Statement for the Record

Bradley I. Buswell

Deputy Under Secretary, Science and Technology Directorate

U.S. Department of Homeland Security

Before the U.S. House of Representatives

Science and Technology Committee

Subcommittee on Technology and Innovation

February 3, 2010

INTRODUCTION

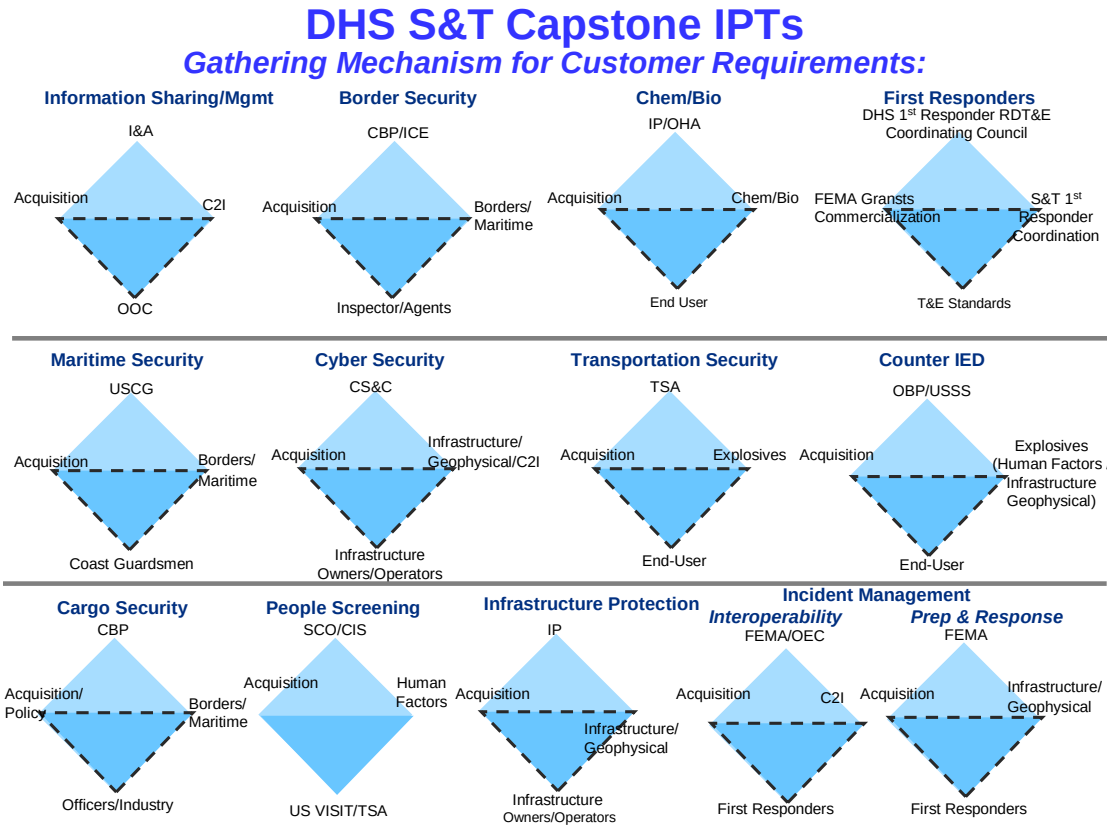
Good afternoon, Chairman Wu, Congressman Smith, and distinguished Members of the Subcommittee. I am honored to appear before you today on behalf of the Department of Homeland Security (DHS) to report on the Science and Technology Directorate's (S&T) research, development, test and evaluation (RDT&E) efforts relating to airport passenger screening technology.

Passenger Screening Capability Development

S&T provides technical support and tools to the major DHS operating components and our nation's first responders who face risk on the front lines of homeland security. S&T funds basic research and technology development, and supports the Department's major acquisitions through testing, evaluation and the development of standards.

The Transportation Security Administration (TSA) protects the nation's transportation systems to ensure freedom of movement for people and commerce. TSA has the lead role at DHS in defining the performance of equipment that airports install as part of their security measures. DHS S&T and TSA coordinate closely on research efforts and equipment test and evaluation to advance capabilities to protect the traveling public. These efforts have yielded numerous technical improvements that enhance the effectiveness of screening techniques and technologies while moving increasing numbers of people more quickly through security.

The Department's research and development priorities are primarily customer-driven through our Capstone Integrated Product Team (IPT) process. DHS customers chair the Capstone IPTs and establish their desired capability priorities based on their assessment of risk in their respective mission areas. Three IPTs — Transportation Security, Counter Improvised Explosive Devices (C-IED), and People Screening— are dedicated to identifying and delivering technological solutions for detecting and countering threats to the safety and security of the traveling public. Our Transportation Security IPT, led by TSA with support from DHS S&T's Explosives Division, strives to identify and deliver technologies to improve our layered approach to aviation security. TSA is also an integral member of the People Screening IPT, providing valuable input as a user of proposed screening technologies. Finally, the Counter-IED IPT works to identify and develop trace detection and standoff imaging technologies that will impact the next generation of checkpoint technologies.



All three DHS S&T portfolios — Product Transition, Innovation/Homeland Security Advanced Research Projects Agency (HSARPA), and Basic Research — participate in the IPT process. While the IPT members drive the selection of Product Transition projects, the expressed needs that arise from this process also inform the selection of projects in our Basic Research portfolio and similarly inform the higher-risk/high pay-off initiatives undertaken by our Innovation/HSARPA portfolio. The more insight we gain regarding current and future threats and the capability gaps of our stakeholders, the better positioned we are to identify promising areas of research and explore innovative solutions that are outside the development timeframe for the nearer term-focused Product Transition portfolio.

In addition to the Capstone IPT process, we have recently established the DHS – Department of Energy (DOE) Aviation Security Enhancement Partnership to advance technical solutions to key aviation security problems in support of priorities announced by the President following the failed Christmas Day bombing attempt While DHS has always worked in close collaboration with the DOE National Laboratories, we have now agreed to create a senior-level (at the Under Secretary level) governance mechanism to manage ways to extend and leverage this relationship with a focus on improving aviation security by:

- Delivering key advanced aviation security technologies and knowledge;
- Conducting analyses to assess possible vulnerabilities and threats and support/inform technology requirements, policy, planning, decision-making activities; and

- Reviewing the use of existing aviation security technologies and screening procedures, and the impact of new or improved technologies using a systems analysis approach to illuminate gaps, opportunities and cost effective investments.

This testimony will primarily address three areas of interest expressed by the Subcommittee: the passenger screening research and development priorities including current and planned research efforts; the physical, social and resource constraints on passenger screening and its impacts on technology; and the testing process that implements passenger screening technology.

Research and Development Priorities

There is no single technological solution to aviation security. A layered security approach to passenger screening features multiple passenger and baggage screening tools and integrates human factors considerations, metal detectors, Advanced Imaging Technology (AIT) with X-rays and millimeter waves, trace explosives detection and canines. S&T's R&D Program is focused on improving the performance of currently deployed screening equipment and procedures in the near-term, and developing and deploying new technologies and procedures in the long-term. Future improvements aim to screen passengers and carry-on baggage for an increasing range of threats and streamline travel by easing certain restrictions, such as the need to remove shoes during screening or limits on carrying liquids onto the plane.

We develop technologies and techniques that maximize our operational flexibility to ensure the privacy, civil rights and civil liberties of our citizens are protected. Our screening research programs are developed and executed in close cooperation with the DHS Chief Privacy Officer as well as the Office of Civil Rights and Civil Liberties to ensure that we consciously consider and address their impacts or risk to the public. S&T conducts in-depth analyses of such efforts through ongoing dialogue with the DHS Privacy Office and the DHS Office of Civil Rights and Civil Liberties and related documentation (i.e. Privacy Impact Assessments or Civil Liberties Impact Assessments).

Through the Checkpoint Program, we continuously evaluate and improve the capabilities of currently deployed technologies against new threats and seek to develop state-of-the-art threat detection technology for TSA passenger checkpoints to screen out evolving threats while improving the passenger experience with higher throughput and minimal restrictions. The highest-priority effort in this area is improving detection software algorithms, including effective automatic target recognition, in our currently deployed imaging systems, particularly AIT and Advanced Technology (AT) X-ray screening devices. AIT is one of the most promising technologies for detecting non-metallic weapons and small quantities of explosives concealed on individuals. AT X-ray provides an enhanced detection capability with multi-dimensional visual screening and improved image resolution of carry-on bags. Both of these technologies would greatly benefit from algorithm improvement and other systems research and engineering approaches that consider human factors to optimize security officer performance in threat

detection and identification. The President's Budget Request for this work in Fiscal Year (FY) 2011 is $22.3 million and includes the Checkpoint Program, home-made explosives research and systems research and engineering related to human factors.

Efforts dedicated to suspicious behavior detection could also provide near-term benefit in passenger screening. The Suspicious Behavior Detection Program strives to improve screening by providing a science-based capability to identify unknown threats indicated by deceptive and suspicious behavior. This program addresses operational needs for real-time, non-invasive detection of deception or hostile intent that are applicable across the DHS mission. The President's Budget Request for this work in FY 2011 is $8.9 million and includes the Human Factors Counter-IED Program and its Suspicious Behavior Detection Program.

In the longer term, a continuing, robust RDT&E program across the three S&T portfolios is necessary.

The Explosives Research Program funds multidisciplinary basic research in imaging, particle physics, chemistry, material science and advanced algorithm development to develop enhanced explosive detection and mitigation capabilities. The President's Budget Request for FY 2011 includes $9.1 million for this work.

The transition program, guided by the Capstone IPT process, is comprehensive and encompasses:

- Automated imaging systems to screen for weapons, conventional explosives, and home-made explosives (HME) in carry-on bags;
- Trace explosives detection capabilities for identifying explosives on people and in carry-on baggage;
- A next generation fully automated checkpoint for detecting weapons and explosives on people for aviation, mass transit, public gathering venues, or other potentially high-risk buildings;
- Human performance research and technology development for increased security officer efficiency and effectiveness;
- A science-based capability to derive, validate, and automate detection of observable indicators of suicide bombers;
- A science-based capability to identify known threats and facilitate legitimate travel through accurate, timely, and easy-to-use tools for biometric identification and credential validation;
- Technologies and methods for identifying insider threats.

The President's Budget Request for FY 2011 is $31.1 million for Counter-IED efforts applied to checkpoint screening for explosives.

The innovation program, managed by HSARPA, is looking at "leap-ahead" technologies such as:

- Future Attribute Screening Technology (FAST) to determine if it is possible to detect malintent (the mental state of individuals intending to cause harm) by utilizing non-invasive physiological and behavioral sensor technology, deception theory, and observational techniques. Though we have established an initial scientific basis for the technology, this project is still in the early stages as we work on both the science and theory to support the concept.
- MagViz is looking at the possibility of using technology similar to hospital MRI machines to look for and identify liquids. The magnetic fields in MagViz are much lower power than its medical counterparts, allowing operation without the restrictions and high costs of traditional MRI. We demonstrated this technology with a small scale prototype at the Sunport Airport in Albuquerque, NM in December 2008. MagViz was successful at identifying a dangerous liquid in a small bottle among many non-hazardous liquids in a standard TSA checkpoint bowl. The project is still in the research phase, and we are now trying to prove the technology using a larger size container and a broader array of both non-hazardous and potentially hazardous liquids.

The President's Budget Request for FY 2011 is $11 million for these projects.

Acknowledging Constraints

Development and the eventual deployment of effective passenger screening technology must meet legal and regulatory requirements. S&T works closely with TSA and other DHS offices to ensure the work we are doing has a clear path to deployment.

In addition to meeting the letter and intent of laws and regulations, public acceptance and perceptions of technology are important factors that cannot be overlooked. S&T uses Community Perceptions of Technology Panels that include informed experts from industry, public interest, and community-oriented organizations to identify potential acceptance issues.

S&T Role at the Transportation Security Laboratory (TSL)

Test and evaluations activities at the TSL encompass two independent functions. First, the Independent Test and Evaluation (IT&E) function is responsible for evaluating mature technology that may meet TSA's security requirements and is suitable for piloting or deployment. Second, the research and development function has responsibilities ranging from applied research, to prototype development, to technology maturation that produces prototypes suitable for evaluation by the Independent Test and Evaluation Team.

The IT&E group works closely with TSA's Office of Security and Technology to determine and discuss testing requirements, priorities and results of evaluations. IT&E activities at TSL include certification, qualification, and assessment testing and generally are performed to determine if detection systems meet customer-defined requirements. Results support decisions of DHS operating elements (such as TSA) for field trials and production or deployment, as well as key

program milestones, benchmarking, and investment strategy. RDT&E activities are designed to verify that a prototype or near-commercial off-the-shelf system has met performance metrics established within the R&D program such that it can proceed to the next R&D stage.

The Certification Test Program is reserved for detection testing of bulk and trace explosives detection systems (EDS) and equipment under statutory authority 49 U.S.C. §44913 for checked baggage. Before mature EDS are deployed, it must be certified that salient performance characteristics are met.

Qualification Tests are designed to verify that a security system meets customer-defined requirements as specified in a TSA-initiated Technical Requirements Document. This test, along with piloting (field trials) generally results in a determination of fitness-for-use. This process is modeled after the certification process and is defined within the Qualification Management Plan. Unlike the Certification Test, the requirements of the Qualification Management Plan typically expand beyond detection functions to include operational requirements. The result of Qualification Testing is a recommendation of whether candidate systems should be placed on a Qualified Products List (QPL).

Laboratory Assessment Testing is conducted to determine the general capability of a system. These evaluations of candidate security systems are carried out in accordance with interim performance metrics, and the results drive future development efforts or operational deployment evaluations. While the IT&E group practices best scientific principles in test design, execution, and evaluation of data, assessment criteria are determined by the DHS component's needs.

Developmental Test and Evaluation (DT&E) is performed by the R&D team at the TSL and involves testing in controlled environment to ensure that all system or product components meet technical specifications. These tests are designed to ensure that developmental products have met major milestones identified within the R&D project. DT&E testing at the TSL assesses the strengths, weaknesses, and vulnerabilities of technologies as they mature and gain capability. The primary focus is to ensure that the technology is robust and ready for Certification or Qualification tests.

S&T Role in Standards

The S&T Test & Evaluation and Standards Division guides the National Institute of Standards and Technology's (NIST) standards development efforts for aviation security. These efforts are directed towards development of voluntary consensus standards and associated test methods by the private sectors standards bodies (e.g. Institute of Electrical and Electronic Engineers (IEEE); American Society for Testing and Materials International (ASTM International); the National Electrical Manufacturers Association (NEMA); InterNational Committee for Information Technology Standards (INCITS); and the International Organization for Standardization (ISO).

Chief test engineers from TSL and TSA are actively engaged with NIST on standards development, ensuring that U.S. national standards reflect the need for enhanced aviation security.

Conclusion

Aviation security is critical. As I've described, we will leverage the resources of the National Laboratories to bring needed capabilities to the forefront, and we will continue to collaborate with other Federal partners, academia and industry. We have a Broad Agency Announcement in place to solicit technological solutions for countering the threat across a broad spectrum. Additionally, we are engaging our international partners to ensure we are capturing the best technologies possible and to help them improve their security capabilities.

Thank you for your dedicated efforts to improve the safety of air travel for all Americans. I appreciate the opportunity to meet with you today to discuss research initiatives to strengthen passenger screening and I look forward to answering your questions.