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 - Advance Materials Design (Tier 1) – This project will provide the Office of Infrastructure protection (OIP) with materials, design procedures, and innovative construction methods that enable hardening or increasing the resiliency of assets deemed most vital to the safety, economy, and security of the Nation.

Milestones and Deliverables

   FY 2009:
- Develop a tool to design protective measures for vital infrastructure using advance materials - composite type 1.

   FY 2010:
- Report on the use of advanced materials in Critical Infrastructure Protection.

Blast/Projectile - Protective Measures and Design Tools – This project will provide protective measures for the tier 1 and 2 critical infrastructure assets, as defined by the Office of Infrastructure Protection. These protective measures will, in some cases, be unique to the specific asset. These protective measures could include blast protection, rapid response and recovery, and other defensive measures.

Milestones and Deliverables

   FY 2009:
- Deliver protective measures (bridges, tunnels, dams phase 2) for Tier 1 and 2 asset protection to OIP.

   FY 2010:
- Deliver to OIP protective measures (bridges, tunnels, dams phase 3) for tier 1 and 2 critical assets.

   FY 2011:
- Deliver protective measures (next priority targets, phase 1) for tier 1 and 2 critical assets to OIP.

Blast/Projectile - Unified Blast Analysis Tool – The project will develop a blast analysis tool that will enable owners and operators of the most vital critical infrastructure sites to implement affordable, reliable blast and projectile mitigation measures. This tool will improve Critical Infrastructures and Key Resources (CI/KR) capabilities to withstand the 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:**
> - Deliver version 1.0 blast analysis tool for underwater tunnels, dams, and cable-stayed bridges.
>
> **FY 2010:**
> - Identify alternative mitigation measures and evaluate their potential effectiveness, and provide demonstrations of these results.
>
> **FY 2011:**
> - Build a modular design tool for critical infrastructure (embankment dams, tunnels, and bridges for this phase) similar to the Army's Anti-Terrorist Planner.

Modeling, Simulation, and Analysis Program – This program is developing a capability to improve the ability of decision makers to evaluate CI/KR risks and changes to risks (including interdependencies). The capability will help public service and private industry policy/decision makers, owners/operators, planners and responders understand the consequences of policy and investment options before enacting solutions, and provide real-time support during crises. The program will enable

- o rapid examination of interdependencies, trade-offs between risk reduction benefits and protective action costs,
- o the incorporation of threat information, vulnerability assessments, and disruption consequences.

Interdependencies Model Build-Out (CIP-DSS) – The project is developing a risk-informed decision support system that provides information for making critical infrastructure protection decisions by considering all 17 critical infrastructure sectors and their primary interdependencies, and computing human health and safety, economic, public confidence, national security, and environmental impacts.

Milestones and Deliverables

> **FY 2007:**
> - Build out CIP Decision Support System (DSS) to include physical/natural disaster disruption scenarios and complete the chemical case study.
> - Transition completed CIP-DSS tool to Office of Infrastructure Protection (OIP) and complete project.

Sector and Threat Specific MSA – Develop and implement a transition plan for deployment of the CIP-DSS to the NISAC, support OIP-driven interactions with key stakeholders to describe and vet metropolitan and national-scale CIP-DSS models, analysis support for national exercises and to key stakeholders including HITRAC, SSCs and Sector Specialists.

Milestones and Deliverables

> **FY 2007:**
> - Vet CIP-DSS and socialize with Sector representatives.
> - Conduct sector and threat-specific analysis and studies.
> - Complete project.

Real-time Decision Support Tool Project –The project will provide the algorithm to support a real-time decision support tool with dynamic, real-tie updates from existing sensor networks and databases. 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:

* Develop the architectural design of a real-time decision support system (RT-DSS), and include improved sensor information for dynamically updated databases.
* Focus effort on the systems level design and interfaces of the technology.

    FY 2010:

* Conduct a proof of concept and feasibility demonstration.

    FY 2011:

* Demonstrate a capability to update databases in real-time.

The National Critical Infrastructure Protection R&D Plan Program – The CIP thrust area annually 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). The NIPP, the SSPs, 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. IGD 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 the S&T Directorate. This group developed the first annual NCIP R&D Plan in FY 2004.

Milestones and Deliverables

    FY 2007:

* Update the plan with synthesis across past annual plans, and integrate information from the NIPP National Annual Report.

    FY 2008:

* Update the plan to reflect improvements on baseline information established in the previous years.

    FY 2009-2011:

* Update the plan based on advances in technology and discussions with the DHS Preparedness Directorate, the Sector Specific Agencies, private industry through the Coordinating Council System, and all other agencies involved in funding R&D relevant to CIP.

Advanced Surveillance and Detection Systems Program: This program will integrate advanced, automated and affordable intrusion and other physical disruption and insider threat monitoring, surveillance and detection technologies into CI/KR to improve the ability of infrastructure owners and operators to monitor their infrastructure assets internally and externally.

Advanced Surveillance Systems – This project develops the algorithm to provide automated anomaly detection to interpret multi-modal surveillance information from multiple types of intrusions.

Milestones and Deliverables

    FY 2009:

- Conduct an analysis of Commercial-Off-The-Shelf (COTS) in infrastructure applications in advanced surveillance and select sets of wave forms and sensor systems for three Tier 1 settings (urban, remote, and submerged).

FY 2010:

- Develop advanced, tailored set of technologies for type 1 (urban, remote, or submerged).

FY 2011:

- Demonstrate type 1 technologies.

Underwater Surveillance – Provides advanced, automated, affordable underwater monitoring and surveillance technologies to detect underwater threats in harsh environments for extended periods. The technologies will be capable of being seamlessly and transparently integrated into infrastructure operations and operate in tandem and in support of law enforcement and other protective services/agencies.

Milestones and Deliverables

> **FY 2009:**

- Develop potential solutions for underwater surveillance.

FY 2010:

- Conduct testing and evaluation of existing technologies.

FY 2011:

- Transition underwater surveillance technologies to OIP.

Response and Recovery Technologies Program: Starting in FY 2009, will provide 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.

New Electrical Grid Transformer – IGD will partner with the Electric Power Research Institute (EPRI) to specify, design, build, and demonstrate 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.

Milestones and Deliverables

> **FY 2009:**

- Prepare final specification, based on utility steering committee, and issue request for proposals.

FY 2010:

Design and demonstrate first single phase Recovery Transformer

FY 2011:

- Deliver final prototype.

Rapid Response and Recovery Project – This project provides rapid response and recovery technologies for CI/KR assets to limit damage and consequences and resume normal operations. It will develop rapid response and recovery technologies for infrastructure assets, including underwater tunnels, levees, and dams. This project will also integrate technologies into testing environments and facilitate the deployment of tested technologies, which will likely include affordable/retrofitable technologies.

Milestones and Deliverables

FY 2009:
- Demonstrate rapid response and recovery technologies for three highest priority components of Tier 1 infrastructure assets.

FY 2010:
- Transition rapid response and recovery technologies for infrastructure assets

FY 2011:
- Demonstrate rapid response and recovery technologies for infrastructure assets, including underwater tunnels, levees, and dams.

Community Based CIP Institute Program – This program supports university and private industry partnerships to develop community-based homeland security technologies and mature them so that they can become commercially attractive. 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.

IGD requested no funding for this program beyond FY 2007.

    Milestones and Deliverables

        FY 2007:
- Design and test light-weight passenger/freight railcar armor against projectiles, IEDs, and explosives in-car or buried under track.
- Test multi-functional, carbon materials for modular assembly and sprayable foam coatings to provide blast mitigation, radiation/chemical protection, and enhanced electronic security
- Demonstrate coal-combustion by-product (CCB)-coated ammonium nitrate sample on agricultural use.

Risk Reduction Technologies Program – IGD focuses this program on sector-specific or region-specific needs, as identified by OIP, or 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.

    Blast/Projectile Protection Project – The project develops suites of advanced materials, design procedures, and innovative construction methods that can be used to protect critical infrastructure and key resources. It leverages existing DOD research and development, along with existing federal investment in nanotechnology and other extremely strong materials

    Milestones and Deliverables

        FY 2007:
- Complete program plan and architecture design.

        FY 2008:
- Conduct feasibility demonstration.
- Develop prototype.

Preparedness and Response (P&R) Thrust Area: This 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 – This program focuses on the development of advanced, scalable, interoperable, and non-proprietary incident information-management, decision-making, and training tools for incident commanders and emergency responders 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.

The program will include incident logistics and resource tracking systems that are critical in restoring services, replenishing critical infrastructure, and helping disaster victims in a timely fashion. The logistics systems will provide total asset visibility to incident responders and commanders and will help to manage the entire logistics supply chain, from inventory management to total distribution and verification of supply disbursements.

Interagency Modeling and Atmospheric Assessment Center (IMAAC) – IMAAC 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 2007:
- Provide support to over 20 real world incidents
- Participate in the planning and conduct of exercises (i.e., TOPOFF 4 Command Post Exercise) in support of the National Response Plan (NRP) and the National Preparedness Goal.
- Support the National Exercise program, TOPOFF 4.
- Institute a suite of scientifically accredited models to be used for atmospheric hazard predictions.
- Enhance ongoing educational and outreach program to State and Federal agencies on the operational use of IMAAC and develop an enhanced web-based interface permitting greater use of sophisticated modeling tools.

FY 2008:
- Deliver accredited event reconstruction and building infiltration models.
- Complete project.

Unified Incident Command and Decision Support – The project is developing a Unified Incident Command and Decision Support (UICDS) framework, based on NIMS/ Incident Command System (ICS) and NRP, and developing 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. IGD will start this project in FY 2008.

Milestones and Deliverables

FY 2008:
- Deploy pilot implementations of the architecture at one or more Regional Technology Integration (RTI) cities.
- Identify sub-components to migrate to the Advanced Incident Management Enterprise System (AIMES).

FY 2009:
- Transition sub-components of UICDS to Advanced Incident Management Enterprise System (AIMES).
- Complete project.

Training, Exercise & Lessons Learned (TE&LL) – The TE&LL project is developing 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. TE&LL will link multiple agencies, functions, and jurisdictions to improve preparedness for emergency responders and managers so they become more proficient in decision making. TELL incorporates training objectives, scenarios, and metrics defined by other programs, and the capability to capture lessons learned so they can be used later as part of the after action review. TE&LL 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 2007:
- Complete development of system requirements that support national, interoperable simulation-based training and exercises.
- Conduct advanced concept demonstrations, which will include the capability to simulate large-scale emergency response operations that require nationwide deployment of resources from Federal, state and local response organizations.
- Conduct evaluation exercises at several locations across the United States

FY 2008:
- Develop a system prototype based on the architecture developed in FY 2007.

FY 2009:
- Conduct several federated training exercises, using the TE&LL prototype, across the United States with various first responder communities.
- Identify sub-components to migrate to the Advanced Incident Management Enterprise System (AIMES).
- Initiate the transition process into Integrated Modeling, Mapping, and Simulation program.

FY 2010:
- Demonstrate TE&LL sub-components with a combination of live and simulated incident information at a multi-jurisdictional level.
- Transition federated simulation-based training and exercise capability to the customer.

Advanced Incident Management Enterprise System – Starting in FY 2009, AIMES will build upon the UICDS architecture and TELL framework to develop the next-generation incident-management enterprise system that will revolutionize the way our Nation's responders handle incidents by providing an integrated interoperable, and unified common operating picture with total visibility into:
- o incident information;

- o resources;
- o environment;
- o logistics supply chain;
- o response and recovery plans;
- o methods;
- o tactics; and
- o 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 and develop an AIMES prototype for a federated UICDS and TE&LL system to interoperate with other Federal agencies beginning with DOD.

FY 2011:
- Integrate and test AIMES with other first responder technologies, such as the 3-D Locator system, the Physiological Monitoring System and the prototype Logistics System to demonstrate the AIMES functionality

Incident Logistics and Resource Tracking System – IGD also will begin this project in FY 2009 to provide a comprehensive and transparent disaster logistics enterprise across the entire area of responsibility of all disaster response, public and private, partners. This enterprise system will allow critical resources to be more effectively managed and enhance real time coordination and situational awareness that will be 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 utilization of the supply chain by identifying the best routes to staging areas and the return to the disaster site, as well as from supply areas to the staging area.

Milestones and Deliverables

FY 2009:
- Develop a prioritized list of FEMA Logistics System Requirements
- Develop a Logistics System Functional Prototype

FY 2010:
- Demonstrate key sub-system components in a relevant operational environment and develop system.

FY 2011:
- Integrate key ILRT sub-components into a functional Logistics and resource Tracking System that will be able to tie to FEMA's Total Asset Visibility capability.

Preparedness and Response Technologies Program – This program is developing 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

Personal Protective Equipment (PPE) Project – This project focuses on developing materials that can provide protection during response to chemical, biological, radiological, nuclear, and explosive (CBRNE) events. PPE made with these materials will have properties such as:
- o self-decontamination for chemical and/or biological agents;
- o increased service life;
- o self-healing upon being compromised (e.g., ripped, torn); and
- o flame resistance.

The PPE project will develop 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.

Milestones and Deliverables

FY 2007: (Based on prior year funding)
- Provide prototypes of new materials and garments with improved protection capability for chemical/biological hazards.
- Test prototypes in accordance with appropriate performance and operational requirements.
- Develop a standardized process for emergent response and recovery guides/policies/procedures during incidents of national significant for emergency responders starting with events caused by radiological dispersion devices and improvised nuclear devices

FY 2008:
- Transition new, advanced personal protection materials to prototype fabrication program for production of operational 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.

Preparedness and Response Advanced Concepts and Systems Program – This program is an incubator of basic research and innovative capabilities that will engage the emergency response communities at the Federal, State, and local levels to assess needs and establish requirements for advanced technologies that will improve the ability for the emergency responders to track, locate and identify responders real time. Based on requirements, the program will develop and experiment with advanced concepts and produce early prototypes to validate functional performance so a detailed technology development and acquisition plan can be generated. Based on customer input, this program has focused on locating first responders in challenged areas (e.g. subterranean facilities, skyscrapers, and warehouses).

Advanced Concepts & Special Studies Project – This project takes 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 2007:
- Using prior year funding, develop the system requirements and designs for a first responder 3D location system for tracking personnel that will provide incident

commanders situational awareness through accurate location and monitoring inside threatened buildings, collapsed buildings, and subterranean areas.

FY 2008:
* Conduct government testing of the 3-D location system.
* Complete project and program.

Regional Technology Integration (RTI) Program – This program facilitates the transition of 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:
  o atmospheric monitoring and detection systems for chemical and biological toxins;
  o monitoring and detection systems that are integrated with existing emergency response and traffic management infrastructures (like video surveillance systems);,
  o connecting emergency operations centers to a common operational picture and facilitate rapid and coordinated response across multiple jurisdictions;
  o planning and exercise tools to evaluate multi-jurisdictional performance for State and local decision-makers; and
  o technologies credentialing emergency responders and verifying victims' identities during an incident.

Regional Technology Integration Initiative – Anaheim – This project focuses on technology solutions in and around the Anaheim Convention Center (ACC). IGD concentrates its efforts on:
  o secure two-way access to new sources of information;
  o improved sensors and monitoring capabilities for detection of chemical agent or large scale biological attacks; and
  o 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 minimizing 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 2007:
* Develop system design & acquisition plans.
* Conduct a Bio Detect-to-Treat Pilot.
* Conduct a Command, Control and Interoperability and Explosives Protection Pilot.

   FY 2008:
* Conduct a Command, Control and Interoperability and Chem/Bio Detect-to-Warn Pilots
* Transition to Local Operations/Support.

Regional Technology Integration Initiative – Cincinnati Project – The Cincinnati Urban Area includes the City of Cincinnati, Hamilton County, a portion of southwestern OH, southeastern

Indiana and northern KY. The population of the region in the 2000 census was 1,886,650, with the largest population and density being in Cincinnati-Hamilton County. 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:

- o Wired/wireless access to a "virtual EOC" capability;
- o Enhanced regional interoperable communications for voice and data exchange;
- o Regional exercise capability that more effectively engages all ESFs and multiple jurisdictions in the Cincinnati Urban Area; and
- o Enhanced regional alert and notifications systems.

Milestones and Deliverables

FY 2007:

- Pilot EOC connectivity prototype system.
- Conduct first responder credentialing pilot.

FY 2008:

- 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. RTT 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 2007:

- Pilot EOC connectivity prototype system
- Conduct first responder credentialing pilot.

FY 2008:

- RTI Seattle EOC connectivity prototype system.
- Demonstrate the 3-D Locator system at RTI Seattle.
- Transition to Seattle Operations Center.

First Responder Technologies Program – IGD will start this program in FY 2009. It will develop advanced life saving technologies, designed specifically 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, it is critical that the commanders know the whereabouts and health of their first responders as they enter into the incident area. Additionally, first responders rely on effective personal protective equipment so they can save incident victims rapidly. The mission critical technologies developed under this program will go through the Test and Evaluation (T&E) phase before they become part of any acquisition program.

Advanced First Responder Locator – Building off of efforts in previous years, the program will include integrated sensor components, all necessary software for visualizing the location and tracks for the incident commanders (such as building diagrams, floor maps,

office/apartment location), and secure connectivity to the Incident Management Enterprise Systems.

Milestones and Deliverables

FY 2009:

- Develop a prioritized list of technologies for advanced first responder locator system.
- Demonstrate key 3-D Locator prototype sub-components to track first responders with an accuracy of 3-meters.

FY 2011:

- Demonstrate prototype 3-D Locator system that can track first responders with less than a meter accuracy that the EOC can receive and visualize in real time.

First Responder Physiological Monitoring – First responders also need a highly reliable metric and notification system for on-scene identification of firefighters who are at significant risk of an immediate cardio-vascular or cerebral-vascular incident. The program will develop an integrated sensor package that will monitor a responder's vital signs, such as a cardiac rhythm irregularity, that could indicate Pre-Ventricular Contractions (PVCs), cardiac arrhythmias, irregular heart rate, high blood pressure, body temperature shifts, and oxygen saturation. This project will fuse these measurements to establish the physical health of the responder, based on a set of metrics, so appropriate alarms can be sent to 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 Development and Exploration (CD&E) prototype to validate system requirements, architecture, and concept of operations (CONOPS).

FY 2010:

- Demonstrate prototype components of physiological monitoring sensors and conduct laboratory tests.

Integrated Modeling, Mapping and Simulation Program – This program will begin in FY 2009. Based on needs identified by FEMA, this program focuses on developing and integrating 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:

- o Advanced models of the critical infrastructure;
- o Standard integration process and methodology to enable plug and play of legacy and new models; and
- o 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 – This project will provide 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 TE&LL project and will focus on three tracks:

o Model development;
o Integration Framework; and
o 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 a blue print plan of action for the development, test, integration, and deployment of the prototype system.

FY 2011:

- Develop a plug-and-play framework that will shorten integration of the existing and newly developed models.

Geophysical Thrust Area: This thrust area will focus on the development of 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 – SERRI is a pilot research and development program created to assist 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 Southeast U.S.

Milestones and Deliverables

FY 2007:

- Develop an architecture design for suites of advanced materials, design procedures, and innovative construction methods that can be used to protect metropolitan areas.
- Using prior year funding, develop prototype.

FY 2008:

- Deliver proof-of-concept study for mitigation methods for natural disasters.

The primary Federal customers for the Infrastructure and Geophysical Division are the Department's Office of Infrastructure Protection (OIP), Preparedness Directorate and the Federal Emergency Management Agency (FEMA), 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 Secretary's goals of:

o Protecting the Nation from dangerous people;
o Protecting our Nation from dangerous goods;
o Protecting Critical Infrastructure;
o Building a nimble and responsive emergency response system; and
o Strengthening and unifying DHS operations and management.

INNOVATION

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Homeland Innovative Prototypical Solutions (HIPS)	Homeland Innovative Prototypical Solutions (HIPS)	30,000	51,900	44,803	45,860	46,089
High Impact Technology Solutions (HITS)	High Impact Technology Solutions (HITS)	8,000	8,000	5,000	5,000	6,000
Innovation Total		38,000	59,900	49,803	50,860	52,089

Overview

The Office of the Director of Innovation oversees the S&T Directorate'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 Division Directors, other Portfolio Directors, industry, academia, other government organizations, and other sources to determine topic areas for projects. The Director uses many sources for guidance including:
- o DHS Goals and Priorities, as described by the Secretary of Homeland Security;
- o Office of Management and Budget (OMB) and Office of Science and Technology Policy (OSTP) Research and Development Budget Priority Guidance;
- o goals set by the Under Secretary for Science and Technology;
- o DHS Components input regarding their operational capability gaps; and
- o congressional direction

The activities within the office focus on homeland security R&D that could lead to significant technology breakthroughs that would greatly enhance DHS operations. These are complimentary to the programs and projects that reside in the Six Divisions, focusing on areas that may not be explored otherwise, primarily because of the high-risk nature of the effort. Successful accomplishment of these projects would prove extremely beneficial, perhaps even substantively changing the operational environment of the DHS Components or their customers if successful.

The Innovation/HSARPA projects consist of Homeland Innovative Prototypical Solutions (HIPS) and High Impact Technology Solutions (HITS), which are described in further detail below. Projects have decision points to determine the viability of the remaining efforts. Innovation/HSARPA requires flexibility to:
- o assess its high risk projects to determine whether or not they should continue;
- o consider emerging technologies that may have utility for S&T's customers within DHS;
- o adjust to changing or emerging threats; and
- o capitalize on emerging opportunities to leverage other federal programs and activities for use by DHS.

Additionally, the office is constantly seeking new and innovative thoughts on how science and technology can help meet the Department's goals. This continuous assessment of where

innovation is "pushing the envelope" will require Innovation to be flexible and scalable in the projects it undertakes.

Homeland Innovative Prototypical Solutions (HIPS) Thrust Area: DHS S&T designed HIPS to deliver prototype-level demonstrations of game changing technologies in two to five years. These projects have moderate to high risk, with a high payoff. Examples of HIPS projects are provided below.

Project Chloe – Project Chloe will investigate 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 the Explosives Division of the S&T Directorate) and builds on the progress of detection and disabling technologies to demonstrate a cost effective and quick prototype for application.

Milestones and Deliverables
  FY 2007:
  - Demonstrate that sensors based on a high altitude platform can detect launch of MANPADS.

  FY 2008:
  - 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.
  - Evaluate alternative DHS missions for *CHLOE* payloads and technologies.
  - Evaluate project for termination, continued development, or transition.

Scalable Common Operational Picture Experiment (SCOPE) – SCOPE will invest in DOD's Joint Concept Technology Demonstration for Global Observer (GO), a High Altitude Long Endurance (HALE) Unmanned Aircraft System (UAS). With this investment, the S&T Directorate is able to leverage DOD's unmanned systems expertise and investments in order 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 2007:
  - Develop key UAS subcomponents (Power and Propulsion, Vehicle Management System, Center Wing Panel).

  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.

Rapid Liquid Component Detector (SENSIT) -- SENSIT will use very low signal-level MRI technology to screen baggage for liquid explosive components and explosive materials. The goal is to screen of baggage in under 12 seconds, which is similar to the timeline associated with the current X-ray screening of baggage at airport entry points.

Milestones and Deliverables

FY 2007:
- Demonstrate SENSIT in laboratory setting.

FY 2008:
- Demonstrate prototype system.

FY 2009:
- Demonstrate SENSIT detection of liquid explosives within baggage.

FY 2010:
- Demonstrate SENSIT detection of solid materials.
- Evaluate project for termination or transition.

Scalable Composite Vessel Prototype – This project will mitigate risk associated with the design and build of a composite monolithic hull. Using the S&T Directorate's expertise and network of scientists across the public, private industry and academia this project will work to lower life cycle costs for the U.S. Coast Guard (USCG). Currently, USCG urgently needs additional patrol boat hours. The S&T Directorate will demonstrate a lightweight hull made of composite material that will enable ships to travel at high speeds close to shore. Furthermore, this composite hull will reduce patrol boat operation and maintenance costs, which allows for increased patrol area and usage.

Milestones and Deliverables

FY 2008:
- Identify Critical Technology Elements (CTE) associated with composite hull materials and manufacturing processes
- Design the prototype vessel

FY 2009:
- Complete construction of monolithic composite hull.

FY 2010:
- Deliver prototype vessel to the Coast Guard.
- Conduct operational evaluation to support USCG acquisition program.

Safe Container (SAFECON) – SAFECON is a screening device for containers that will screen cargo for suspect materials. A major DHS capability gap is the ability to screen cargo quickly and effectively. Therefore, much of the cargo that enters the U.S. is unscreened or under screened. SAFECON, if successful, will fill partially this gap.

Milestones and Deliverables

FY 2007:
- Investigate various technologies, including
  - probing systems installed on cranes that on load and off load containers; and
  - sensors and container materials to improve the effectiveness and efficiency of the screening of cargo containers.

FY 2008:
- Test promising technologies and work to ensure minimal impact on the flow of commerce.

FY 2009:
- Conduct demonstrations of the targeted technologies.

FY 2010:
- Conduct pilot test and port demonstration of SAFECON.
- Evaluate project for termination or transition.

Future Attribute Screening Technologies Mobile Module (FASTM2) – FASTM2 develops real-time, mobile screening technologies to automatically detect behavior indicative of possible hostile intent or deception at security checkpoints, such as border crossings, transportation portals, and other critical infrastructures. While existing screening technologies, such as biometrics, offer the potential to identify *known terrorists*, FASTM2 technologies will focus strictly on real-time behavior patterns in an attempt to prevent the *unknown terrorist* from gaining successful access to his or her desired location. FASTM2 will develop mobile, real-time, non-invasive systems that detect culturally independent, multi-modal indicators using diverse automated sensor technologies. The mobile and reconfigurable features will facilitate deployment at air, land, and sea portals. This technology will directly support and augment the operational missions of Federal, State, and local agencies to conduct real-time screening across the operational mission space.

Milestones and Deliverables

FY 2007:
- Demonstrate mobile integrated non-invasive technology proof-of-principle that establishes the viability of detecting deception and suspicious behavior.
- Coordinate closely with Departmental operational components to ensure that the technology and research directly address operational checkpoint, screening, and interviewing environments.

FY 2008 – FY 2012:
- Demonstrate the capability to detect hostile intent, deception and suspicious behavior in near real-time, using behavior- and physiologically-based non-invasive technologies.
- Continue to improve the sensor systems and the algorithms required to provide real-time indication of hostile intent.

FY 2009:
- Conduct a Real-Time Auto Intent Detection demonstration.

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:
- Transition Multi-Modal Auto Intent Detection.

Resilient Electric Grid (REG) – REG is a system/technology that will prevent 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, DHS S&T will implement the system in the Manhattan, N.Y.C. financial district to protect the economic infrastructure of American business, with follow-on implementations for additional critical infrastructure in other metropolitan areas around the country.

Milestones and Deliverables

FY 2007:

- Initiate a prototype program in upper Manhattan to develop a system for linking multiple electrical substations to provide redundant power delivery.
- Select prime contractor.
- Develop system architecture.

FY 2008:

- Demonstrate key supporting technologies in laboratory and representative environments.

FY 2009:

- Demonstrate additional capabilities in fault current limiter technology.

FY 2010:

- Transition REG to existing grid and critical infrastructure.

Hurricane & Storm Surge Mitigation – Hurricanes cause significant human suffering and property damage in the United States. This effort intends to encourage innovative approaches to decrease that damage through a combination of reducing the intensity of and steering hurricanes. We do not understand the mechanisms that cause hurricanes to change direction. By developing a better understanding of why hurricanes follow the paths they do, S&T may be able to develop technology to steer hurricanes. Marshland along the coast dampens storm surges. In areas where there is no marshland, storm surges have caused extensive damage. This effort will also develop approaches and technology to duplicate the effect of marshland and reduce the strength of storm surges. Conceptually, something as simple as towing a large assemblage of old carpets into the area of the storm may produce the desired effect. Possible system solutions are:

- Inflatable and drop-in structures, that last just long enough to prevent severe damage;
- Fast-growing techniques to rapidly provide roughness imitating the effect of marshlands on lowering tide levels;
- Effective alternatives for rerouting flood waters; and
- Flood-proofing critical infrastructure.

Milestones and Deliverables

FY 2008:

- Conduct a storm surge mitigation concept capability demonstration.

FY 2009:

- Conduct a formal analysis of the surge mitigation system.

FY 2010:

- Conduct a pilot test/surge mitigation prototype demonstration.
- Evaluate project for termination, further development or transition.

Improvised Explosive Device (IED) Defeat – IED Defeat is pursuing the development of detection and mitigation technologies to counter IEDs. Leveraging the counter IED efforts currently underway in DHS, DOD, and other agencies, IED Defeat will investigate some extremely high risk technologies to:

- locate IEDs prior to their detonation; and
- mitigate the damage caused from any successful IED attack.

Milestones and Deliverables

FY 2007:

- Investigate systems to detect VBIED's
- Explore technology to negate the blast and shock wave created by explosions.

FY 2008:
- Conduct a concept feasibility study and begin development of a proof-of-concept.

FY 2009-2012:
- Develop a proof-of-concept for IED defeat and blast mitigation technology. This effort will continue through FY 2012 as we attempt to deliver more technology solutions to detect, predict, prevent, destroy at range, and mitigate IEDs.

FY 2010:
- Complete technology feasibility studies.

FY 2011:
- Conduct a technology demonstration.
- Reach a final decision regarding further prototype development.

Levee Strengthening & Damage Mitigation – Starting in FY2007, this project will develop techniques to rapidly prevent, reduce, and stop a breach in a levee. Potential concepts include:
- o float-in structures guided by cables;
- o drop-in structures lofted by aircraft; and
- o roll-out coverings, such as an articulated concrete mat, possibly using aircraft in the construction effort.

DHS S&T hopes 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 - 2008:
- Develop concept for rapid identification of problem zones in levees.
- Identify promising, affordable temporary and permanent strengthening options.
- Conduct a levee rapid breach repair concept capability demonstration.

FY 2009:
- Prototype a levee repair system.

FY 2010:
- Conduct a pilot test/levee demonstration.
- Evaluate project for termination, further development or transition.

Third Generation Secure Border Initiative – This effort will investigate multiple technologies to improve the security of the borders of the United States. This effort will examine innovative approaches to improve the technology used in controlling the border, including:
- o improved detection of illegal activity;
- o information flow to law enforcement personnel;
- o common operating pictures;
- o verification of identity;
- o authentication of documents; and
- o protection of law enforcement personnel.

Milestones and Deliverables

FY 2010:
- Develop a proof-of-concept for the Third Generation Secure Border Initiative.

FY 2011:
- Conduct a laboratory demonstration.

Genetically Altered Bio Agency Detect System – This effort will examine innovative approaches to develop biological detectors to sense organisms that have been genetically

altered to avoid detection. Current methods for biological detection rely on characteristics of individual organisms being detected. In many cases, detection can be thwarted by genetically modifying an organism so that it remains a biological hazard but no longer has the clues that enabled its detection. This effort will encourage innovative approaches to develop biological detectors capable of detecting genetically modified biological agents.

Milestones and Deliverables
> **FY 2010:**
> * Provide a proof-of-concept for the Genetically Altered Bio Agent Detect System.
> **FY 2011:**
> * Conduct a laboratory demonstration.

Next Generation Behavioral Screening Technologies System – S&T has multiple efforts associated with the detection of the intent of an individual to commit a hostile act prior to the commission of such act, for example by screening individuals at a public event through a video surveillance camera. While those efforts have provided success, this effort is intended to result in dramatic improvement of the success rates through innovative approaches that will complement the work done in earlier fiscal years.

Milestones and Deliverables
> **FY 2011:**
> * Provide a proof-of-concept for the Next Generation Hostile Intent Detection System.

National Common Operating Picture – S&T is currently pursuing efforts to improve capabilities at providing a common operating picture (COP) to all government responders to an event. This effort will expand that concept to result in innovative approaches that provide a common operating picture of the operationally significant areas in the Nation, allowing high-resolution visual and other sensor images that provide value to decision makers in the response to an event.

Milestones and Deliverables
> **FY 2011:**
> * Provide a proof-of-concept for the National Common Operating Picture.

High Impact Technology Solutions (HITS) Thrust Area: HITS provide proof-of-concept answers 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.

Tunnel Detect – The S&T Directorate is pursuing the development of detection technologies to locate underground tunnels.

Milestones and Deliverables
> **FY 2007:**
> * Demonstrate an unmanned aircraft system for tunnel detection.
> **FY 2008:**
> * Demonstrate an improved airborne system, combined with ground based technologies, to increase the probability and accuracy of detection of these systems.
> * Evaluate project for termination, further development or transition.
> **FY 2009:**
> * Integrate sensors into modular design, and phase-in high-resolution listening devices and confirmation/denial technologies.
> **FY 2010:**
> * Conduct an operational field evaluation and lessons learned.

Document Validator – HSARPA plans to develop a highly effective scanner that can identify fraudulent documents in a single pass.

Milestones and Deliverables

   FY 2007:
   - Investigate feasibility of reducing size and increasing speed of current technologies.
   - Investigate the feasibility of automating an efficient process for acquiring and managing new document models.
   - Increase the library of documents available for validation.

   FY 2008:
   - Develop prototype document validator system.
   - Field test several systems to validate their utility and user friendliness for our Transportation Security Administration, Customs and Border Protection and Citizenship and Immigration Services related customers.

   FY 2009:
   - Conduct an operational demonstration of the prototype document validator.
   - Evaluate project for termination or transition.

Biometric Detector – HSARPA is investigating a highly effective, small, non-contact fingerprint scanner used for identification.

Milestones and Deliverables

   FY 2007:
   - Improve the technologies associated with current non-contact single-fingerprint devices to reduce the size and increase the speed over present-day, larger systems.

   FY 2008:
   - Demonstrate small and portable, non-contact single-fingerprint devices.

   FY 2009:
   - Produce final report of the Prototype Biometric Detector Performance.
   - Transition to TRL 7 Decision Point.

Critical Infrastructure Change Detect (Wide Area Surveillance) – HSARPA is evaluating inexpensive, low-cost, lightweight Unmanned Aerial Vehicles (UAVs) that provide sensors that for monitoring changes over critical targets, such as fuel farms or dams. This system will especially monitor changes along the perimeters of such areas. The system would then vector security personnel to investigate the changes detected.

Milestones and Deliverables

   FY 2007 and FY 2008:
   - Analyze System Architectures / Wave Forms / Algorithms for urban environments
   - Conduct concept capability demonstrations, including one in lower Manhattan.

   FY 2008:
   - Demonstrate prototype wide area surveillance and tracking system for lower Manhattan.

Cell-All Ubiquitous Chem/Bio Detect – This project expects to create 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:
   o size;
   o initial and operating costs;
   o power consumption;
   o maintenance requirements;

o ruggedness; and
o 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.

Milestones and Deliverables

FY 2007:

- Conduct studies and early demonstrations.

FY 2008:

- Conduct laboratory demonstrations.

FY 2009:

- Conduct field demonstrations.
- Evaluate project for termination or transition.

First Net – The goal of this project is to create 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:

- Create a preliminary design of First Net concepts.

FY 2009:

- Conduct laboratory demonstration of First Net concepts.
- Provide recommendations for scalable prototype implementation.

Real Time Bio Detect – This project will work to create a near-real-time system for monitoring bio-agents. The system will

- o analyze samples once per ten minutes,
- o monitor the environment autonomously and continuously, and
- o simultaneously analyze for threats from CDC's Category A and B agents list.

Milestones and Deliverables

FY 2007:

- Conduct a Real Time Bio Detection conceptual demonstration.
- Create a technology development roadmap.

FY 2008:

- Conduct a laboratory demonstration.
- Evaluate project for termination or transition.

Resilient Tunnel – Resilient Tunnel will analyze and model underground tunnels to validate and refine vulnerability studies. HSARPA will use the results of these studies to design and evaluate the effectiveness of alternative mitigation measures. DHS S&T intends to establish a comprehensive research program that will validate and expand upon the analyses performed to date and identify alternative technical solutions that DHS could apply to mitigate the vulnerability.

Milestones and Deliverables

FY 2007:

- Survey concepts for tunnel protection and select prototype design(s).

- Conduct initial prototype development.

FY 2008:
- Design and build prototype.

FY 2009:
- Conduct a prototype test.

FY 2010:
- Deploy a full-scale prototype.
- Evaluate project for termination or transition.

Next Generation Explosive Detect – Starting in FY 2010, this HIT will explore dramatically improving capabilities to detect explosives. Existing efforts to improve explosive detection capabilities include standoff detection of Improvised Explosive Devices (IEDs) and homemade explosives. The intent of this next-generation explosives detection effort is to enable detection of explosives at greater ranges and at lower concentration levels.

Milestones and Deliverables

FY 2010:
- Develop a proof-of-concept for Next Generation Explosive Detect.

FY 2011:
- Conduct a laboratory demonstration.

Advanced Area Surveillance Tech – Starting in FY 2010, HSARPA will investigate innovative approaches to conduct surveillance on wide areas, while also reducing operating costs of such systems. These surveillance capabilities might include:
- automatically identify individual of interest (e.g., intruders);
- track them;
- automatically review previously recorded information to determine their previous locations;
- alert security personnel; and
- determine changes to an area under surveillance and alert personnel to anomalies.

Milestones and Deliverables

FY 2010:
- Develop a proof-of-concept for the Advanced Area Surveillance Technology.

FY 2011:
- Conduct a laboratory demonstration.

Advanced Behavioral Screening Technologies – HSARPA will initiate this effort in FY 2010 to enhance the ability of first responders and screeners to detect hostile intentions at safe standoff distances. The S&T Directorate has multiple efforts associated with the detection of the intent of an individual to commit a hostile act prior to the commission of such act. For example, the detection of the intent of an individual to commit a hostile while the individual is undergoing screening at customs during entry into the United States. While those efforts have provided success, this effort could result in dramatic improvement of the success rates, decrease false alarm rates, and develop new protocols. These innovative approaches will complement the work done in earlier fiscal years.

Milestones and Deliverables

FY 2010:
- Develop a proof-of-concept for the Advanced Behavioral Screening Technologies.

FY 2011:
- Conduct a laboratory demonstration.

Phone Home – HSARPA will develop a "snap on your belt" or rapidly deployable portable radio communications solution that will allow first responders to communicate across all disciplines and radio bands during day-to-day operations or recovery operations due to natural disasters, major incidents, and acts of terror. This effort provides first responders the capability to communicate on all designated interoperability channels authorized for use by federal, state, and local agencies as needed and as authorized. HSARPA will incorporate sufficient and redundant innovative power solutions capable of sustained power for an extended duration.

Milestones and Deliverables
> **FY 2007:**
- Working concept demonstration.
> **FY 2008:**
- Delivery of prototype equipment.
- Identification of scenarios and initiation of a full pilot program for testing.

Next Generation Explosive Defeat (APE2) – S&T has multiple efforts associated with the defeat of explosives. This effort will encourage innovative approaches to actively cancel the shock waves of explosives, significantly mitigating their destructive effects on the structure being protected.

Milestones and Deliverables
> **FY 2011:**
- Provide proof-of-concept for the Next Generation Explosive Defeat.

The primary Federal customers for the Innovation 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. Successful transition of these technologies will substantially improve DHS components' performance and support the Secretary's goals of:
- o Protecting the Nation from dangerous people;
- o Protecting our Nation from dangerous goods;
- o Protecting Critical Infrastructure;
- o Building a nimble and responsive emergency response system; and
- o Strengthening and unifying DHS operations and management.

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Operations	Plum Island Animal Disease Center (PIADC) Operations	26,500	27,030	30,700	32,186	33,743
	NBACC Operations	13,500	16,770	8,860	7,713	6,533
	CSAC Operations	225	225	500	510	520
	EML	2,700	2,700	2,700	2,750	2,850
	TSL Operations	13,500	13,770	15,500	16,250	17,037
Construction	Plum Island Animal Disease Center (PIADC) Upgrades	24,224	17,319	-	-	-
	NBAF Construction	23,000	11,000	45,600	184,900	172,000
	PNNL 300	2,000	-	-	-	-

Overview

The Office of National Laboratories (ONL), which executes Laboratory Facilities programs, provides the Nation with a coordinated, enduring core of productive science, technology and engineering laboratories, organizations and institutions, which can provide the knowledge and technology required to secure our homeland.

The *Homeland Security Act of 2002* assigns ONL the responsibility for "the coordination and utilization of the Department of Energy (DOE) 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 coordination and oversight of organic and DOE laboratory operations in direct support of the Department and its missions, ONL also has the specific responsibility for coordinating homeland security related activities and laboratory directed research conducted within all national laboratories.

ONL outlay activities lie in two thrust areas: Laboratory Operations and Construction. ONL has responsibility to ensure that required infrastructure laboratory facilities support ongoing Science and Technology mission research and development activities.

Laboratory Operations Thrust Area: The Laboratory Operations Thrust Area focuses on managing the operations and maintenance and providing oversight of specialized DHS laboratories and infrastructure. ONL provides the planning, budgeting and coordination needed to ensure that these laboratories effectively support S&T Directorate programs. The 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).

Plum Island Animal Disease Center (PIADC) Operations – PIADC 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 responsible for the operations. The combined work of both agencies at PIADC is in direct support of S&T Directorate 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.

The S&T Directorate employs an operations contractor to provide much of the day-to-day support and labor at the facility. This represents the largest portion of operations investments for PIADC. Other major operations investments include security, utilities, and fuel costs.

National Biodefense Analysis and Countermeasures Center (NBACC) Operations – The NBACC directly supports the S&T Directorate's biological and agricultural terrorism countermeasures 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 complement the mission responsibilities of the Department of Defense (DOD), the Department of Health and Human Services (HHS), and USDA.

o 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.

o The BTCC conducts studies and laboratory experiments to fill in information gaps to understand better 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. Under the current schedule, the new facility will be fully operational in the third quarter of FY 2009 although parts of it should be ready for occupancy earlier. Completion of the new NBACC will greatly expand research capacity.

Chemical Security Analysis Center (CSAC) Operations – The CSAC, located in interim facilities at DOD's Edgewood Chemical Biological Center (ECBC) in Aberdeen, Maryland, develops and informs risk assessments related to national chemical defense. Operated with limited capacity in cooperation with the Federal Bureau of Investigation (FBI) and DOD, the CSAC directly supports the S&T Directorate's chemical countermeasures thrust area in the Chemical and Biological Division. The operations investments for this facility (office space and computer equipment) include rent, security, and utilities.

CSAC provides DHS S&T with the scientific basis for the awareness of chemical threats and the attribution of their use against the American public. CSAC effectively supports chemical countermeasures programs and is a resource that provides a centralized compilation of chemical hazard data. In October 2006, DOD commenced construction of the 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 at the end of FY 2008 under the current plan. Planned operations investments include rent, security, and utilities.

Environmental Measurements Laboratory (EML) Operations – 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. Historically, EML activities have focused on the measurement of low-level radiation. In past years, EML provided staff to support the Domestic Nuclear Detection Office (DNDO) when DNDO was part of the S&T Directorate.

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 2007/2008, the 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 investments for this facility include rent, security, and utilities that are paid to the GSA based on an annual occupancy agreement.

Transportation Security Laboratory (TSL) Operations – TSL is a science and engineering laboratory that develops civil transportation security technologies such as explosives and weapons detection systems. TSL enhances and accelerates development of promising technologies to the point of operational test and evaluation. The TSL program directly supports transportation security and the S&T Directorate'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.

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 operations investment is for contractor personnel supporting various internal TSL research, engineering and test facilities. Planned operations investments for this facility include rent, security, utilities, and contractor laboratory support.

Construction Thrust Area: The 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 the S&T Directorate, the Department, and other government agencies such as 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 – NBAF is a next-generation biological and agricultural defense facility proposed to enhance and protect the country's agriculture and public health and support complimentary missions of DHS, USDA, and HHS. Once completed, NBAF will replace PIADC and provide new research, development, testing, and evaluation infrastructure that allow research to enhance agriculture and public health. NBAF supports the Biological Countermeasures Thrust Area 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 provide comprehensive and coordinated construction management of the estimated 500,000 square feet NBAF project. The project is currently in the site selection process (evaluation of 17 potential site locations). Final down-selection of the sites will occur in June 2007. The completion of a non site-specific NBAF conceptual design will occur concurrently with the Site Selection Process.

Milestones and Deliverables

FY 2007:
- Begin conceptual design.
- Complete site visits.
- Finalize down select.
- Begin Environmental Impact Statements (EIS).
- Complete conceptual design.

FY 2008:
- Complete EIS and Record of Decision.
- Begin detailed design.

FY 2010:
- Construction begins.

FY 2014:
- Facility will be operational.

Once operational in FY 2014, the NBAF facility will house approximately 200 personnel. Total NBAF cost is dependent on final site selection.

Plum Island Animal Disease Center (PIADC) Upgrades – As the Nation's first line of defense against foreign animal diseases, PIADC is critical for the protection of agricultural infrastructure. 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, helping to ensure safe and secure operations. In FY07, design began on various laboratory enhancements such as a new animal wing and upgrades of various support facilities. In addition, funds requested will continue projects that were identified as part of a multi-year Corrective Action Plan in a FY 2005 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 DHS 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.

Once NBAF is operational, activities at PIADC will transfer to the new facility. Transition of operations from PIADC to NBAF will occur over several months to maintain vital operations of DHS and USDA. Because of the nature of past and current work at PIADC, proper decontamination and decommissioning (D&D) of the facility after the transition will be critical to meet regulatory compliance and eventual disposal of the site.

Milestones and Deliverables

FY2007:
- Begin design of major upgrades.
- Award CMc Contract for major upgrades.
- Start construction of major upgrades.

FY 2010:
- Upgrade construction completed.
- Overall corrective actions completed.

Pacific Northwest National Laboratory (PNNL), Area 300 Program – The PNNL *Capability Replacement Laboratory* construction project is in Richland, Washington. ONL will represent DHS in providing oversight and management for the construction of this DOE-led project scheduled to be operational in FY 2011. PNNL currently provides DHS with research and development in several national mission-critical areas, such as radiological detection and information analytics, in support of DHS S&T, Preparedness/Infrastructure Protection, and Customs and Border Patrol (CBP). S&T participation in this effort after FY 2007 is subject to additional funding.

Milestones and Deliverables

    FY 2007:
- Complete design.

ONL's internal customers are S&T's executing divisions. The primary external Federal customers are USDA, Transportation Security Administration (TSA), and the Federal Bureau of Investigation (FBI). Successful transition of these technologies will substantially improve DHS components' performance and support the Secretary's goals of:
- o Protecting our Nation from dangerous goods; and
- o Building a nimble and responsive emergency response system.

TEST & EVALUATION AND STANDARDS

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
Standards	Explosives	3,080	3,000	3,000	3,447	3,500
	Chem/Bio	3,660	3,320	3,239	3,272	3,402
	CCI	800	880	900	900	1,100
	Borders/Maritime	1,006	1,262	1,250	1,250	1,250
	Human Factors	1,966	2,265	2,262	2,262	2,365
	Infrastructure - Geophysical	7,894	8,025	7,974	8,004	8,023
	Standards Development	1,491	1,378	1,050	1,050	1,050
Testing & Evaluation	Test Area/Capability	-	-	2,802	2,802	2,802
	T&E Infrastructure	-	-	700	700	700
	Plans and Policy	-	-	700	700	700
	Testing & Evaluation	4,682	4,302	-	-	-
HSI	HSI	300	450	427	435	445
SBIR	SBIR	553	638	650	663	678
T&E/Standards Total		25,432	25,520	24,954	25,485	26,015

Overview

The Test & Evaluation (T&E) and Standards program provides technical support and coordination to assist the Nation's emergency responders in the acquisition of equipment, procedures, and mitigation processes that are safe, reliable and effective. The program carries out its activities through two thrust areas:

- o Standards - Supports the development of consensus-based measures, from basic specifications to performance criteria, that gives DHS and its customers confidence that technology and systems will perform as required.
- o 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 T&E and Standards in conjunction with the Under Secretary for S&T works across DHS and with numerous external partners to build consensus and encourage the adoption of needed, voluntary standards, and to provide testing and evaluation guidelines.

Standards Thrust Area: 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

- o our Nation's emergency responders can rely on the equipment, procedures, and mitigation processes they need to do their jobs;
- o personnel from different jurisdictions can easily communicate with one another;
- o detection and testing for threat agents produces consistent, accurate results; and
- o 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.

Explosives Standards Program – This program focuses on 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.

<u>**Milestones and Deliverables**</u>
FY 2007:
- Complete 'sniffer' explosives detection standards, test materials, and methods.
- Complete of X-ray detection standards for weapons and contraband (bulk explosives).

FY 2008:
- Test development for bulk and trace explosives equipment.
- Release of image standards for X-ray detection, body scanning, and performance evaluation criteria.
- Standards for Blast Resistant Trash Can Testing.

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.

Chemical/Biological Standards Program – This program focuses on 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.

<u>**Milestones and Deliverables**</u>
FY 2007:
- Develop standards for both chemical and biological detection equipment, adding standards for integrated chemical, biological, radiological, nuclear, and explosive (CBRNE) sensors; development of integrated Chem/Bio decontamination guidelines via interagency process.

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 simulants 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.

Command, Control, and Interoperability Standards Program – This program focuses on 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 2007:
- Develop performance standards for transmitters and antennae for radio transmission, for emergency responders that will apply new signal processing technologies to allow amplification of weak signals through rubble from collapsed structures (responder locators).
- Complete a clearinghouse of existing incident management standards that first responders can use to demonstrate NIMS compliance.

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.

Borders/Maritime Standards Program – This 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:
1. Standards to enhance the security of shipping containers and cargo handling processes; and
2. Standards to facilitate the reliable use of RFID systems for homeland security and first-responder applications.

Milestones and Deliverables

FY 2007:
- Support full adoption of the American National Standards Institute (ANSI) and Institute of Electrical and Electronics Engineers (IEEE) and gamma-ray technical performance standards for screening equipment.
- Support the development of measurement methods, performance metrics, standards, testing protocols, and key technologies to facilitate reliable use of RFID systems for homeland security and first-responder applications, such as localization for first responders, identity authentication, access control, and critical asset protection at the border.

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.

Human Factors Standards Program – This program focuses on developing 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.

Milestones and Deliverables

FY 2007:
- Complete multi-modal biometrics standards (fingerprint, face, iris), including standards for
  - latent fingerprint analysis;
  - rapid biometric evaluation; and
  - biometric image and feature quality (i.e. software automation ensuring a passport photo meets acceptability parameters).

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.

Infrastructure/Geophysical Standards Program – This program focuses on developing 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. During FY 2006, the program worked with National Institute of Occupational Safety and Health (NIOSH) on a suite of CBRNE respiratory protection equipment standards. This effort included:

- o testing of self-contained breathing apparatus;
- o air Purifying Respirators (e.g., gas masks) and Escape Masks;
- o development of standards for Powered Air Purifying Respirators and Closed-Circuit Self Contained Breathing Apparatus; and
- o development of simulants for chemical warfare agents for use in the development of respirators.

Milestones and Deliverables

FY 2007:
- Facilitate the development of standards for personal protective equipment (PPE) for law enforcement officers.
- Support the continued development of PPE equipment standards including respiratory protection

FY 2008:
- Develop protocols for the testing and evaluation of protective equipment.

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 PPEE.

FY 2011:
- Finalize revisions of protective clothing standards and to initiate performance testing guideline development.

Current activities also focus on standards for Geographical Information Systems (GIS) and Urban Search and Rescue (USAR) Robots.

Milestones and Deliverables

FY 2007:
- Continue to work closely with DHS users of GIS information to ensure that relevant data standards are part of the emerging information systems of DHS.

FY2008:
- Support standards for responder use of location technology in emergency operations, specifically technologies for locating responders and alerting systems used by the responders.

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.

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.

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.

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, the S&T Directorate must pay to maintain its membership and ensure voting rights in decision-making processes. The S&T Directorate 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: This 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. In addition, the thrust area plans to work with the DHS Chief Information Officer (CIO) to provide support for periodic T&E of information security controls, standards, and techniques to ensure effective implementation.

In addition, Federal, State and local government, and first responders rely upon regulatory and procurement certification; the thrust area will coordinate and integrate a certification system, where needed and when appropriate.

Milestones and Deliverables

FY 2007:
- Formulate and implement T&E policy and perform an initial review of the existing Departmental T&E infrastructure, including establishment and staffing of the T&E Office.

FY 2008:
- Identify needed T&E infrastructure that will involve participation in requirements development and test planning activities across DHS
- Evaluate potential partner activities across the Federal government;
- Develop and promulgate DHS S&T Policy.

FY 2009:
- Complete the Integrated DHS T&E Infrastructure Plan.

FY 2010:
- Promulgate a DHS T&E Strategic Plan.

FY 2011:
- Complete a coordinated inter-Agency T&E Strategic Plan .This planning will support three areas of effort, defined in FY 2008 as programs and projects, as follows:

Test Areas and Capabilities – Test Areas and Capabilities program supports DHS by establishing and implementing processes to
- o facilitate technology development and acquisition;
- o accelerate technology delivery;
- o assure products meet performance requirements; and
- o reduce the development risk.

T&E will implement policies and procedures as follows:
1. initially within the S&T Directorate;
2. expand to DHS entities with greatest need; and
3. expand across all DHS entities.

The S&T Directorate supports the implementation of T&E policies and procedures by developing educational materials and implementing training, routine communications, workshops, etc.

The Test Areas and Capabilities program will support test and evaluation though a cyclical process of support and coordination that will:
- o identify mature technology development programs (with concurrent standards);
- o develop and establish metrics for successful test protocols;
- o develop and establish metrics for certified testing facilities (in partnership with industry); and
- o establish qualification metrics for facilities to produced qualified products

The T&E Office supports this cycle that operates continuously with periodic evaluation and insertion of new technologies as they mature out of DHS S&T or are identified by partners or end users.

Milestones and Deliverables

FY 2007:
- Conduct analysis of needed T&E resources.
- Closeout Countermeasures Test Bed activities.
- Transition mature programs into T&E:
  - Transportation Worker Identification Card (TWIC);
  - Chem/Bio Threat Response & Recovery: Validated Sampling Plans;
  - Interoperable Communications T&E; and
  - Biothreat Detection: Handheld Assay second Round Testing.

FY 2008-2009:
- Report on 1) needed T&E resources, 2) emerging technologies needing T&E support within DHS, and 3) external T&E resources available.
- Transition mature programs into T&E:
  - personal protective and operational equipment for responders and law enforcement;
  - explosives detection technologies; and
  - interoperable sensor technologies.

FY 2010-2011:
- Transition mature programs into T&E:
  - biometrics collection and analysis technologies;
  - credentialling management and verification technologies; and
  - access control technologies.

T&E Infrastructure – Before initiating its own T&E program, the S&T Directorate should assess, integrate, and coordinate 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.

Milestones and Deliverables
    FY 2007:
- Review existing Departmental T&E infrastructure.

    FY 2008:
- Identify needed T&E infrastructure that will involve participation in requirements development and test planning activities across DHS.
- Evaluate partner activities across the Federal government.

    FY 2009:
- Complete the Integrated DHS T&E Infrastructure Plan.

    FY 2010:
- Work with Plans and Policies to promulgate a DHS T&E Strategic Plan.

    FY 2011:
- Complete a coordinated inter-Agency T&E Strategic Plan.

Plans and Policy – T&E Plans and Policy will coordinate with the T&E Infrastructure program to 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. Finally, it will develop and implement an overarching strategy for the qualification and certification of technologies and accreditation of facilities and programs.

Milestones and Deliverables
    FY 2007:
- Establish T&E Office.
- Formulate and implement T&E policy.

    FY 2008:
- Evaluate policies related to potential partner activities across the Federal government
- Develop and promulgate of DHS T&E Policy.

FY 2009:
- Ensure the Integrated DHS T&E Infrastructure Plan communicates T&E policy across DHS.

FY 2010:
- Promulgate a DHS T&E Strategic Plan.

FY 2011:
- Ensure the coordinated inter-Agency T&E Strategic Plan communicates T&E policy.

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 of:

- o Protecting the Nation from dangerous people;
- o Protecting our Nation from dangerous goods;
- o Protecting Critical Infrastructure;
- o Building a nimble and responsive emergency response system; and
- o Strengthening and unifying DHS operations and management.

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
SAFETY Act	SAFETY Act	4,224	4,297	8,500	8,680	8,864
Transition	International & Interagency Programs	3,691	3,501	3,571	3,642	3,715
	Program Transition	6,057	6,349	1,009	1,246	1,482
	Tech SHARE	-	-	10,000	10,000	10,000
	Technology Clearinghouse	9,500	9,500	-	-	-
HSI	HSI	199	435	412	422	430
SBIR	SBIR	368	618	628	643	655
Transition Total		24,039	24,700	24,120	24,633	25,146

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, operation of the Technology Clearinghouse, Technology Solutions, and management of S&T Directorate's international and interagency programs.

SAFETY Act Thrust Area: The Office of SAFETY Act Implementation (OSAI) 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:
- o Operations;
- o Outreach; and
- o coordination.

Operations - OSAI's 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 2007:
- Implement a remote evaluation process with subject matter experts (SMEs) that will
    - allow a greater number and variety of SMEs to participate;
    - streamline the evaluation process; and
    - reduce operating costs.

FY 2008,
- 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.

- 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.

FY 2010 and 2011:
- Improve the application evaluation process for SAFETY Act.

Outreach - The office seeks to promote 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 2007:
- Focus outreach to encourage industry participation, particularly among small businesses.
- Better educate prospective applicants and encourage new applications by targeting audiences at conferences and major stakeholder meetings.
- Implement an aggressive communication strategy with industry groups and trade associations.

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 2011:
- Continue outreach efforts to increase the number of applications received.

Coordination - The office 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 2007 and 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

Transition Thrust Area: As the advocate within the S&T Directorate 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 the S&T Directorate 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 – The Office of Government Agency and International Liaison works to fully leverage 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 the S&T Directorate'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 Directorate 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 2007:
- Leverage external organizations in three venues:
  - Interagency Agreements;
  - International Agreements; and
  - International Collaborations (Visiting Scientist Collaborations (VSC), Conference/Workshop Collaborations (CWC), and Science and Technology International Collaborations (STIC)).
- Leverage other agencies' RDT&E efforts, understand stakeholder and end user priorities, and inform the S&T Directorate's investments in homeland security-related science and technology, including:
  - State of California DHS; and
  - Department of Defense (DOD) Northern Command (NORTHCOM).
- Establish a Memorandum of Agreement with DOD on information sharing for homeland security and homeland defense-related science and technology.
- Recapitalize partnership with the Interagency Technical Support Working Group (TSWG) with a Memorandum of Understanding for co-management of joint DHS/TSWG projects.

FY 2008:
- Integrate the 2007 results into science and technology programs of record funded by the S&T Divisions and interagency and international partners.
- Establish coordinated R&D agendas with key Federal partners for each of the DHS S&T divisions to address:
  - Urgently needed near-term solutions;
  - Longer term strategic investments needed to ensure future game-changing homeland security capabilities;
  - Comprehensive, research-based definable goals for such efforts; and

- Development of annual measurable objectives and specific targets to accomplish and evaluate the goals for such efforts.

FY 2009:
- Hold an International Conference on Science and Technology in South America.
- Expand scientist and engineer exchange program to additional partner nations.
- Develop joint strategic R&D programs with each of the S&T Directorate's divisions and other appropriate partner nations as defined in the coordinated research agendas established in FY 2008.
- Conduct a National Interagency (State/Local/Tribal) Conference and Symposium to refine government interoperability achievements.
- Conduct Baseline Federal Interagency RDT&E Conference & Workshop to validate current and future national appropriations.

FY 2010:
- Hold an International Conference on Science and Technology.
- Expand scientist and engineer exchange program to key partners in all five continents.
- Expand the cooperative R&D program to the European Union.
- Conduct a National Interagency (State/Local/Tribal) Conference & Symposium to refine government interoperability achievements.
- Conduct a Baseline Federal Interagency RDT&E Conference and Workshop to validate current and future national appropriations.

FY 2011:
- Hold an International Conference on Science and Technology.
- Develop joint strategic R&D programs with other appropriate executive agencies as defined in the coordinated research agendas (FY 2008).
- Conduct a National Interagency (State/Local/Tribal) Conference and Symposium to refine government interoperability achievements.
- Conduct a Baseline Federal Interagency RDT&E Conference and Workshop to validate current and future national appropriations; and expand the Interagency Exchange Program.

Program Transition – The Transition Office aligns and coordinates the S&T Directorate's transition effort with the Departmental component's requirements using Capstone Integrated Process 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 eleven functional homeland security areas:
- o Border Security;
- o Cargo Security;
- o Chemical/Biological Defense ;
- o Cyber Security;
- o Explosive Prevention;
- o Incident Management;
- o Infrastructure Protection;
- o Information Sharing/Management;
- o Interoperability;
- o Maritime Security; and
- o People Screening.

FY 2007:
- Provide support and analysis to customer-led IPTs to develop prioritized science and technology capability gaps.
- Coordinate development of Enabling Homeland Capabilities (EHCs) that close identified capability gaps.
- Monitor EHC efforts for cost, schedule and capability to ensure the technology effectively transitions into acquisition and ultimately to DHS, State and local operating agencies.

FY 2008:
- Mature the IPT process and conduct further analysis to align the S&T Directorate's advanced technology efforts to the Department's highest priority mission capability gaps.
- Conduct quarterly status updates and semi-annual program reviews.

FY 2007 and FY 2008:
- Develop and 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 and 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.

Technologies to Secure the Homeland and Advance Responder Effectiveness (Tech SHARE) Program – TechSHARE consists of Tech Clearinghouse and Tech Solutions. S&T's Tech Clearinghouse will develop 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.

Tech Clearinghouse – The system and associated efforts encourage and support innovative solutions to enhance homeland security and fulfills Section 313 of the Homeland Security Act of 2002. The goal is to provide:
  - o government organizations with information to support procurement and grant guidance decisions; and
  - o technology developers with requirements and operational information that can help them develop more useful tools.

Milestones and Deliverables
FY 2007:
- Implement Section 313 of the *Homeland Security Act of 2002* (P.L. 107-296), including:
  - Releasing a certified and accredited Version 1.0 of the Technology Clearinghouse;
  - Providing Federal, state, local, and tribal organizations with crucial information to support procurement and grant guidance decision and help end users more efficiently search for relevant, reliable information; and

- Providing technology developers with requirements and operational information to help develop more useful tools.

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 – FY2011:
- 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).
- Provide training on technologies developed by Tech Solutions.

Tech Clearinghouse continually identifies and integrates new sources of information into its website.

Tech Solutions – DHS S&T established Tech Solutions, as part of Tech SHARE, to rapidly address technology gaps identified by Federal, State, local, and tribal first responders (Police, Fire, EMS). Tech Solutions gathers gaps using a web site www.Safecomprogram.com. The goals include:
- o 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
- o developing a solution that meets 80 percent or more of the identified requirement.

Milestones and Deliverables

FY 2007:
- Transition an operational web based system from the Office of Naval Research to the S&T Directorate that is capable of electronically collecting capability gaps submitted by the first responder community.
- Pilot three biological agents capable of eradicating Carrizo Cane or Giant Reed along the Rio Grand basin.

FY 2008:
- Initiate prototype development activities for an external voice projection device for level A, B and C protective gear.
- Initiate prototype development activities for a resource tracking and status system capable of locating emergency vehicles and teams across regions and states within the U.S.

The gaps received through the web site will determine the prototypes to be developed and demonstrated. Final selection for prototypes will not occur until thorough review and evaluation of proposals as they are received. Between FY 07-11, Tech Solutions plans to demonstrate a number of prototypes, which potentially include:
- o Ocular Scanning;
- o Stand-Off Patient Triage;
- o Fire Engine Seatbelt Safety;
- o Vehicle Air Filtration;
- o Extremity Protection;

- o   Chem/Bio Exposure Detection;
- o   Miniaturized Chem/Bio Detectors; and
- o   Under Vehicle Inspection.

The primary Federal customers for the Transition Office 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 Transition Office supports the successful transition of technologies that will substantially improve DHS components' performance and support the Secretary's goals of:

- o   Protecting the Nation from dangerous people;
- o   Protecting our Nation from dangerous goods;
- o   Protecting Critical Infrastructure;
- o   Building a nimble and responsive emergency response system; and
- o   Strengthening and unifying DHS operations and management.

UNIVERSITY PROGRAMS

Thrust Area	Program	FY 2007 (RE) ($000)	FY08 (PB) ($000)	FY09 (Plan) ($000)	FY10 (Plan) ($000)	FY11 (Plan) ($000)
DHS Centers	Multi-Center Priority Projects	1,132	3,600	2,328	1,629	1,630
	Center for Advancing Microbial Risk Assessment (CAMRA)	3,158		-	-	-
	Center Of Excellence for Risk & Economic Analysis of Terrorism Events (CREATE)	4,105		-	3,000	3,300
	Institute For Discrete Sciences (IDS) University Affiliate Centers	3,579	3,300	-	-	-
	Center of Excellence for Command, Control and Interoperability	3,947	2,300	3,000	3,000	3,000
	Center of Excellence for Maritime Island & Extreme/Remote Environmental Security	2,095	1,500	3,000	3,000	3,000
	Center of Excellence for Explosives Detection, Mitigation, and Response	4,105	1,500	3,000	3,000	3,000
	Center of Excellence for Border Security and Immigration	2,105	1,500	3,000	3,000	3,000
	Center of Excellence for Biological, Chemical and Agricultural Security			-	3,000	3,300
	Center of Excellence for Foreign Animal & Zoonotic Disease Defense (FAZD)	4,105	3,600	3,300	-	-
	Center of Excellence for Food Protection & Defense (NCFPD)	4,105	3,600	3,300	-	-
	Center of Excellence for National Consortium for the Study of Terrorism and Responses to Terrorism (START)		3,600	3,300	3,300	3,300
	Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management		1,500	3,000	3,000	3,000
	Center of Excellence for the Study of Preparedness and Catastrophic Event Response (PACER)			-	3,300	3,300
Fellowships	Scholars and Fellows	10,000	7,300	7,000	6,300	6,500
Minority Serving Institutions	Minority Serving Institutions	4,212	3,750	3,500	3,000	3,000
HSI	HSI	677	682	646	660	673
SBIR	SBIR	1,250	968	985	1,005	1,025
University Programs Total		48,575	38,700	39,369	40,194	41,028

Overview
DHS S&T Directorate engages the academic community, through University Programs, to conduct research/analysis and provides education/training programs to support DHS priorities to enhance homeland security capabilities. The program 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.

This program invests in three thrust areas:
- o a coordinated, university-based system of DHS Centers of Excellence (COEs);
- o DHS Scholars and Fellows; and
- o the Minority Serving Institutes.

Centers of Excellence Thrust Area: The COEs conduct 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, the COEs are building scientific leadership and core competencies in multi-disciplinary areas of importance to homeland security. Presently, these areas are:
- o risk and economic analysis of terrorism;
- o food system protection and defense;
- o foreign animal and zoonotic disease defense;
- o social origins of and behavioral responses to terrorism;
- o preparedness and response to catastrophic events;
- o microbial risk assessment; and
- o discrete sciences.

DHS S&T designed the COEs to:
- o work with and complement other DHS research and development programs, including Federal laboratories' homeland security research;
- o take advantage of other related Federally-sponsored research; and
- o 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. DHS S&T currently funds five COEs and intends to establish six new COEs through FY2010. Additionally, several of the existing centers will extend the term of some of the original COEs. The program will combine the missions of several of the centers to create a consolidated initiative that better aligns with the S&T Directorate Research and Development (R&D) priorities. These adjustments will bring the total of COEs to eleven over the next two-three 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.

Existing COEs:
- o 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)
- o Center of Excellence for Food Protection and Defense (NCFPD) based at the University of Minnesota (http://www.fpd.umn.edu/);
- o Center of Excellence for National Center for Foreign Animal and Zoonotic Disease Defense (FAZD) based at Texas A&M University (http://fazd.tamu.edu/);
- o 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/); and
- o Center of Excellence for the Study of Preparedness and Catastrophic Event Response (PACER) based at Johns Hopkins University (website in development)

Existing Cooperative Centers:
- o Center for Advancing Microbial Risk Assessment (CAMRA) based at Michigan State University, established jointly with the U.S. Environmental Protection Agency (http://camra.msu.edu/); and
- o Institute for Discrete Sciences (IDS) University Affiliate Centers, led by Rutgers University in collaboration with Lawrence Livermore National Laboratory (awarded August 2006).

New COEs:
The S&T Directorate will establish **new COEs** from FY 2007 – FY 2010 as follows:
FY 2007
- • Center of Excellence for Explosives Detection, Mitigation, and Response
- • Center of Excellence for Border Security and Immigration

- Center of Excellence for Maritime Island & Extreme/Remote Environmental Security
- FY 2008
- Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management

FY 2009
- Center of Excellence for Command, Control and Interoperability

FY 2010
- Center of Excellence for Biological, Chemical and Agricultural Security

CREATE Program – This center, based at the University of Southern California, 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. Research in these areas can contribute 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 2007:
- Developed a set of emergency response models for:
- predicting fire spread;
- allocating medical supplies for disasters; and
- determining the consequence of floods and other catastrophic events.
- Developed a first-of-its-kind independent risk assessment tool that permits analysts to study the potential risk and consequences – including the economic impact – of a MANPADS attack (man-portable air defense systems)
- Worked with the Office of Infrastructure Protection and the California Office of Homeland Security to develop risk-based approaches for allocating funds to protect critical infrastructures in California.

FY 2007 to FY 2011:
- 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 models into an overall risk management model that supports specific countermeasure decisions and major policy/resource allocation decisions in homeland security.

NCFPD Program – This Center, based at the University of Minnesota, aligns with the S&T Directorate's Chemical and Biological Division. 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 system-wide food security, including:
- 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 2005 and FY 2006:

- Partnered with the Food and Drug Administration (FDA) to develop a food industry Consequence Management System (CMS), an advanced integrative tool that provides a visual model for predicting, tracking and assessing the economic and health consequences of a food system attack.
- Initiated a food event response network to communicate detected cases of food poisoning in real time and share with affected state health departments.
- Developed a checklist for Pandemic Flu and its impact on the food industry.

FY 2007 to FY 2009:

- 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; and
- Establish innovative prevention, response & recovery strategies to minimize the probability and health/economic consequences of food system attacks.

FAZD Program – This Center, based at Texas A&M, aligns with the S&T Directorate's Chemical and Biological Division. 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:

- o prevention;
- o surveillance;
- o intervention;
- o 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, which helps inform the Department's development of countermeasures and effective control strategies.

Milestones and Deliverables

FY 2006:

- Developed rapid detection technologies for intentional zoonotic diseases, including Avian Influenza; and
- Developed vaccines, screening tools and models for the spread of Foot and Mouth Disease.

FY 2007 to FY 2009:

- 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.

START Program – This Center, based at the University of Maryland, aligns with the S&T Directorate's Human Factors Division. 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 2006:
- Developed the GTD and extended it from 1997 to the present.
- Participated in DHS radicalization initiatives.
- Studied the motivations and intents of terrorism.
- Conducted surveys on community and citizens' responses to terrorism attacks.

FY 2007 to FY 2011:
- 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 United States' 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.

PACER Program – This Center, based at Johns Hopkins University, aligns with the S&T Directorate's Infrastructure and Geophysical Division. 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 immediacy. The Center is planning to investigate issues relevant to the theory and practice of emergency preparedness and response to terrorism incidents and natural disasters, including:
- 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.

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;

- o studies of formal and informal response networks; and
- o 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 2007 to 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 through FY 2011:

- 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.

Cooperative Centers:

CAMRA Program – This Center, based at Michigan State, aligns with the S&T Directorate's Chemical and Biological Division. DHS and U.S. Environmental Protection Agency 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 (BACs), which was of interest to both DHS and the Environmental Protection Agency (EPA). 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:

- o Exposure, Detection, Fate and Transportation of Biological Agents of Concern;
- o Infectious Disease Models for Assessing Microbial Risk and Developing Control Strategies;
- o Dose Response Assessment; and
- o Risk Communications and Analysis, and Information Sharing platforms.

Milestones and Deliverables

FY 2007:

- 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, and then use it to help.
- 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.

Institute for Discrete Sciences - University Affiliate Centers Program (IDS-UACs) Program – The IDS-UACs are scheduled for completion in FY 2008. This group of Centers is aligned with the S&T Directorate'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). The UACs and IDS will conduct coordinated research on advanced methods for information analysis and the development of computational technologies to protect the Nation.

Milestones and Deliverables
FY 2007 – 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.

New COEs:
Center of Excellence for Explosives Detection, Mitigation, and Response - This COE initiates in FY 2007 and will be aligned with the S&T Directorate's Explosives Division. This COE will conduct research to enhance the Nation's capabilities to prepare for, prevent, mitigate, respond to, and recover from terrorist attacks involving explosives. 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 research and development (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:
- o 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);
- o Detection of explosives and explosive devices, including methods to screen people and containers and other potential conveyances of explosive materials;
- o 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
- o 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 2007 - 2011.

Milestones and Deliverables
FY 2007 to 2011:
- 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.
- Identify at least one successful result research project in standoff detection as a candidate for transition to advanced engineering development.
- Obtain first-generation scientific properties from available technical tools to characterize and test HME and precursor compounds; and
- Establish an integrated sensor platform as a test bed for comparing the functionality of non-intrusive detection technologies.

Center of Excellence for Border Security and Immigration - This COE initiates in FY 2007 and aligns with the S&T Directorate's Borders and Maritime Division. The Center will provide fundamental research in support of DHS's goals of strengthening border security, interior immigration enforcement, and streamlining the immigration process. DHS and its component agencies have the responsibility to protect and control our borders against terrorist threats, criminal endeavors, illegal immigration and contraband, while facilitating legal travelers and trade into the U.S. DHS customers and end users of this COE will include ICE, Citizenship and Immigration Services, U.S. Coast Guard, 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. The S&T Directorate 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 2007-2011.

Milestones and Deliverables
FY 2007 to 2011:
- Establish a network of premier academic research universities as partners.
- Establish a portfolio of interdisciplinary research projects, subject to periodic review and revision.
- Develop a framework to inform DHS policymakers with empirical immigration research to increase the efficiency of immigration enforcement.
- Based on insights from research successes, develop corresponding educational curriculum materials in topical areas of greatest promise for long-term research and enduring need.
- Analyze the organizational and human factors that constrain or facilitate the effectiveness of border security operators.
- Identify the impact of immigration policy and law on population dynamics.
- Develop detection and surveillance technology for intentional and accidental border security threats.

Center of Excellence for Maritime Island & Extreme/Remote Environmental Security - This COE initiates FY 2007 and aligns with the Borders and Maritime Division. This COE will

provide fundamental research to support DHS and other agencies' maritime security goals, including:
- o improved interdiction capabilities;
- o enhanced capacity to respond to catastrophic events particularly for U.S. islands and extreme environments; and
- o improved (more secure and efficient) marine transportation system.

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), U.S. Coast Guard, 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 2007-2011.

Milestones and Deliverables
FY 2007 to 2011:
- 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 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.
- Identify all interested parties and develop an interactive communication network;
- Develop a comprehensive framework for maritime security that accounts for multiple potential sources of vulnerability (e.g. staff, passengers, cargo, and port security).
- Develop detection and surveillance technology for maritime security threats.

Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management - This COE initiates in FY 2008 and will be aligned with the Infrastructure and Geophysical Division. It will conduct 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. DHS anticipates that these COE discoveries will ultimately save American lives, property and economic activities, both regionally and nationally.

This COE will conduct basic and transformational research in areas related to Coastal region issues, including but not limited to the following topics:
- o Natural hazards of the coastal region (e.g., flooding from hurricanes or storm surges);
- o 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;

o   Approaches to securing public-sector coastal infrastructure and meeting other public-sector needs in crisis incidents; and

o   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 to 2011:

- 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 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.

- Identify all interested parties and develop an interactive communication network.

- 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.

Center of Excellence for Command, Control and Interoperability –This COE is also initiating in FY 2009 but will merge activities, started in FY 2007, of the Institute of Discrete Sciences University Affiliate Centers (see below) and the DHS Regional Visualization and Analytics Centers. This COE aligns with the S & T Directorate's Command, Control and Interoperability Division.

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 Command, Control and Interoperability Division's core activities in:

o   knowledge management;

o   threat assessment;

o   surveillance and reconnaissance;

o   cyber security; and

o   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 to 2011:

- 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.
- 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 Biological, Chemical and Agricultural Security – DHS S&T plans to initiate this COE in FY 2010 and aligned it to the Chemical and Biological Division. This center's customers and end users will include DHS Preparedness Directorate/CMO, USDA, FDA, CDC, EPA, State and Local Food System Agencies, Food and Agriculture Private Sector, State Chief Veterinary Officers, DHS Office of Health Affairs and State Departments of Agriculture.

The mission of this COE will conduct research and develop technologies, tools, and advanced methods to defend the safety of the post-harvest food system, protect against the introduction of high-consequence foreign animal and zoonotic diseases with an emphasis on prevention, surveillance, intervention and recovery, and develop and adopt strategies and technologies to counter chemical threats

Milestones and Deliverables
FY 2010 to 2011:
- Develop food event modeling systems.
- Develop methods for rapid and accurate detection of zoonotic diseases.
- Develop new vaccines and antiviral agents to protect animals.
- Develop new risk communications approaches to minimize the potential impact of food contamination or disease spread.

Multi-Center Priority Projects – This program 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 2007:
- Extend the reach of this collaboration by establishing a Cooperative Agreement competition that will be open to all DHS organizational components to propose research projects in partnerships with any of the DHS University Centers or other academic institutions and national laboratories.
- Conduct pilot studies to:

- evaluate industry sector vulnerability assessment tools;
- investigate measures of economic resilience; and
- conduct a multi-Center study of catastrophic risk perception in the U.S.

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.

FY 2007-2011:
- Develop a technology transition plan to accelerate the application of DHS University Centers' research results to operational use.
- Initiate additional cross-center and cross-agency research projects in advanced economic analysis and detection and diagnostics.
- Evaluate DHS University Programs and Individual Centers to determine effective future directions
- Develop management systems to improve delivery of results to homeland security partners.
- Codify process for selecting Joint Center/Lab/Division inter-disciplinary projects complex research areas of high priority to DHS.
- Hold workshops on critical multidisciplinary/multi-COE/NL areas of research such as:
  - terrorism prediction;
  - behavioral response to catastrophes/risk perception/risk communication;
  - consequence impact modeling;
  - economic resilience to disasters; and
  - compilation of terrorism economic models.

Minority Serving Institutions Thrust Area: The S&T Directorate established the Minority Serving Institutions (MSI) program in FY 2007. MSI initiatives will improve 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. DHS S&T will use competitive incentives to integrate the MSI program with the DHS University Centers.

Milestones and Deliverables

FY 2008:
- Continue developing far-reaching and multi-faceted MSI programs that incorporate MSIs into the Centers of Excellence
- Develop homeland security research and training capabilities at the MSIs.

  FY 2009:
- 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.

FY 2007 – 2011:
- Implement a Summer Research Team Program for MSI that provides a 10 – 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.

- Sponsor a Summer Workshop on Teaching Terrorism for faculty and graduate students at Minority Serving Institutions (MSIs). The workshop will:
  - offer an intensive short-course on the fundamentals of terrorism;
  - introduce academics to new and innovative techniques utilized to teach terrorism; and
  - provide access to high-level officials working in the intelligence and counter-terrorism fields.
  - feature expert specialists from the Centers of Excellence
  - integrate curriculum content from the DHS Centers of Excellence, including material on:
    - the social-behavioral causes and consequences of terrorism;
    - terrorism risk analysis;
    - food security, zoonotic disease defense; and
    - catastrophic event preparedness and response;
- 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; and
  - Provide scholarships for students of MSIs that will enable them to develop the necessary skills to become professionals in homeland security related fields.

Fellowships Thrust Area: The DHS Fellowships 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. DHS S&T draws students, scholars and faculty from postsecondary, graduate and professional levels of science and engineering disciplines that directly support the S&T Directorate's Divisions and the Department's mission. The Fellowships thrust area includes:
  - o Scholarships and Fellowships;
  - o National Research Council (NRC) Postdoctoral Associateship;
  - o American Association for the Advancement of Science (AAAS) Fellows;
  - o Summer Research Team for MSIs; and
  - o Visiting Scholars.

Over 100 institutions are represented by participants, including Historically Black Colleges and Universities and Minority Serving Institutions in more than 40 States, the District of Columbia and Puerto Rico.

Scholarships and Fellowships Program – University Programs 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 six 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 components such as the U.S. Coast Guard (USCG) and the Office of Intelligence and Analysis (IA).

Milestones and Deliverables
2007-2011:
- 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.

The primary Federal customers for the University Programs 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 Secretary's goals of:
- o Protecting the Nation from dangerous people;
- o Protecting our Nation from dangerous goods;
- o Protecting Critical Infrastructure;
- o Building a nimble and responsive emergency response system; and
- o Strengthening and unifying DHS operations and management.

PROJECT DETAIL INDEX

	Chemical	Analysis	Chemical Security Analysis Center (CSAC)	24
			Chemical Infrastructure Risk Assessments	25
			Chemical Forensics and Attribution (FAP)	25
		Detection	Autonomous Rapid Facility Chemical Agent Monitor (ARFCAM)	25
			Integrated CBRNe Detection System	26
			Lightweight Autonomous Chemical Identification System (LACIS)	26
			Low Vapor Pressure Chemicals Detection Systems (LVPCDS)	26
			Next Gen Low Vapor Pressure Chemicals Detection Systems (LVPCDS)	27
			Next-Gen ARFCAM and LACIS	27
			Non-Intrusive Container Monitor	27
			Rapidly Deployable Chem Detection Systems (RDCDS)	27
		Response and Recovery	Facility Restoration Demonstration	28
			Fixed Laboratory Response Capability	28
			Portable High Throughput Integrated Laboratory Identification System (PHILIS)	28
			Integrated Detection/Decon Demo	28
			Non Traditional Agent - Mobil High Throughput Laboratory	29
			Chemical Decontamination R&D	29
			Oil Spill	29
			Integrated Consortium of Laboratory Networks (ICLN)	29
Command, Control & Interoperability	Cyber Security	Information Infrastructure Security	Secure Protocols	32
			Process Control Systems (PCS) Security	33
			Cyber Security Assessment	33
		Cyber Security Research Tools and Techniques	Experimental Research Testbed	34
			Research Data Repository	34
			Experiments and Exercises	34
			Internet Route Monitoring	35
		Next Generation Technologies	Next-Generation Technologies	35
	Communications, Interoperability and Compatibility	OIC	Technology Demonstration Projects	36
			Public Safety Architecture Framework (PSAF)	36
			Statement of Requirements (SoR)	36
			Standards and Modeling	37
			Interoperability Migration Model	37
			Compliance Assessment	37
			Outreach	37
			SAFECOM Transition	38
			Emergency Data Exchange Language (EDXL) Data Standards	38
			IP Backbone Test & Evaluation	38
			P25 Interfaces	38
			Wireless Broadband Production	38
		IFSL Information Sharing	IFSL Information Sharing	39

	Knowledge Management Tools	Knowledge Frameworks	Architecture and Framework	40
			Collective Situational Awareness	40
			ICAHST	40
			Common Operating Picture (COP) Data Fusion Technologies	41
			Integrated Data Processing and Analysis	41
			Law Enforcement and Intelligence Sensor Fusion	41
			Network Identity Management	41
			Real Time Data Processing and Visualization	41
		Analytical Research	Visualization and Analytics	42
			Data-Intensive Computing, Privacy and Forensics	43
		Collaborative Information Sharing	Data Privacy Technologies	43
			Multi-Level Information Dissemination	44
			Suspicious Activity Reporting	44
			Threat Dissemination Standards	44
	Surveillance, Reconnaissance & Investigative Technologies	USSS Support	Advanced Live-Scan Import Software (ALIIS)	45
	Emergent Threat Assessments	WME Capability Assessments and Atribution	all-WME	45
		Countermeasures Development and Detection	Countermeasures Development and Detection	46
		Future Capabilities Research and Development	Future Capabilities Research and Development	47
		Identification and Assessments	Identification and Assessments	47
Explosives	Explosive Detection	VBIED/SBIED	Standoff Suicide Bomb Detection	49
			Vehicle Borne Bomb Detection	49
		Home Made Explosives	Home Made Explosives Characterization	49
			Home Made Explosives	50
			Home Made Explosives Stand Alone Detection	50
			Home Made Explosives Technology Integration	50
		Cargo	Air Cargo	51
			Canine Explosives Detection	51
		CheckPoint	Automated Carry-On Detection	52
			Next Generation Carry-On Detection	52
			Next Generation Passenger Checkpoint	52
			Explosive Trace Detection	53
		Checked Baggage	Improvements to Deployed Check Baggage Technology	53
		Manhattan II	Manhattan II	54
	Response	Bomb Assessment	Bomb Assessment Technologies and Integration	54
		Render Safe	Detection and Neutralization Tools	55
	Mitigation	Conveyance Protection	Aircraft Hardening	56
			Aircraft Vulnerability Tests	57
	Counter-MANPADS	DIRCM	GUARDIAN Countermeasure	58
			JETEYE Countermeasure	58
	Research	Explosives Research	Algorithm and Analysis of Raw Images	59
			Fundamental Particle Physics	59
			Detection Technology and Material Science	60
			Liquid and Home Made Explosives Chemical Characterization	60

Human Factors	Human Research & Engineering	Human-System Optimization	Human Performance	62
		Personal Identification Systems	Biometrics	63
			Credentialing	63
			Commerical Data Source	64
			Mobile Biometrics Systems	64
		Technology Acceptance and Integration	Community Acceptance of Technologies Panel	64
		Transportation Technology and Human Integration	Enhanced Screener-Technology Interface	65
	Social-Behavioral Threat Analysis	Community Preparedness, Response, and Recovery	Enhancing Public Response and Community Resilience	65
			Quantitative Psychosocial Impacts Index	66
			Risk Perception, Public Trust, and Communication	66
		Motivation & Intent	Group Violent Intent Modeling	67
			Global Terrorism Database	67
			Open-Source Modeling Applicability	68
			Radicalization Deterrence	68
		Suspicious Behavior Detection	Hostile Intent Detection - Automated Prototype	68
			Hostile Intent Detection - SPOT	69
			Hostile Intent Detection - Standoff Training	69
			Insider Threat Detection	69
Infrastructure/ Geophysical	Critical Infrastructure Protection	Protective Technologies	Blast/Projectile - Advance Materials Design (Tier 1)	72
			Blast/Projectile - Protective Measures and Design Tools	72
			Blast/Projectile - Unified Blast Analysis Tool	73
		Modeling, Simulation & Analysis	Interdependencies Model Build-Out (CIP-DSS)	73
			Sector and Threat Specific MSA	73
			Real-time Decision Support Tool	74
		National CIP R&D Plan	National CIP R&D Plan	74
		Advanced Surveillance and Detection Systems	Advanced Surveillance Systems	75
			Underwater Surveillance	75
		Response and Recovery Technologies	New Electrical Grid Transformer	75
			Rapid Response and Recovery	75
		Community Based CIP Institute	Community Based CIP Institute	76
		Risk Reduction Technologies	Blast/Projectile Protection	76

Category	Program Area	Program	Project	Page
Preparedness and Response	Response	Incident Management Enterprise	IMAAC	77
			Unified Incident Command and Decision Support (UICDS)	77
			Training, Exercise & Lessons Learned (TE&LL)	78
			Advanced Incident Management Enterprise System	79
			Incident Logistics and Resource Tracking System	79
		Preparedness & Response Technologies	Personal Protection Equipment (PPE)	80
		Preparedness & Response Advance Concepts and Systems	Advanced Concepts & Special Studies	80
		Regional Technology Integration	Regional Technology Integration - Anaheim Initiative	81
			Regional Technology Integration - Cincinnati Initiative	81
			Regional Technology Integration - Seattle Initiative	82
		First Responder Technologies	Advanced First Responder Locator	82
			First Responder Physiological Monitoring	83
		Integrated Modeling, Mapping & Simulation	Simulation Based Incident Planning and Response	83
	Geophysical	Southeast Regional Research Initiative	Southeast Regional Research Initiative	84
Innovation	Homeland Innovative Prototypical Solutions (HIPS)	Homeland Innovative Prototypical Solutions (HIPS)	Project Chloe	86
			Scaleable COP Experiment (SCOPE)	86
			SENSIT NMRI	87
			Scaleable Composite Vessel Prototype (SCVP)	87
			SAFECON	87
			Future Attribute Screening Technologies Mobile Module (FAST M2)	88
			Resilient Electric Grid	88
			Hurricane & Storm Surge Mitigation	89
			IED Defeat	89
			Levee Strengthening & Damage Mitigation	90
			Third Generation Secure Border Initiative	90
			Genetically Altered Bio Agent Detect System	90
			Next Generation Behavioral Screening Technologies	91
			National Common Operating Picture	91
	High Impact Technology Solutions (HITS)	High Impact Technology Solutions (HITS)	Tunnel Detect	91
			Document Validator	92
			Biometric Detector	92
			Critical Infrastructure Change Detect	92
			Cell-All Ubiquitous Chem/Bio Detect	92
			First Net	93
			Real Time Bio Detect	93
			Resilient Tunnel	93
			Next Generation Explosive Detect	94
			Advanced Area Surveillance Tech	94
			Advanced Behavioral Screening Technologies	94
			Phone Home	95
			Next Generation Explosive Defeat (APE 2)	96

Laboratory Facilities	Operations	Plum Island Animal Disease Center (PIADC) Operations	Plum Island Animal Disease Center (PIADC) Operations	96
			NBACC Operations	97
			CSAC Operations	97
			EML	98
			TSL Operations	98
	Construction	NBAF Construction	NBAF Construction	98
		Plum Island Animal Disease Center (PIADC) Upgrades	Plum Island Animal Disease Center (PIADC) Upgrades	99
		PNNL 300	PNNL 300	100
T&E/Standards	Standards	Explosives	Explosives Countermeasures Standards	102
			X-Ray Screening Equipment Standards	102
		Chem/Bio	Biological Countermeasures Standards	102
			Chemical Countermeasures Standards	102
		CCI	Communication Standards	103
			Incident Management Training and Process Standards	103
			Knowledge Management Standards	103
		Borders/Maritime	Cargo Security Technology Standards	104
			RFID	104
		Human Factors	Biometrics Equipment Standards	105
			Credentialing	105
		Infrastructure - Geophysical	GIS Interoperability Standards	106
			NIMS Integration Center/EML	106
			Personal Protective Equipment for Responders	106
			Urban Search and Rescue Robots Standards	106
		Standards Development	ANSI	107
			HSI	107
			IAB	107
			IEEE	107
			INCITS	107
			Standards Infrastructure	107
	Testing & Evaluation	Test Areas and Capabilities	Biothreat Detection: Hand Held Assay Second Round Testing	108
			Chem/Bio Threat Response & Recovery: Validated Sampling Plans	108
			Program Closeout CounterMeasures Test Bed	108
			Interoperable Communications T&E	108
			T&E Development and Analysis	108
			Transportation Worker Identification Credential – T&E	108
		T&E Infrastructure	T&E Infrastructure Development	109
		Plans and Policy	T&E Policy Analysis & Development	109
Transition	SAFETY Act	SAFETY Act	SAFETY Act	111
	International & Interagency	International & Interagency Programs	International & Interagency Programs	113
	Program Transition	Program Transition	Program Transition	114
	Tech SHARE		Technology Clearinghouse	115
			Tech Solutions	116

University Programs	DHS Centers			
University Programs	DHS Centers	Center Of Excellence for Risk & Economic Analysis of Terrorism Events (CREATE)	CREATE	120
		Center of Excellence for Food Protection & Defense (NCFPD)	NCFPD	120
		Center of Excellence for Foreign Animal & Zoonotic Disease Defense (FAZD)	FAZD	121
		Center of Excellence for National Consortium for the Study of Terrorism and Responses to Terrorism (START)	START	121
		Center of Excellence for the Study of Preparedness and Catastrophic Event Response (PACER)	PACER	122
		Center for Advancing Microbial Risk Assessment (CAMRA)	CAMRA	123
		Institute For Discrete Sciences (IDS) University Affiliate Centers	Institute For Discrete Sciences (IDS) University Affiliate Centers	124
		Center of Excellence for Explosives Detection, Mitigation, and Response	Center of Excellence for Explosives Detection, Mitigation, and Response	124
		Center of Excellence for Border Security and Immigration	Center of Excellence for Border Security and Immigration	125
		Center of Excellence for Maritime Island & Extreme/Remote Environmental Security	Center of Excellence for Maritime Island & Extreme/Remote Environmental Security	125
		Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management	Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management	126
		Center of Excellence for Command, Control and Interoperability	Center of Excellence for Command, Control and Interoperability	127
		Center of Excellence for Biological, Chemical and Agricultural Security	Center of Excellence for Biological, Chemical and Agricultural Security	128
		Multi-Center Priority Projects	Joint DHS-COE Competitions	128
Fellowships	Minority Serving Institutions	Minority Serving Institutions	Minority Serving Institutions	129
		Scholars and Fellows	Scholars and Fellows	130

HIPS and HITS

<u>Homeland Innovative Prototypical Solutions (HIPS)</u>, which are designed to deliver <u>prototype-level demonstrations</u> of game-changing technologies in two to five years. These projects are moderate to high risk, with high payoff

<u>High Impact Technology Solutions (HITS)</u>, which are designed to provide <u>proof-of-concept</u> answers within one to three years that could result in high-payoff technology breakthroughs. These projects have considerable risk of failure, however they also offer the potential for significant gains in capability

Homeland
Security

Homeland Innovative Prototypical Solutions (HIPS)

Explosives	Chem/Bio	Command, Control & Interoperability	Borders/Maritime	Human Factors	Infrastructure/Geophysical
Project Chloe- High altitude aerial platform existing above civil aviation Counter-MANPADS **SENSIT** – System to identify numerous liquids in baggage **IED Defeat / APE** **VBIED Defeat** – Detection/prevention and mitigation technologies to counter IEDs		**SCOPE** (Scalable Common Operational Picture Experiment) – Leverages Global Observer JCTD	**Scalable Composite Vessel Prototype (SCVP)** – Lightweight, composite material with high speed hull **SAFECON** – 90 second container screening device	**FAST M2** (Future Attribute Screening Technology Mobile Module) – Relocatable Lab capable of testing for behavioral/ physiological cues of "hostile intent" Double or triple wide trailer tested at various sites around the country	**Resilient Electric Grid** – System that will prevent cascading effects of power surge on electrical grids **Levee Strengthening and Rapid Repair** - rapidly stop a breach in a levee **Storm Surge and Hurricane Mitigation**

High Impact Technology Solutions (HITS)

Explosives	Chem/Bio	Command, Control & Interoperability	Borders/Maritime	Human Factors	Infrastructure/Geophysical
	Real Time Bio Detection and Identify **Cell-All** - Ubiquitous Chem/Bio/agent detector	**First Net** - First Responder Reliable Relay Link **Phone Home** – Inter-operative and inexpensive hand-held radios	**Tunnel Detect** – Ability to detect, identify, and confirm illegal and clandestine underground border structures and activities	**Document Validator** –High proficiency scanner that can identify fraudulent docs Leverage USSS system **Biometric Detector** – High proficiency small biometric scanner	**Wide Area Surveillance/ Change Detection for Critical Infrastructure** **Resilient Tunnel**– Tunnel Protection/Blast Mitigation

Homeland Innovative Prototypical Solutions (HIPS)

Division	Project	FY07	FY08	FY09	FY10	FY11	FY12	FY13
Explosives/C2I	Project Chloe	$8M	$10M					
C2I	SCOPE (Global Observer JCTD)	$2M	$2M					
Explosives	SENSIT NMRI	$1M	$2.9M	$2.9M	$1M			
Explosives	IED Defeat/APE	$2M	$4M	$4M	$6M	$6M		
Borders/Maritime	Scalable Composite Vessel Prototype SCVP		$8M	$8M	$1M			
	SAFECON	$5M	$6M	$8M	$4M			
Human Factors	FAST M2	$5M	$7M	$8M	$10M	$8M		
Infrastructure/Geophysical	Resilient Electric Grid	$5M	$7M	$7M	$8M			
Infrastructure/Geophysical	Levee Strengthening and damage mitigation	$2M	$2.5M	$4M	$5M			
Infrastructure/Geophysical	Hurricane and storm surge mitigation		$2M	$3M	$4M			
Chem / Bio	Genetically altered BIO AGENT Identification System				$3.9M	$8M	$12M	$8M
Borders / Maritime	3rd Gen Secure Border Initiative				$3M	$8.926M	$11.979M	$5.039M
Human Factors	Next Gen Behavioral Screening Technologies					$8M	$9M	$12M
C2I	National Common Operating Picture					$7M	$9M	$10M
Explosives	Next Generation IED prevent and detect						$5M	$13M
		$30M	$51.4	$44.9M	$45.9M	$45.926M	$46.979M	$48.039M

High Impact Technology Solutions (HITS)

Division	Project	FY07	FY08	FY09	FY10	FY11	FY12	FY13
Chem/Bio	Real Time Bio Agent Field Detection and Identification	$1M	$1M					
Command, Control & Interoperability	"First NET" First Responder Reliable relay link		$0.5M	$1M				
Borders/Maritime	Tunnel Detect	$2M	$1M					
Human Factors	Document Validator	$0.5M	$1M					
	Biometric Detector	$1M	$1M					
Infrastructure/Geophysical	"Resilient Tunnel" Tunnel Protection / Blast Mitigation	$1M	$1.5M	$2M				
Infrastructure/Geophysical	Critical Infrastructure Change Detection	$1M	$1M					
Chem/Bio	Cell-All Ubiquitous Chem/Bio detect	$1M	$1M	$2M				
CCI	Phone Home	$0.5 M						
Explosives	Next Generation Explosive Detect				$2M	$1M	$1M	
Human Factors	Advanced Behavioral Screening Technologies				$1M	$2M	$2M	
Infrastructure	Advanced Area Surveillance Tech				$2M	$1M	$2M	$1M
Explosives	Next Generation Explosive Defeat (APE 2)					$2M	$1M	$1M
CCI	Global Common Operating Picture							$2M
Borders/Maritime	Global Domain Awareness							$2M
		$8M	$8M	$5M	$5M	$6M	$6M	$6M

Homeland Innovative Prototypical Solutions
Counter-MANPADS / Persistent Surveillance

Project Chloe

65K Feet

Border & Critical Infrastructure Surveillance

Maritime Surveillance & Interdiction

Counter-MANPADS Functions

1. MWS Detect & Declare
2. Slew & Hand-off
3. Track
4. Jam

Engagement Time: 3-10 Seconds

MANPADS

Unmanned Aircraft Systems (UASs)

- High-Altitude Stand-Off Counter-MANPADS
- High Altitude – Wide-Area Coverage
- Long Endurance – Persistent Surveillance
- Large Payload – Multi-Sensor

Operational Characteristics

- Real-time sensor fusion/dissemination
- Multi-user / border surveillance requirements
- Commercial Aircraft MANPADS protection
- Automatic target detection/recognition
- Persistence (24/7, all-weather coverage)

Homeland Security

Homeland Innovative Prototypical Solutions

SENSIT

Liquid & Solid Explosive Detection at Ultra-Low Field *without radiation*

Control Electronics

2 Layer Mu-Metal Shield

Magnetic Detectors

SQUID Array

Dewar

Plastic airport bin

Polarization coil

Measurement coil

CAUTION
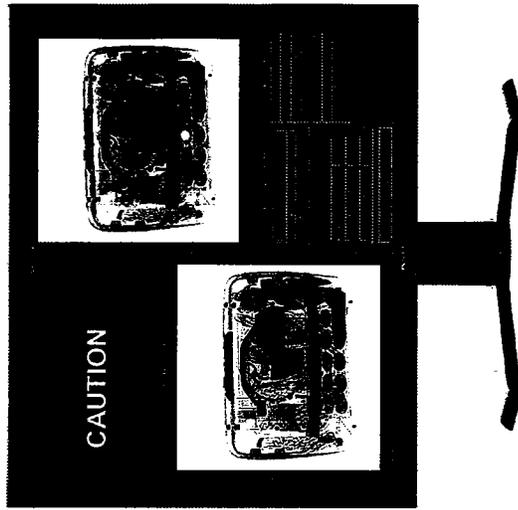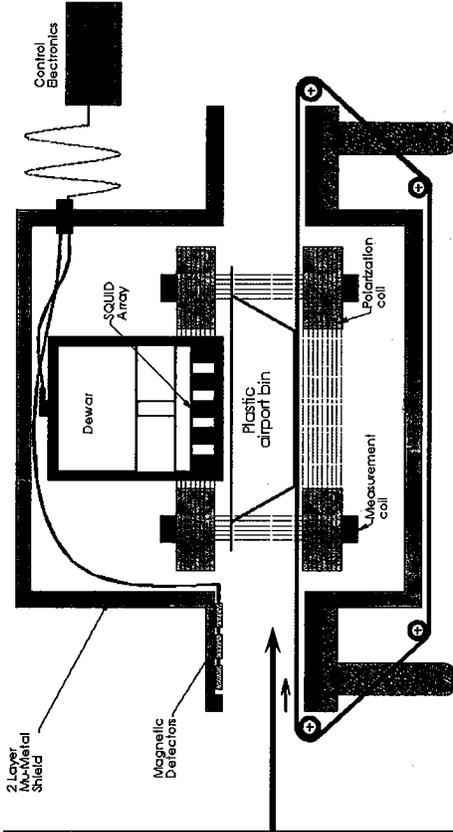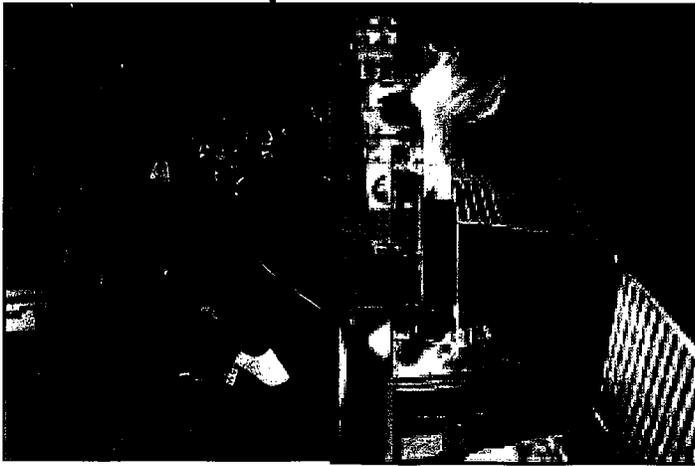
Magnetic Resonance Technology

- Detect Liquid & Solid Explosives
- Detect Explosive Components
- Simple **"Green"** / **"Yellow"** / **"Red"** alerts
- Non-contact
- Extremely sensitive
- Materials remain inside baggage
- Applicable at any security portal

6

High Innovative Prototype Solutions
Improvised Explosive Devices Defeat

- *Puffers* for explosives trace material detection on people, bags/parcels, and vehicles
- Walk-through/whole-body imaging (e.g., backscatter)
- Advanced Protection Explosive (APE): cancellation methods for explosive shock waves
- Drive-through imaging technology (x-ray, neutron of materials only)
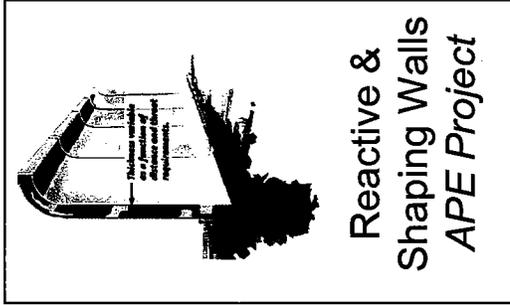
Active Armor

Reactive & Shaping Walls
APE Project

Masonry Walls

Explosive Resistant Coating

ERC Coated Steel

Uncoated Steel
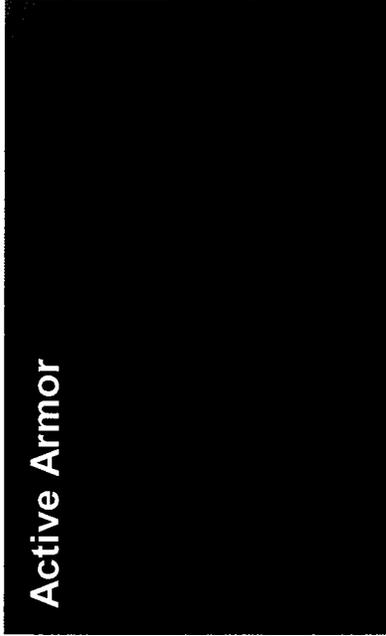
Predict, Detect, Defeat and Destroy

IED/VBIED at range (100 yards) to change the calculus of the bomber versus the defender

Homeland Security

Homeland Innovative Prototype Solutions
Technologies for Suicide Bomber Defeat & Blast Mitigation

Explosive Device Deactivation

Reactive & Shaping Walls
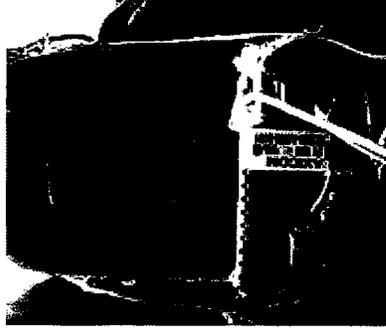
Suicide Bomber & Device Detection
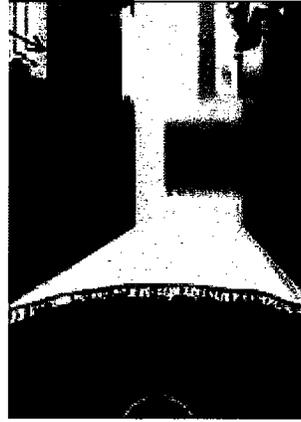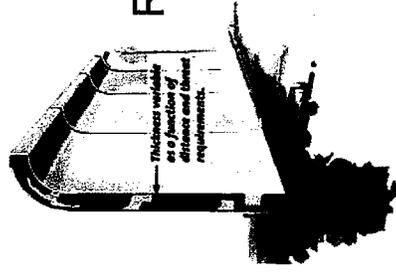
Blast Mitigation

Homeland Security

Homeland Innovative Prototypical Solutions
Scalable Common Operating Picture Experiment JCTD

Find and Fix High Value Targets

Communications Relay

Maritime / Border Operations
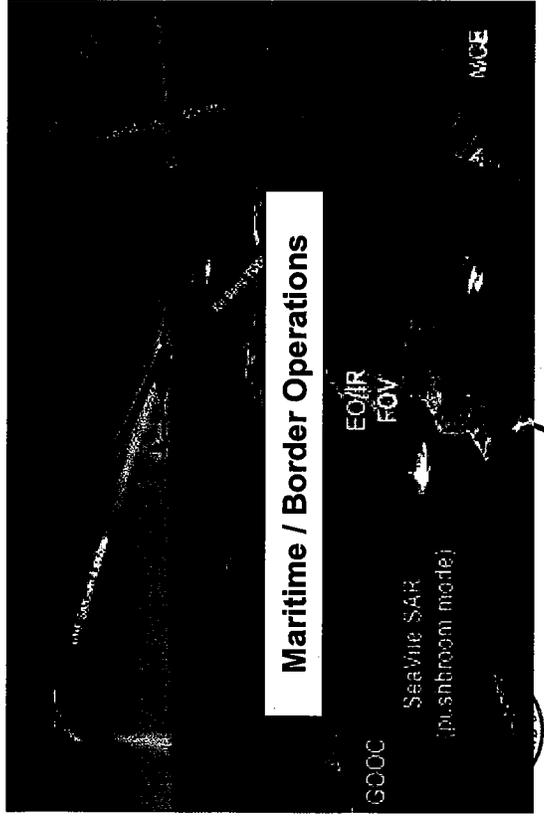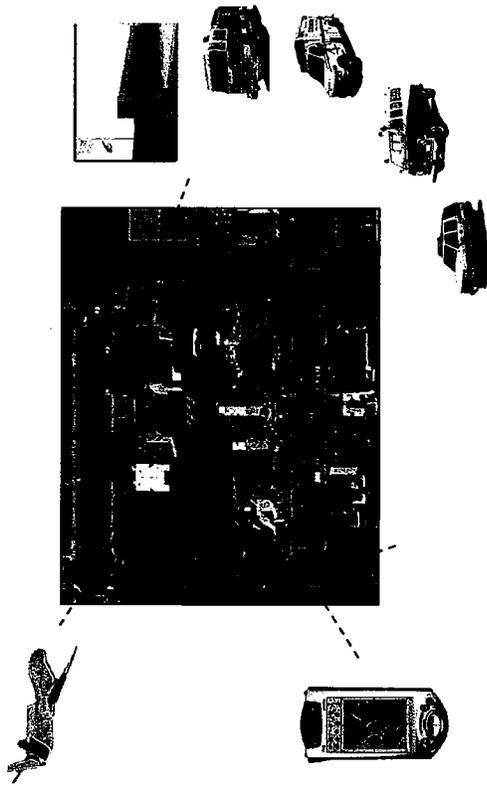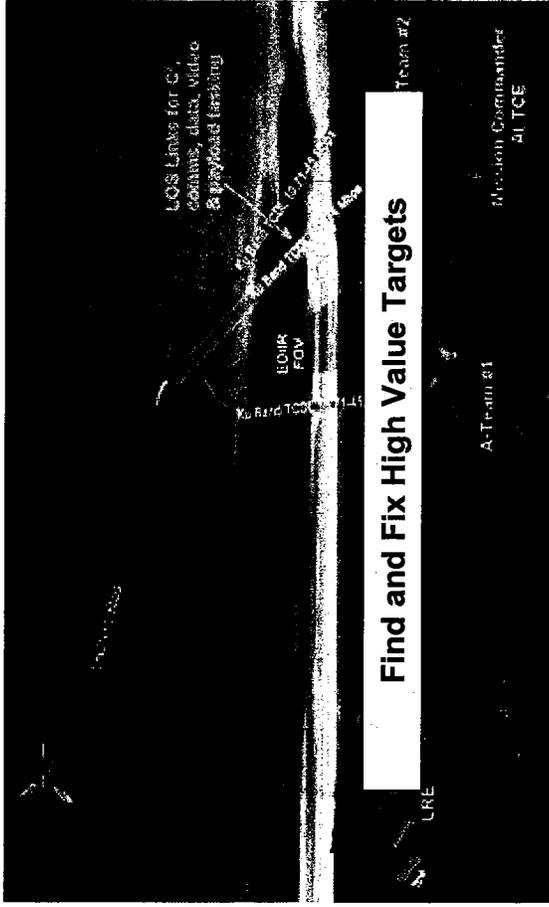
Homeland Innovative Prototypical Solutions
Scalable Composite Vessel Prototype (SCVP)
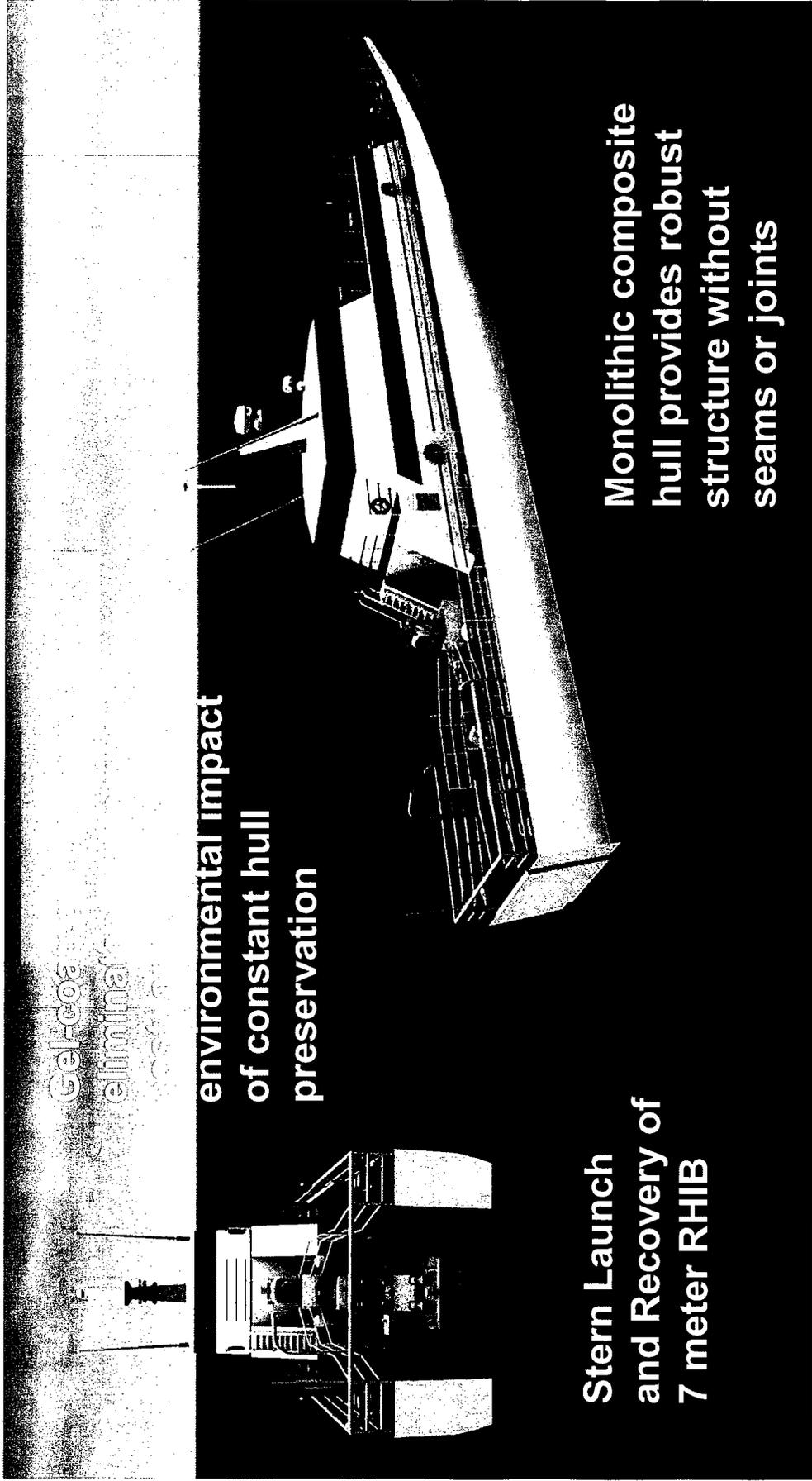
environmental impact
of constant hull
preservation

Gel-coat
eliminated

Stern Launch
and Recovery of
7 meter RHIB

Monolithic composite
hull provides robust
structure without
seams or joints

Homeland
Security

Homeland Innovative Prototypical Solutions

SAFECON

Quickly Detect and Identify Dangerous Cargo

Integrated Sensor Suite: explosives, chemical agents, biological agents human cargo, contraband

Scan for WMD, contraband, and human cargo during normal crane transport operations

➤ Improved Non-Intrusive Inspection (NII) capability

➤ Improved Sensors for explosives, Chem, and Bio agents

Homeland Security

Homeland Innovative Prototype Solutions

Future Attribute Screening Technology Mobile Module (FAST M2)
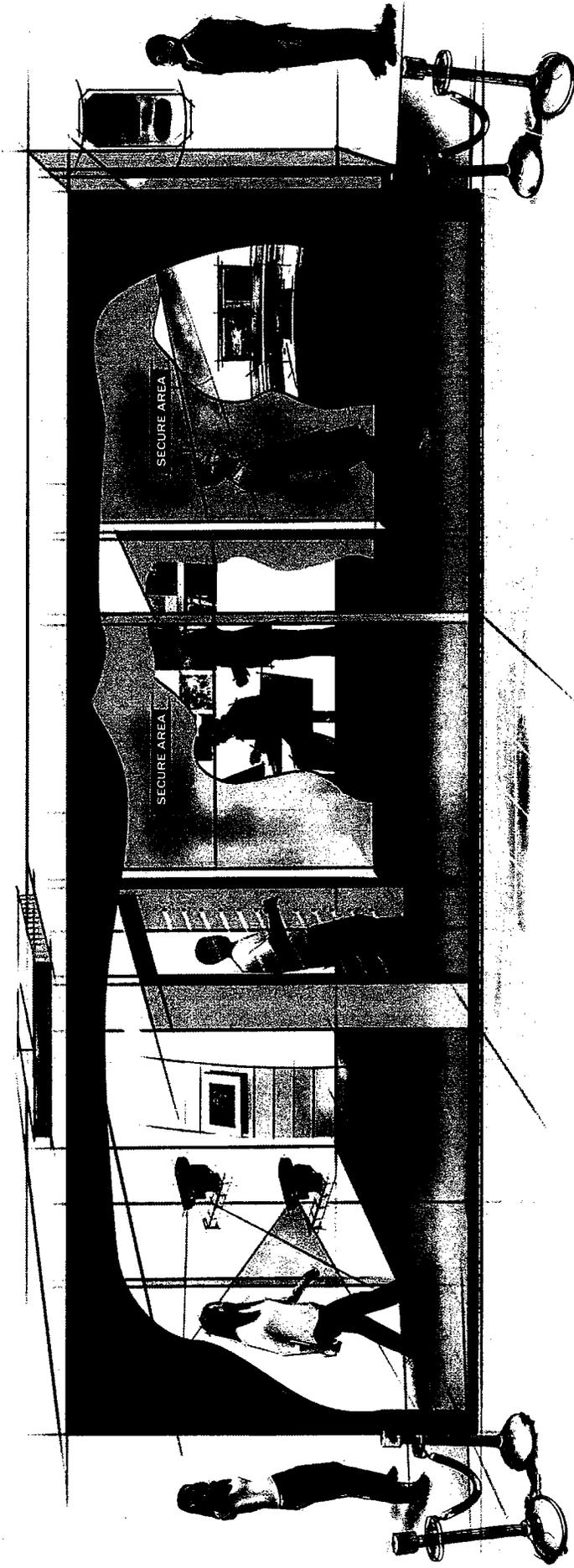
Systems

- Queue management
- Behavioral profiling
- Rapid risk assessment
- Screening methodologies

Operational Characteristics

- Discover screening methods for intent
- Privacy protection for all participants
- Simple to operate and use

Functions

- Identity verification
- Attribute measurement
- Risk determination
- Behavior focused screening

Homeland Security

12

Homeland Innovative Prototypical Solutions
Resilient Electric Grid (REG)
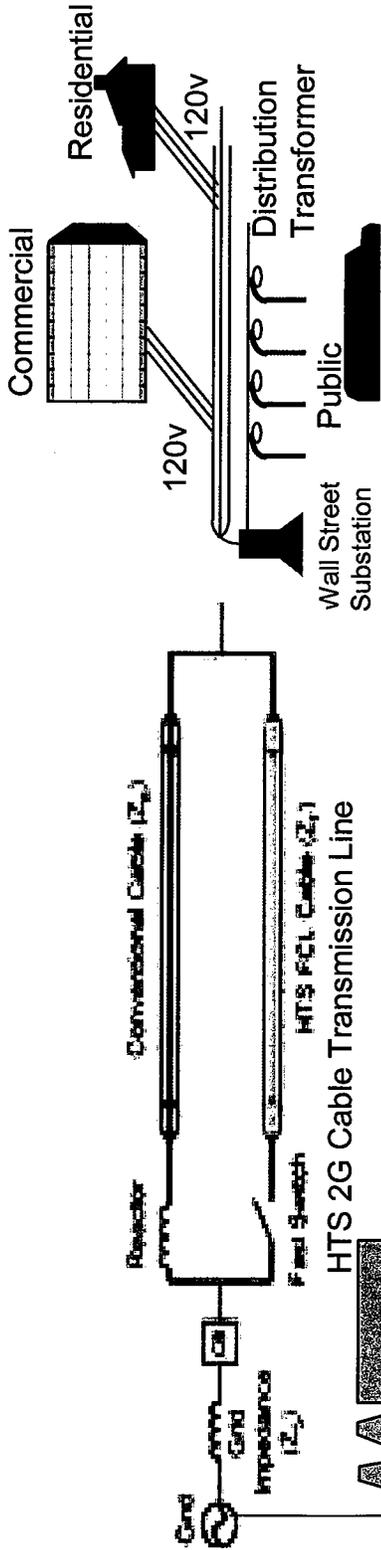
Homeland
Security

Homeland Innovative Prototypical Solutions

Levee Strengthening and Rapid Repair

Pre-emptive mapping of weak levees

Pre-Flood Deployment of Protective And Rapid Repair Supplies to Problem Locations

Drop-in structures lofted by aircraft

Float-in structure guided by cables

Explosively Emplaced Support Structures

Roll-out protective coverings such as articulated concrete mats

Homeland Security

14

Homeland Innovative Prototypical Solutions
Storm Surge Mitigation (SSM)
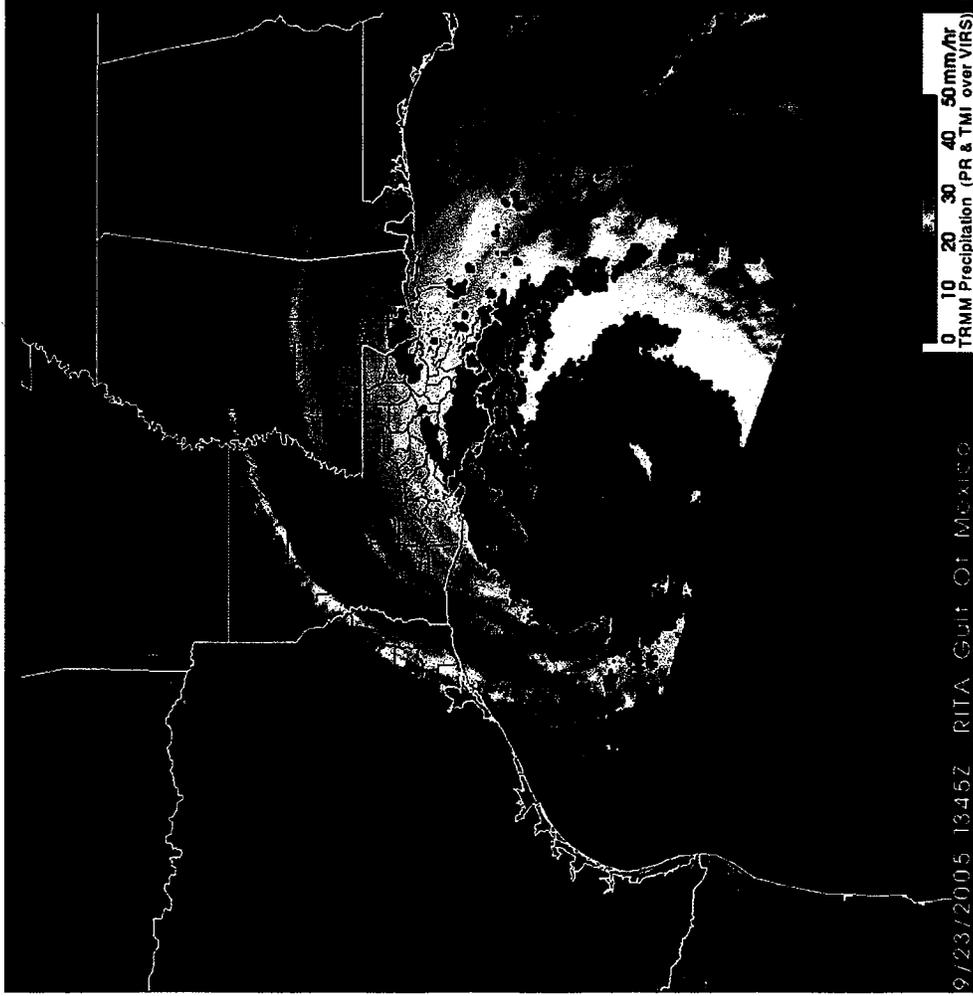
Strategic use of underwater blasts to mitigate storm surge?

Use of drop-In structures to limit surge?

Rerouting of flood waters to limit damage to Critical infrastructure?

Homeland
Security

High Impact Technology Solutions
Real Time Bio Detect

Systems to detect biological agents in less than 60 seconds, and then provide RF information transfer to various centers for decision making and corrective action.
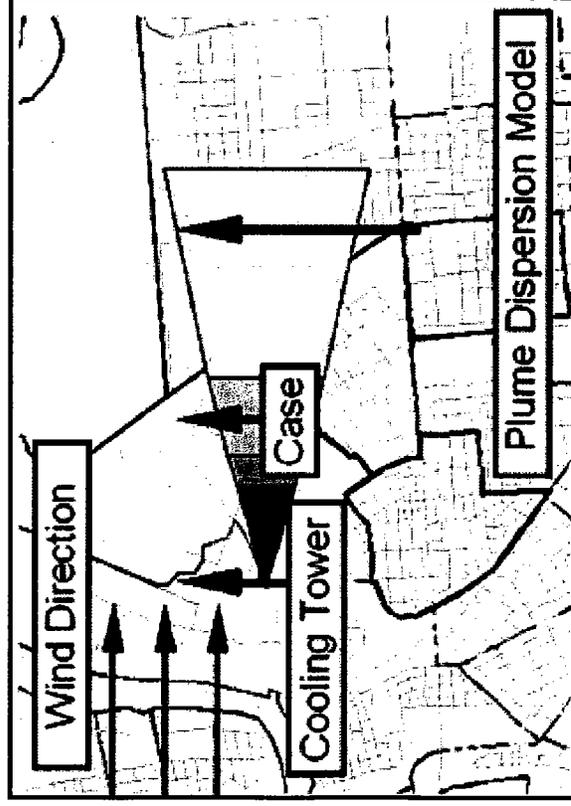
Detection via cell culture

VS

Wind Direction

Case

Cooling Tower

Plume Dispersion Model

Homeland Security

16

High Impact Technology Solutions
First Net

Homeland
Security

High Impact Technology Solutions
Tunnel Detection
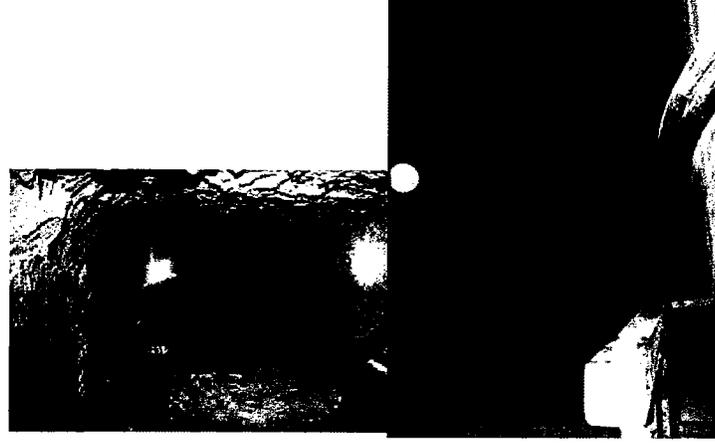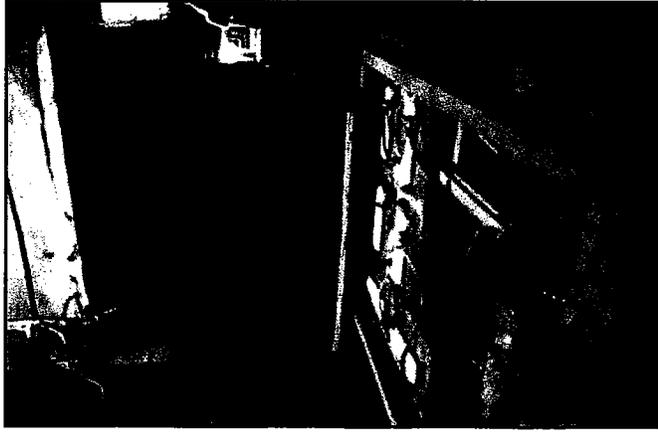
- Air circulation
- Electricity
- Concrete infrastructures

Homeland
Security

High Impact Technology Solutions
Document Validator

Functions
- Document Validation
- Identity verification
- Global identity awareness

Systems
- Immigration Control
- Queue Management
- Identity databases

Homeland
Security

19

High Impact Technology Solutions
Biometric Detector
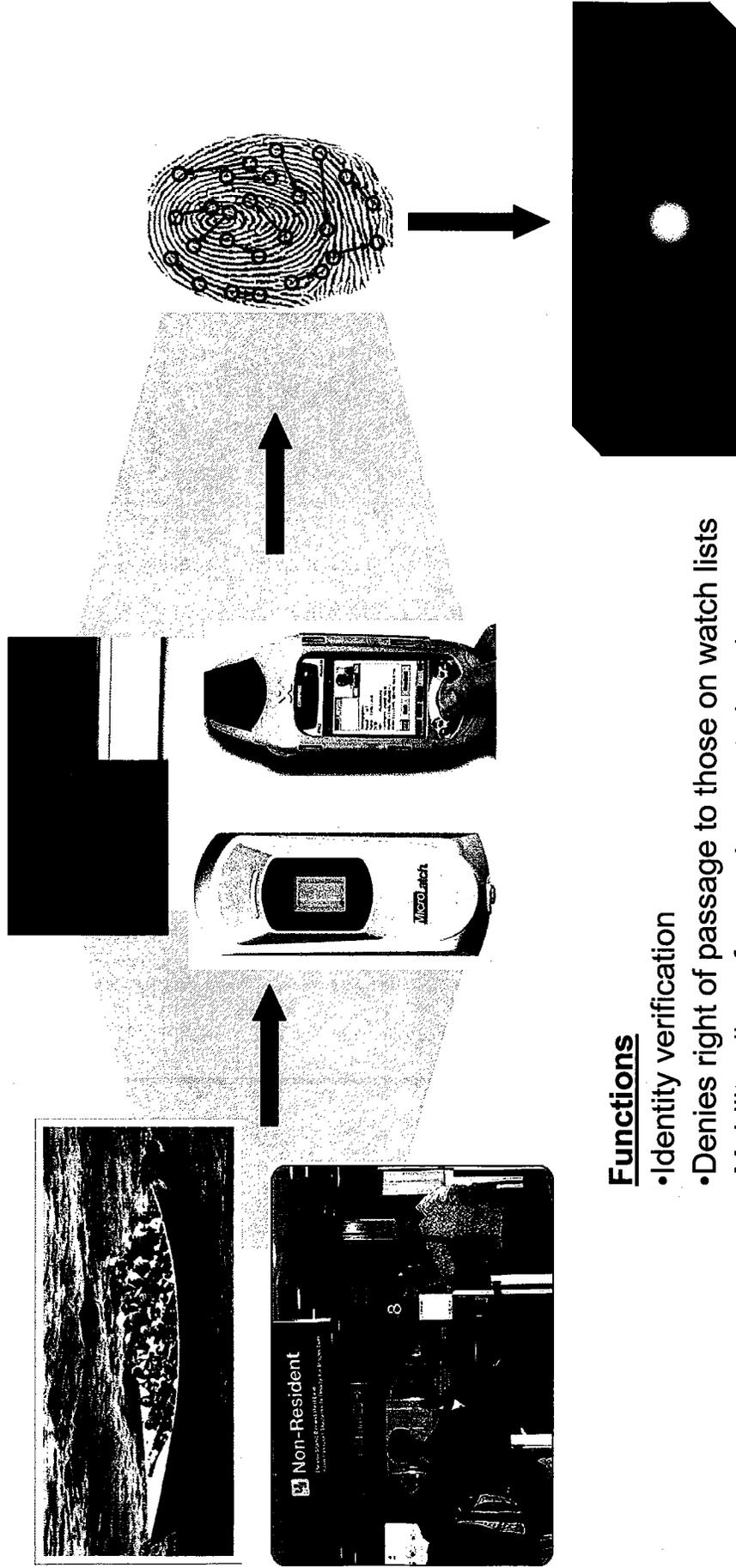
Functions
- Identity verification
- Denies right of passage to those on watch lists
- Mobility allows for use in remote locations
- Improved movement of legitimate individuals through checkpoints

Homeland
Security

High Impact Technology Solutions
Cell-All Ubiquitous Chem/Bio Detect
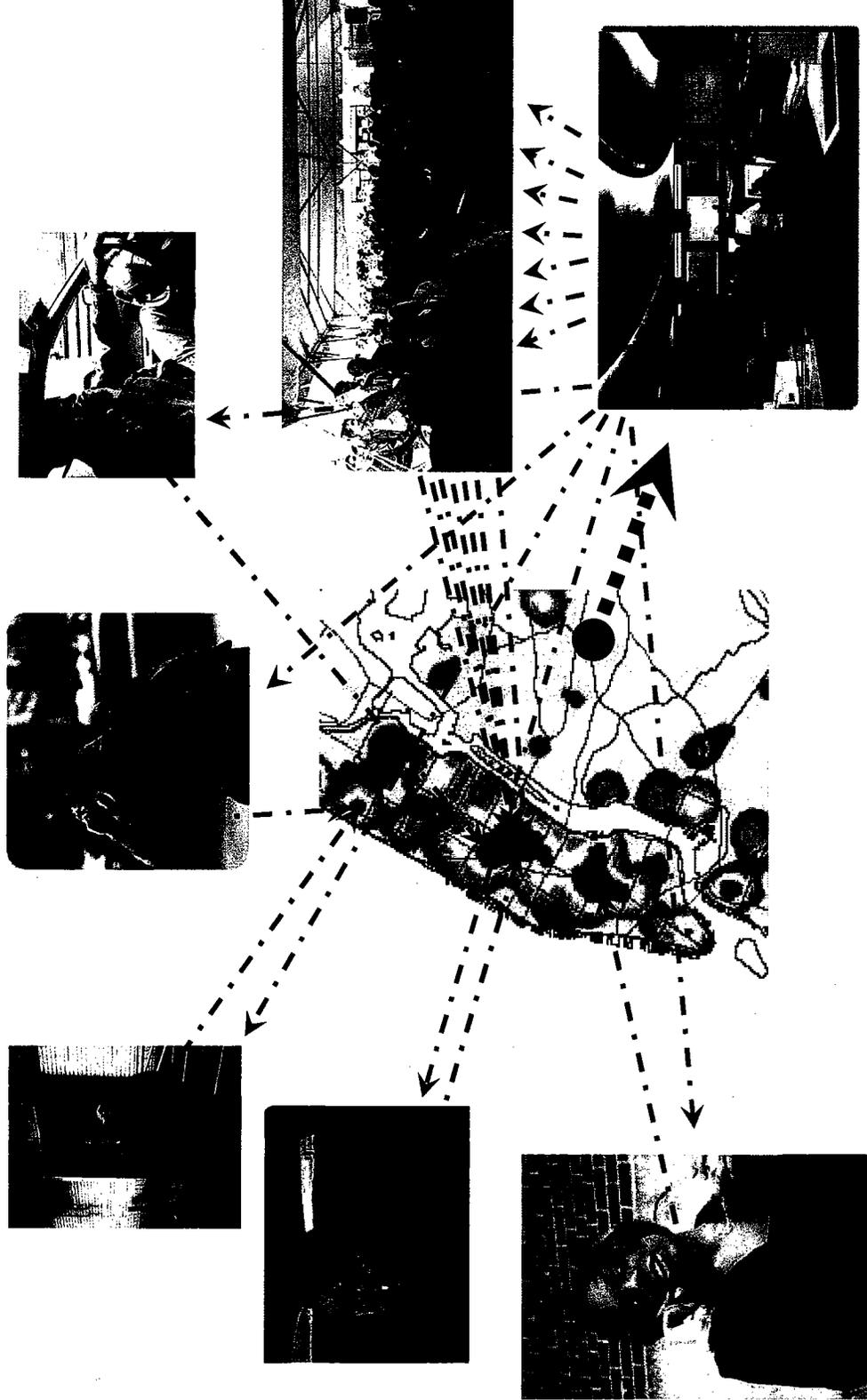
Homeland
Security

High Impact Technology Solutions
Critical Infrastructure Change Detection

Explore Methods to Monitor Critical Infrastructure

Densely Populated Urban Environments

Large and Remote Locations

Homeland Security

22
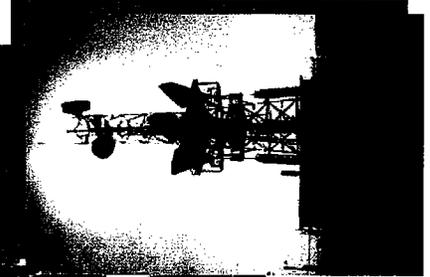
High Impact Technology Solutions
Resilient Tunnel

Station

Maximize lives saved – provide time to evacuate
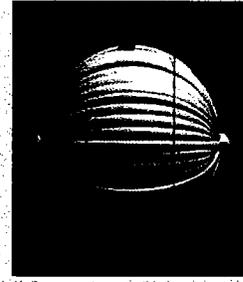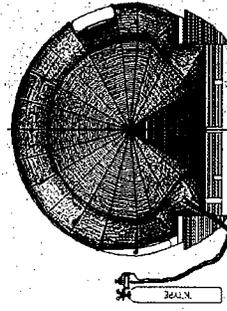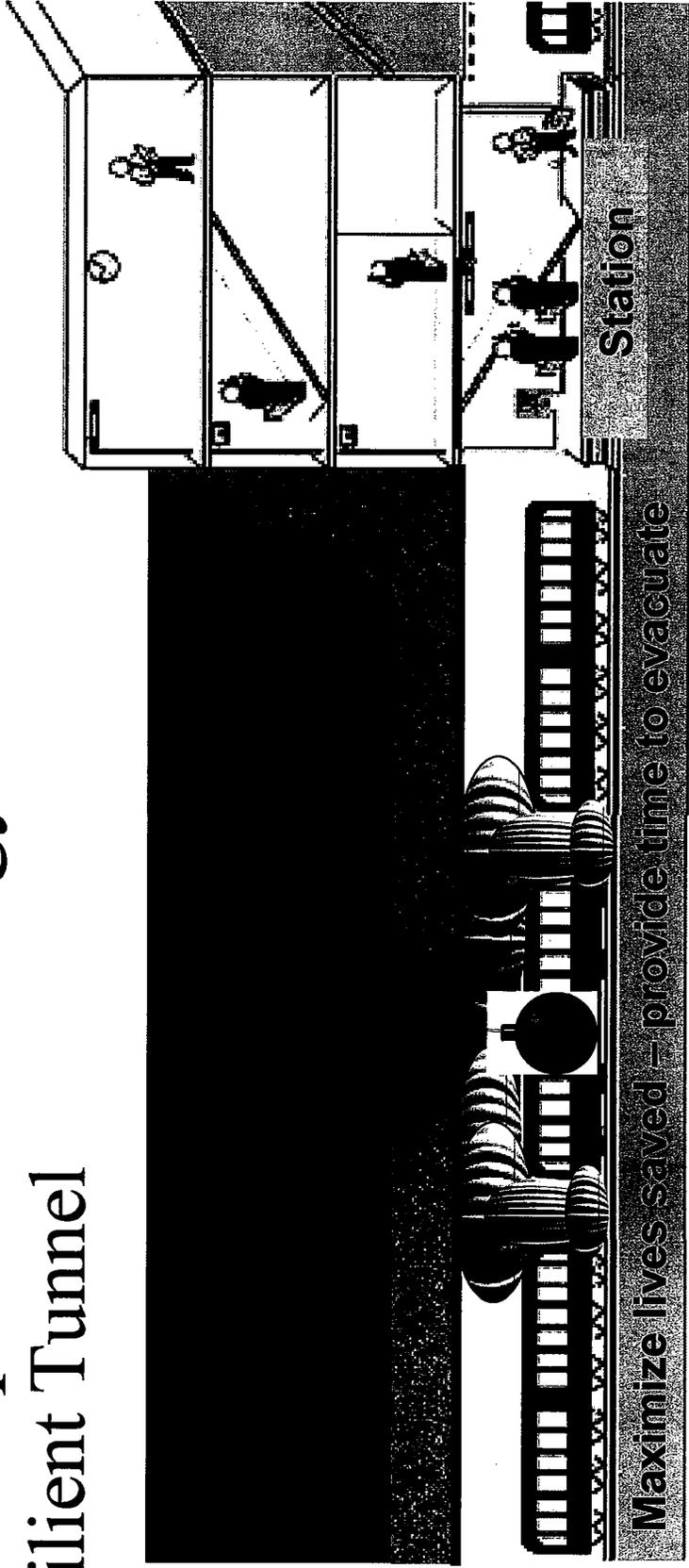
Recent advances in inflatable structure technology:

- Stronger Materials
- Rapid Inflation
- Lower Cost than Flood Gates
- Sustainable

Homeland
Security

23

High Impact Technology Solutions
Phone Home

Inter-operative and inexpensive hand-held radios

Allows National Emergency Responders to communicate
with state and local officials on both National frequencies and
Local frequencies.

Homeland
Security

Attachment 3 to S&T Directorate Strategic Plan

Capstone IPT Representative High Priority Technology Areas

Science & Technology
Security & Trust

March 2007

Homeland
Security

Border Security:
Representative Technology Needs

- Improved ballistic protection via personal protective equipment *(Borders/Maritime Division Lead)*

- Improve detection, tracking, and identification of all threats along the terrestrial and maritime border *(Borders/Maritime Division Lead)*

- Ability to access ICE databases in which voice information is entered; provide analytical, reporting, and automated case deconfliction; classify, identify voice samples *(C2I Division)*

- Non-lethal compliance measures for vehicles, vessels, or aircraft allowing for safe interdiction by law enforcement personnel *(Borders/Maritime Division Lead)*

- Non-destructive tools that allow for the inspection of hidden or closed compartments to find contraband or security threats *(Borders/Maritime Division Lead)*

- Improved analysis and decision-making tools that will ensure the development/implementation of border security initiatives *(Borders/Maritime Division Lead)*

- Ability to non-intrusively determine the intent of subjects during questioning *(Human Factors Division)*

- Ability for law enforcement personnel to quickly identify the origin of gunfire and classify the type of weapon fired *(Borders/Maritime Division Lead)*

- Ability for law enforcement officers to assure compliance of lawful orders using non-lethal means *(Borders/Maritime Division Lead)*

Homeland
Security

2

Cargo Security:
Representative Technology Needs

- Enhanced screening and examination by non-intrusive inspection *(Borders/Maritime Division)*

- Increased information fusion, anomaly detection, Automatic Target Recognition capability *(Borders/Maritime Division)*

- Detect and identify WMD materials and contraband *(Borders/Maritime Division)*

- Capability to screen 100% of air cargo *(Borders/Maritime Division)*

- Test the feasibility of seal security; Detection of intrusion *(Borders/Maritime Division)*

- Track domestic high-threat cargo *(Borders/Maritime Division)*

- Harden air cargo conveyances and containers (Borders/Maritime Division)

- Positive ID of cargo & detection of intrusion or unauthorized access *(Borders/Maritime Division)*
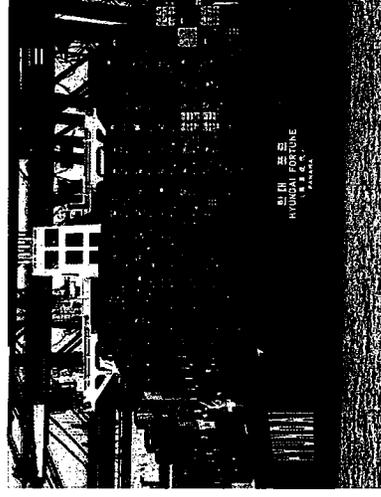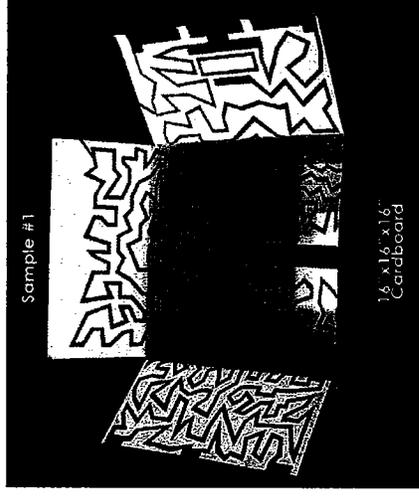
Homeland
Security

Chem/Bio Defense:
Representative Technology Needs

- Tools to detect and mitigate animal disease breakouts *(Chem-Bio Division)*

- Policy net assessments to provide fresh perspectives on fundamental elements of the national biodefense strategy *(Chem-Bio Division)*

- Improved tools for integrated CBRN Risk Assessment *(Chem-Bio Division)*

- Incident characterization capability for response & restoration *(Chem-Bio Division)*

- Improved ChemBio Forensic Analysis capability *(Chem-Bio Division)*

- National-scale detection architectures and strategies to address outdoor, indoor (e.g., highly trafficked transportation hubs) and critical infrastructure *(Chem-Bio Division)*

- Consequence assessments of attacks on chemical facilities and Chem Bio attacks on other critical infrastructure *(Chem-Bio Division)*

- Integrated CBRNE Sensor Reporting capability *(Chem-Bio Division)*

- Handheld rapid biological and chemical detection systems *(Chem-Bio Division)*

- Detection paradigms and systems for enhanced, emerging and novel biological threats *(Chem-Bio Division)*
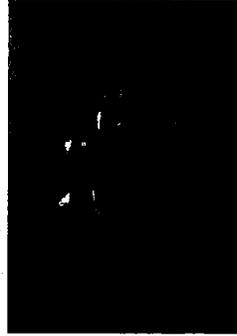
Homeland
Security

Cyber Security:
Representative Technology Needs
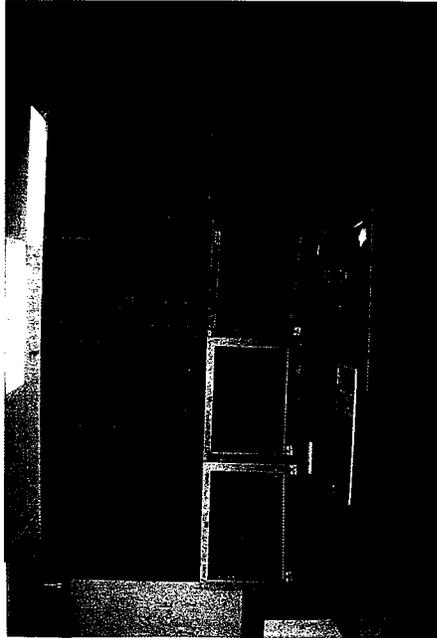
- Secure internet protocols including standard security methods *(C2I Division)*

- Improved capability to model the effects of cyber attacks and understanding of internet topography *(C2I Division)*

- Comprehensive next-generation network models *(C2I Division)*

- Composable and scalable secure systems *(C2I Division)*

- Technologies and standards for managing identities, rights and authorities used in an organization's networks *(C2I Division)*

- Information system insider threat detection models and mitigation technologies *(C2I Division)*

- Analytical techniques for security across the IT system engineering life-cycle *(C2I Division)*

- Process Control Systems (PCS) security *(C2I Division)*

Homeland
Security

Explosives Prevention: Representative Technology Needs

- Standoff detection on persons (portable solutions) *(Explosives Division)*

- System solution for detection in baggage (checked & carried) *(Explosives Division)*

- Capability to detect VBIED / large threat mass (container, trailer, ship, vessel, car, rail) *(Explosives Division)*

- Capability to detect homemade or novel explosives *(Explosives Division)*

- Capability to assess, render safe, and neutralize explosive threats *(Explosives Division)*

- Optimize canine explosive detection capability *(Explosives Division)*
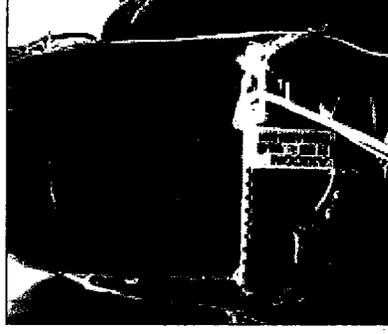
Homeland Security

Incident Management: Representative Technology Needs

- Integrated Modeling, Mapping and Simulation capability *(IP/Geophysical Division)*

- Personnel Monitoring (Emergency Responder Locator System) capability *(IP/Geophysical Division)*

- Personnel Monitoring (Physiological Monitoring of Firefighters) capability *(IP/Geophysical Division)*

- Incident Management Enterprise System *(IP/Geophysical Division)*

- Logistics management tool *(IP/Geophysical Division)*

Homeland
Security

Information Sharing:
Representative Technology Needs

- Data fusion from multiple sensors into Common Operating Picture (COP) *(C2I Division)*

- Improved real-time data sharing of law enforcement information *(C2I Division)*

- Management of user identities, rights and authorities *(C2I Division)*

- Distribution of Intelligence Products *(C2I Division)*

- Information sharing within/across sectors on terrorist threats *(C2I Division)*

- Automated, dynamic, real-time data processing and visualization capability *(C2I Division)*

- Analytic capabilities for structured, unstructured, and streaming data *(C2I Division)*

- Situational awareness between US Coast Guard and partners *(C2I Division)*

- Sensor fusion between Law Enforcement and Intelligence Partners *(C2I Division)*

Homeland
Security

Infrastructure Protection:
Representative Technology Needs
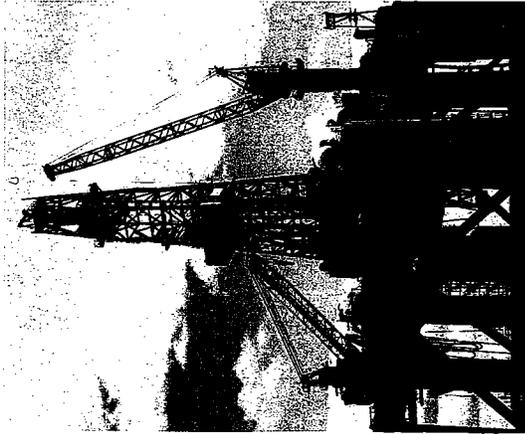
- Analytical tools to quantify interdependencies and cascading consequences as disruptions occur across critical infrastructure sectors *(IP/Geophysical Division)*

- Effective and affordable blast analysis and protection for critical infrastructure; improved understanding of blast failure mechanisms and protection measures for the most vital CI/KR *(IP/Geophysical Division)*

- Advanced, automated and affordable monitoring and surveillance technologies *(C2I Division)*

Homeland Security

Interoperability:
Representative Technology Needs

- Development and evaluation of Internet Protocol (IP) enabled backbones *(C2I Division)*

- Test and evaluation of emergent wireless broadband data systems *(C2I Division)*

- Acceleration of development and testing of P25 IP-based interfaces *(C2I Division)*

- Identification and development of message interface standards *(C2I Division)*

- Transition of Land Mobile Radios communication architectures to cellular based architectures *(C2I Division)*

- Evaluation of access technologies *(C2I Division)*

- Development of the complementary test procedures *(C2I Division)*

Homeland
Security

# Maritime Security: Representative Technology Needs

- Wide-area surveillance from the coast to beyond the horizon; port and inland waterways region - detect, ID, and track *(Borders/Maritime Division Lead)*

- Data fusion and automated tools for command center operations *(Borders/Maritime Division Lead)*

- Vessel compliance through non-lethal compliance methods *(Borders/Maritime Division Lead)*

- Enhanced capability to continuously track contraband on ships or containers *(Borders/Maritime Division)*

- Improved ballistic personal protective equipment for officer safety *(Borders/Maritime Division Lead)*

- Improved WMD detection equipment for officer safety; improved screening capability for WMD for maritime security checkpoints *(Borders/Maritime Division Lead)*
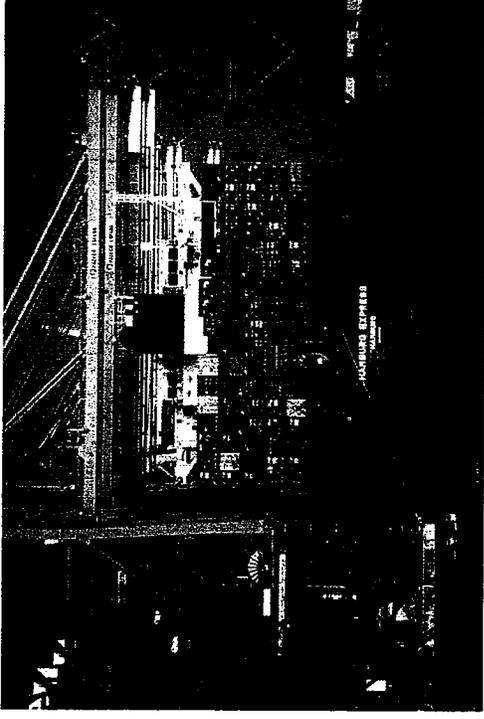
Homeland
Security

People Screening:
Representative Technology Needs

- Systematic collection and analysis of information related to understanding terrorist group intent to engage in violence *(Human Factors Division)*

- Non-invasive monitoring: Identifying and tracking unknown or potential threats from individuals at key checkpoints. Real-time detection of deception or hostile intent through integrated system of human and machine methods *(Human Factors Division)*

- Capability in real-time for positive verification of individual's identity utilizing multiple biometrics *(Human Factors Division)*

- Capability for secure, non-contact electronic credentials; contactless readers or remote interrogation technologies for electronic credentials *(Human Factors Division)*

- Mobile biometrics screening capabilities, to include hand-held, wireless, and secure devices *(Human Factors Division)*

- High-speed, high-fidelity ten-print capture capability *(Human Factors Division)*
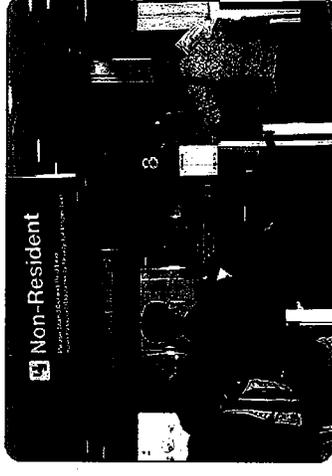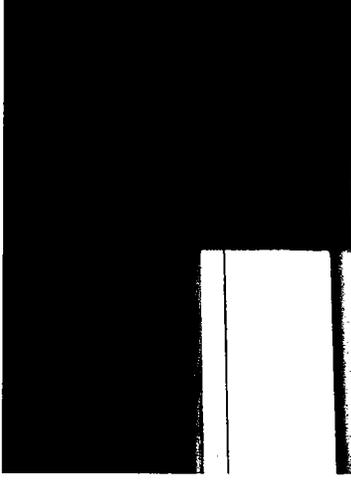
Homeland
Security

DHS S&T Points of Contact

Starnes Walker
Director of Research
Email: S&T-Research@dhs.gov

Roger McGinnis
Director of Innovation
Email: S&T-Innovation@dhs.gov

Bob Hooks
Director of Transition
Email: S&T-Transition@dhs.gov

Jim Tuttle
Division Head, Explosives
Email: S&T-Explosives@dhs.gov

John Vitko
Division Head, Chemical/Biological
Email: S&T-ChemBio@dhs.gov

Dave Boyd
Division Head, Command, Control, & Interoperability
Email: S&T-C2I@dhs.gov

Dave Newton
Division Head (Acting), Borders & Maritime
Email: S&T-BordersMaritime@dhs.gov

Sharla Rausch
Division Head, Human Factors
Email: S&T-HumanFactors@dhs.gov

Chris Doyle
Division Head (Acting), Infrastructure Protection and Geophysical
Email: S&T-InfrastructureGeophysical@dhs.gov

Homeland
Security

Homeland Security

U.S. DEPARTMENT OF HOMELAND SECURITY