REVIEW OF PROGRESS BY THE DEPARTMENT OF HOMELAND SECURITY (DHS), SCIENCE AND TECHNOLOGY DIRECTORATE

HEARING

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTEENTH CONGRESS

FIRST SESSION

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October 27, 2015

A REVIEW OF PROGRESS BY THE DEPARTMENT OF HOMELAND SECURITY (DHS), SCIENCE AND TECHNOLOGY DIRECTORATE

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TUESDAY, OCTOBER 27, 2015

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Lamar Smith [Chairman of the Committee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States

House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Full Committee

A Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate

Tuesday, October 27, 2015
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Witnesses

The Honorable Reginald Brothers, *Under Secretary, Science and Technology, U.S. Department of Homeland Security*

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY**

HEARING CHARTER

**A Review of Progress by the Department of Homeland Security (DHS), Science and
Technology Directorate**

Tuesday, October 27, 2015
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Purpose

On Tuesday, October 27, 2015, the Committee on Science, Space, and
Technology will hold an oversight hearing to review the strategy, mission, organization,
programs, projects, and other activities of the Science and Technology Directorate of the
Department of Homeland Security (DHS S&T).

The purpose of this hearing is to assess any progress that has been made in
addressing concerns raised one year ago in an oversight hearing[1] conducted jointly by the
Committee on Homeland Security Subcommittee on Cybersecurity, Infrastructure
Protection, and Security Technologies and the Committee on Science, Space, and
Technology Subcommittee on Research and Technology, and to determine if further
legislative direction is needed to DHS S&T.

A series of General Accountability Office (GAO) reports have been critical of the
DHS technology development efforts, calling them "fragmented and overlapping." GAO
reports have noted "[a lack of] policies and guidance for defining, overseeing,
coordinating, and tracking R&D activities across the departments," and failure to collect
and evaluate feedback from its customers. These problems risk wasting taxpayer money
through R&D delays and duplication, as well as retarding DHS capacity to develop
technology to address homeland security threats.[2]

Witnesses

*   **The Honorable Reginald Brothers,** Under Secretary for Science and Technology,
    Department of Homeland Security

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[1] Information on the hearing from Sept 9, 2014, can be found at:
https://science.house.gov/legislation/hearings/subcommittee-cybersecurity-infrastructure-protection-and-security-technologies and https://science.house.gov/news/press-releases/targeted-dhs-rd-can-help-secure-our-borders-cyber-networks.
[2] Written Testimony of David C. Maurer, Director of Homeland Security and Justice, GAO
https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-113-SY14-WState-DMaurer-20140909.pdf

Background

The DHS S&T Directorate is the primary research and development arm of the Department and is charged with delivering effective and innovative insight, methods, and solutions for the critical needs of the Homeland Security Enterprise. To fulfill this mission, S&T conducts basic and applied research, development, demonstration, testing and evaluation activities relevant to DHS.

In 2002, Title III of the Homeland Security Act (PL 107-296) established the role of Undersecretary for Science and Technology, the Directorate for S&T, and the Homeland Security Advanced Research Projects Agency (HSARPA) within DHS. The S&T Directorate is responsible for managing and carrying out scientific research and technology development for federal homeland security needs and coordinating this research with other agencies.[3] The Committee on Science, Space, and Technology shares oversight jurisdiction of the S&T Directorate with the Committee on Homeland Security.

The Science and Technology Directorate's mission is to "improve homeland security by working with partners to provide state-of-the-art technology and solutions that help them to achieve their missions."[4]

- Operationally Focused: S&T provides the Homeland Security Enterprise (HSE) with strategic and focused technology options and operational process enhancements.

- Innovation: S&T seeks innovative, system-based solutions to complex homeland security problems.

- Partnerships: S&T has the technical depth and reach to discover, adapt and leverage technology solutions developed by federal agencies and laboratories, state, local and tribal governments, universities, and the private sector - across the United States and internationally. S&T's partners and customers include the operating Components of the Department (such as Customs and Border Protection, the Federal Emergency Management Agency, and the Transportation Security Administration), as well as state, local, tribal, and territorial emergency responders and officials.[5]

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[3] Title III of P.L. 107-296, available at: http://www.gpo.gov/fdsys/pkg/PLAW-107publ296/html/PLAW-107publ296.htm
[4] http://www.dhs.gov/sites/default/files/publications/FY15BIB.pdf, p. 145.
[5] Ibid.

Science and Technology Directorate (DHS S&T) Spending
(dollars in millions)

Account	*FY14 Enacted	**FY15 Enacted	FY16 Request	FY16 Request versus FY15 Appropriation	
				$	%
Science and Technology Directorate					
Acquisition and Operations Support	41.7	41.7	47.1	5.4	13
Laboratory Facilities	547.8	435	133.9	(301.1)	(69)
Research, Development, and Innovation	462	457.5	434.9	(22.6)	(5)
University Programs	39.7	39.7	31	(8.7)	(22)
Management and Administration	129	130	132.1	2.1	2
Totals:	**1,220.2**	**1,103.9**	**779.0**	**(324.9)**	**(29)**

*FY14 Lab Facilities: NBAF Construction $404M
**FY15 Lab Facilities: NBAF Construction $300M (final request for NBAF construction funding)
Source: *FY 2015 Budget in Brief – Homeland Security*[6]

Organization for the S&T Directorate:[7]

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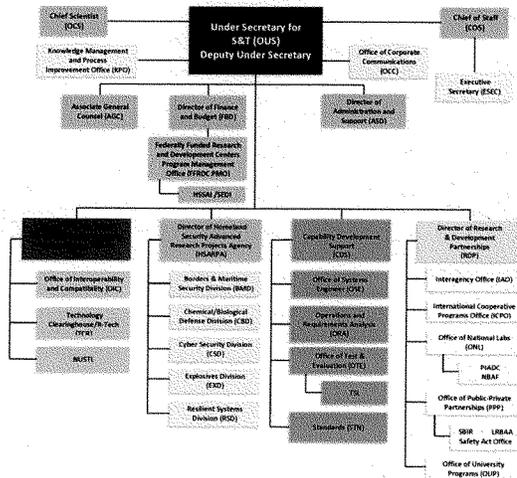
[6] Ibid., p. 143.
[7] DHS Science and Technology Directorate, available at:
https://www.dhs.gov/sites/default/files/publications/ST%20Org%20Chart-12-2012_0.pdf.

The Government Accountability Office has produced several reports related to DHS S&T. In a June 2011 report titled, *DHS Science and Technology: Additional Steps Needed to Ensure Test and Evaluation Requirements are Met,*[8] GAO found that the Testing & Evaluation Standards Office (TES) needed to develop mechanisms to record and verify DHS component acquisition documentation.

In September 2012, GAO released a report titled, *Department of Homeland Security Oversight and Coordination of Research and Development Should Be Strengthened.*[9] GAO found that DHS does not know how much its components spend on research and development (R&D) and does not have policies and guidance for defining R&D and overseeing R&D resources across the Department. According to DHS, the S&T Directorate, the Domestic Nuclear Detection Office (DNDO), and U. S. Coast Guard are the only components that conduct R&D. However, GAO identified an additional $255 million in R&D being conducted by other DHS components. Some of this R&D was found to be similar or duplicative of other work already on-going. As a result, GAO recommended that DHS develop policies and guidance for defining, reporting, and coordinating R&D activities across the Department. GAO also recommended that DHS establish a better mechanism to track R&D projects.[10]

In a September 2013 report titled, *Department of Homeland Security Opportunities Exist to Better Evaluate and Coordinate Border and Maritime Research and Development,*[11] GAO found that DHS border and maritime R&D components reported producing 97 R&D deliverables between 2010 and 2012, at an estimated cost of $177 million. Customers expressed mixed views on the impact of these wide-ranging R&D products.[12]

According to the 2013 report, while DHS is working to develop policies to define and coordinate R&D, additional actions could strengthen internal and external coordination of border and maritime R&D. Work still needs to be done at the agency level to make sure border and maritime R&D efforts are mutually reinforcing and being directed towards the highest priority needs. As a result, GAO recommended that S&T establish "timeframes and milestones for collecting and evaluating feedback from its customers to determine the usefulness and impact of its R&D efforts."[13] GAO also recommended that S&T ensure potential challenges with data reliability, accessibility, and availability are reviewed and understood before approving R&D projects through the network of universities that make-up the DHS Centers of Excellence.[14]

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[8] GAO Report, " DHS Science and Technology: Additional Steps Needed to Ensure Test and Evaluation Requirements are Met," June 2011, available at: http://www.gao.gov/assets/320/319754.pdf.
[9] GAO Report, "Department of Homeland Security Oversight and Coordination of Research and Development Should Be Strengthened," September 2012, available at: http://www.gao.gov/assets/650/648152.pdf.
[10] Ibid.
[11] GAO Report, "Department of Homeland Security Opportunities Exist to Better Evaluate and Coordinate Border and Maritime Research and Development," September 2013, available at: http://www.gao.gov/assets/660/658112.pdf.
[12] Ibid.
[13] Ibid.
[14] Ibid.

Issues and Concerns

Coordination of Research and Development Department Wide

One of the authorities and requirements given to the Under Secretary for Science and Technology in the Homeland Security Act of 2002 is "coordinating and integrating all research, development, demonstration, testing, and evaluation activities of the Department."[17] The Congressional Research Service (CRS) noted in a 2003 report that this is a very difficult task because R&D is also conducted in other DHS components where the Under Secretary has limited authority.[15]

Fundamental Questions in Prioritizing Research and Development

Concerns have been expressed that in responding to immediate needs, DHS has experienced challenges in pursuing basic research and development that could aid the development of innovative, long-term capabilities needed to protect the homeland now and in the future.

- What are measurable results for homeland security R&D?
- Does DHS have a strategy, plan, and appropriate resources to address near- and medium-term R&D homeland security needs while also carrying out a long-term research for game-changing breakthroughs?
- How is DHS ensuring an effective use of resources, without wasteful duplication?
- How is DHS S&T coordinating with component agencies to ensure vulnerabilities are addressed in is research portfolio?

Vision and Strategy

In its "Strategic Plan 2015-2019,"[16] DHS S&T sets forth five "visionary goals." These are:

- Screening at Speed: Security that Matches the Pace of Life
- A Trusted Cyber Future: Protecting Privacy, Commerce, and Community
- Enable the Decision Maker: Actionable Information the Speed of Thought
- Responder of the Future: Protected, Connected, and Fully Aware
- Resilient Communities: Disaster-proofing Society

Questions about these goals include: "How were these S&T goals selected?", and "How do these visionary goals compare with the various homeland security mission areas?"

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[15] Homeland Security Act of 2002 (P.L. 107-296), Sec. 302.
[16] "Strategic Plan 2015-2019." Available at:
http://www.dhs.gov/sites/default/files/publications/st/ST_Strategic_Plan_2015_508.pdf.

Chairman SMITH. The Committee on Science, Space, and Technology will come to order.

Without objection, the Chair is authorized to declare recesses of the Committee at any time.

Welcome to today's hearing titled "A Review of Progress by the Department of Homeland Security Science and Technology Directorate."

I'll recognize myself for five minutes and then the Ranking Member.

Ongoing, productive research and development is crucial to protect our country and its people. Whether terrorists, cyber criminals, or drug or people smugglers, our adversaries are relentless and constantly adjust their tactics. In order to meet evolving risks and threats, we must continuously invest in R&D. Just as important, taxpayers' dollars committed to R&D must have a high return on investment.

Today, the Committee will continue its review of the Department of Homeland Security's Science and Technology Directorate and its important work.

In July 2014, the Committee held a hearing on technologies that would help secure our borders. Then in the following September, we held a joint subcommittee oversight hearing with the Homeland Security Committee itself. The two witnesses at the September hearing were the Director of Homeland Security and Justice at the Government Accounting Office and the Department of Homeland Security Under Secretary for Science and Technology, Dr. Reggie Brothers. The witnesses and our Committee members focused on a series of GAO reviews that found serious problems with management and coordination of R&D within the Department of Homeland Security.

The GAO found the DHS's research and development efforts to be "fragmented and overlapping." GAO also found hundreds of millions of dollars spent in previous years on duplicative R&D projects by other offices within the Department. GAO recommended that the Science and Technology Directorate develop stronger policies and guidance to define, oversee, coordinate, and track R&D across the Department.

America's economy and security are threatened every day by cyber criminals and hackers. Unfriendly foreign governments launch regular cyber-attacks to undermine our national security and steal military and technological secrets. Cyber-attacks against U.S. government and private sector networks continue to grow at an alarming rate. But with each new breach of private and public electronic networks, it's clear the full scope of the threat we face has yet to be realized.

At a subcommittee hearing last week, members of our Committee heard about the threat of cyber-attacks to the power grid. If just one major city were attacked in this way, the economic and societal consequences would be devastating.

The House Science Committee approved the only cyber legislation in the last Congress, the Cybersecurity Enhancement Act of 2014, which was signed into law.

Another area of particular concern is our government's failure to control our country's borders. Unsecure physical and virtual bor-

ders threaten our national and economic security. A country that has lost control of its borders has lost control of its future.

The magnitude of these and other homeland security challenges require constant advances to our technological capabilities. For instance, about 12 million containers arrive in the United States every year, which must be screened by DHS. More than two million passengers fly domestically every day, who must be screened by the Transportation Security Administration. Nearly 100 million international air service passengers must be screened by Customs and the Border Patrol. And the annual number of land travelers to the United States who must be processed by our Border Patrol is approaching 250 million people.

There are not enough agents and screeners available to do this work. Instead, we must adapt, invent and, when necessary, create better technological solutions that are smarter, faster, less expensive, and more effective.

This morning, we will hear from Dr. Brothers on the progress made in the implementation of the GAO's recommendations. He also will update us on the S&T Directorate's initiatives to help DHS component agencies meet the full spectrum of threats.

[The prepared statement of Chairman Smith follows:]

PREPARED STATEMENT OF COMMITTEE CHAIRMAN LAMAR S. SMITH

Ongoing, productive research and development (R&D) is crucial to protect our country and its people. Whether terrorists, cyber criminals, or drug or people smugglers, our adversaries are relentless and constantly adjust their tactics.

In order to meet evolving risks and threats, we must continuously invest in R&D. Just as important, taxpayers' dollars committed to R&D must have a high return on investment.

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magnitude of these and other homeland security challenges require constant advances to our technological capabilities. For instance:

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- More than two million passengers fly domestically every day who must be screened by the Transportation Security Administration;
- Nearly 100 million international air service passengers must be screened by Customs and the Border Patrol; and
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Chairman SMITH. That concludes my opening statement, and the Ranking Member, Mrs. Eddie Bernice Johnson, the gentlewoman from Texas, is recognized for her opening statement.

Ms. JOHNSON. Thank you very much, Mr. Chairman.

I am pleased to welcome Under Secretary Brothers back to the Committee. The last time you testified with us, you only had been in the job 5 months. I look forward to hearing your testimony about the changes you've implemented in the last year, and your thoughts on what this Committee can do in reauthorization to support your efforts in strengthening the security and resiliency of the United States through science and technology.

We've previously heard testimony about GAO's 2012 recommendation that DHS develop policies and guidance for defining, overseeing, coordinating, and tracking R&D activities across the department, and that S&T establish time frames and milestones for collecting and evaluating feedback from its customers. We have also heard criticism of test and evaluation procedures, the quality of external input, relationship with the operational components of DHS and other customers, and employees' morale.

Under Dr. Brothers' leadership, the S&T Directorate has defined R&D, published a strategic plan, undertaken a major overhaul of the S&T Advisory Committee, and developed several program and management initiatives to strengthen the work of the S&T Directorate and make it a more effective partner for DHS.

While I'm sure it was not easy, Dr. Brothers, you may look back at the development of the strategic plan as being the easy part of the job. Now you need to implement and institutionalize your vision.

As you know, you are not the first Under Secretary to inherit an extremely challenged S&T Directorate, nor the first to undertake major reforms in an effort to right the ship. The constant change with every new leader has surely contributed to the challenges facing the S&T Directorate, as well as to very low employee morale.

In your written testimony, you spelled out five priorities for your tenure as Under Secretary. I'd like to hear from you what you hope S&T will look like when it comes time to hand it over to your successor.

This is meant to be a legislative hearing, so I hope that some of the discussion today will help guide our thinking about reauthor-

ization of the S&T Directorate. The Committee on Homeland Security has already reported out a bipartisan reauthorization bill. That bill does a good job of addressing many of the challenges that have been identified over time. As I understand it, the Department provided significant technical assistance in the drafting of that bill, and some of the Department's own priorities for reauthorization are reflected. If there are any remaining concerns or requests for reauthorization provisions, now is the time for Members of this Committee to hear directly from the Under Secretary.

I hope, Dr. Brothers, that you—that we can be a partner with you and unintentionally—not unintentionally place any obstacles in your way as you work hard to build a better and more effective S&T Directorate.

Thank you, Mr. Chairman. I yield back the balance of my time.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF COMMITTEE RANKING MEMBER
EDDIE BERNICE JOHNSON

Thank you Mr. Chairman. I am pleased to welcome Under Secretary Brothers back to the Committee. The last time you testified for us, you had only been in the job for 5 months. I look forward to hearing your testimony about the changes you've implemented in the last year, and your thoughts on what this Committee can do in a reauthorization bill to support your efforts to strengthen the security and resiliency of the United States through science and technology.

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While I'm sure it was not easy, Dr. Brothers, you may look back at the development of the strategic plan as being the easy part of the job. Now you need to implement and institutionalize your vision. As you know, you are not the first Under Secretary to inherit an extremely challenged S&T Directorate, nor the first to undertake major reforms in an effort to right the ship. The constant change with every new leader has surely contributed to the challenges facing the S&T Directorate, as well as to very low employee morale. In your written testimony you spelled out five priorities for your tenure as Under Secretary. I'd like to hear from you what you hope S&T will look like when it comes time to hand it over to your successor.

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Again, thank you Mr. Chairman for holding this hearing and I yield back the balance of my time.

Chairman SMITH. Thank you, Mrs. Johnson.

And I'll introduce our witness. Our witness today is Dr. Reggie Brothers, the Under Secretary for Science and Technology at the Department of Homeland Security. In this position, Dr. Brothers

serves as the Science Advisor to DHS Secretary Jeh Johnson and is responsible for DHS research and development.

Before his Senate confirmation in April 2014, Dr. Brothers was Director of Mission Applications at BAE Systems. He also has served as the Defense Department's Deputy Assistant Secretary of Defense for Research and as a Program Manager at DOD's Defense Advanced Research Projects Agency, or DARPA.

Dr. Brothers earned his bachelor's degree in electrical engineering from Tufts University, his master's in electrical engineering from Southern Methodist University, and his Ph.D. in electrical engineering and computer science from MIT.

Dr. Brothers, we welcome you and look forward to your testimony.

TESTIMONY OF HON. REGINALD BROTHERS, UNDER SECRETARY, SCIENCE AND TECHNOLOGY, U.S. DEPARTMENT OF HOMELAND SECURITY

Dr. BROTHERS. Thank you, and good morning.

Chairman Smith, Ranking Member Johnson, and distinguished Members of the Committee, good morning, and thank you for this opportunity to discuss the role the Department of Homeland Security Science and Technology Directorate, or S&T. I'm grateful for the Committee's longstanding interest and support for the Directorate and the Department.

A year and a half ago, I joined the Department with five priorities for the Directorate: develop visionary goals, produce an actionable strategy, foster an empowered workforce, deliver force-multiplying solutions, and energize a Homeland Security Industrial Base. These were based on feedback from S&T staff, from inside the Department, and from outside stakeholders including Congress. I'm proud to say that as an organization we've enjoyed remarkable success in each of these five areas. I believe S&T is emerging as a federal R&D organization tailor-made for today's fast-changing homeland threats.

To begin with, last year we published Visionary Goals for S&T with an updated S&T Strategic Plan. The plan includes technology roadmaps for each of our major R&D investment areas, and we don't anticipate this being once every four years type of product. We've already updated once, and we're looking at interactive web-based capability moving forward. This is a tool not only to focus our internal energy and resources but to engage people and industry and organizations outside S&T to ensure progress towards common Homeland Security goals.

We reduced the overall number of programs to make room for fewer, more impactful projects, and reprioritized our funding around the most pressing national, departmental and Congressional priorities. Reprioritization allowed S&T to put resources towards urgent areas of need such as unmanned aerial systems and to invest in ambitious new apex projects to tackle future challenges in areas like aviation screening and border situational awareness.

In reshaping our R&D portfolio, we also recognize technical requirements and core competencies in areas like data analytics, identity management that are common across numerous projects regardless of specific subject areas. As a result, to avoid rein-

venting the wheel with each new project, our portfolio includes a new category of projects called engines that help us realize efficiencies compared to previous S&T approaches. These projects represent a novel approach in S&T and benefit from the diverse, broad-ranging expertise within the Directorate. As today's innovational research becomes increasingly interdisciplinary, the value of an engine for promoting efficient collaboration and cross-pollenization within the Directorate only increases.

We've taken numerous steps to empower the workforce, incentivize collaboration in the organization, and boost morale. I'm proud to say that initiatives like S&T's new employee council, a concerted effort to better connect leadership and staff, is beginning to be reflected in S&T's Federal Employee Viewpoint Survey scores. In the most recent survey, we saw significant gains of 10 points or higher on questions related to workforce recognition—workplace recognition, leadership, and innovation. I'm encouraged to see the Directorate working together and rallying around each other but I know our work isn't complete. We'll continue building on our positive momentum.

Some of the most beneficial changes at S&T involve how we partner with components, draw the requirements for our projects, and coordinate R&D across the Department. In an austere fiscal environment, and at the same time, a time of increasing threats, we must be strategic about our R&D work and how we prioritize our investments to make the largest impact in securing our country.

By emphasizing cross-cutting solutions with greater reach in the most pressing Homeland Security challenge areas, we avoid being overly internally driven or too focused on highly specific end-user requests.

As part of the Secretary's Unity of Effort initiative, S&T has relaunched departmental Integrated Product Teams as a formal mechanism for identifying technology capability gaps across the Department's mission areas. Though the Secretary only approved S&T's approach in August, we have already chartered and convened two of the five initial IPTs with two more expected by the end of this month. The IPTs are boosted by S&T initiatives like the Innovation Centers and the Pioneer program that embed S&T staff directly with components, and that'll facilitate better connection and better understanding of operational environments, tactics, techniques, and procedures.

Finally, perhaps most importantly, S&T is making great strides in broadening the community of problem solvers and technologists that make up the Homeland Security industrial base. We launched prize competitions and accelerators to connect with startups and small businesses who may never have considered government as a partner. Our pilot effort for Homeland Security focus accelerators was particularly successful in demonstrating not only startup community interests in participating but also our ability to successfully spur products and companies to attract private investment and simultaneously meet the needs of Homeland Security operators.

In the last year, we also opened three new university-based Centers of Excellence. We broke ground on construction for the cutting-edge Bio and Agro-Defense Facility. We expanded with our international partners including innovative public-private partnership

with Israel. We've established a presence in Silicon Valley to expand our day-to-day, face-to-face contact with major innovations hubs outside the beltway. If we succeed with our expanded Silicon Valley presence, we look forward to using a similar outreach model in Los Angeles, Austin, Dallas, Chicago, Boston, and other hubs around the country.

We're clearly trying a lot of new things at S&T. I've asked the directorate to be experimental, to try new things and think differently about processes. When it doesn't work, we scrap it. When it does, we expand it. As more of these experiments work, we are expecting to reap the benefits inside the Directorate, across the Department and with a growing group of stakeholders.

I look forward to your questions. Thank you.

[The prepared statement of Dr. Brothers follows:]

Testimony of Reginald Brothers
Under Secretary for Science and Technology
U.S. Department of Homeland Security

U.S. House of Representatives
Committee on Science, Space, and Technology

October 27, 2015

Good morning Chairman Smith, Ranking Member Johnson, and distinguished members of the Committee. Thank you for the opportunity to testify before you today on the role of the Department of Homeland Security's (DHS) Science and Technology Directorate (S&T). S&T's mission is to deliver effective and innovative insight, methods, and solutions for the critical needs of the Homeland Security Enterprise (HSE). Technology simultaneously enables both homeland security operators and malevolent actors and, as a result, has a significant and expanding impact on current and future threat environments. In light of this, I will use this testimony to update the Committee on how S&T has evolved to more effectively and efficiently achieve its mission. I look forward to sharing S&T's recent successes with operators and responders and the ways in the last year and a half that we reshaped our approach to research and development (R&D).

It is important to frame the conversation today within the context of modern R&D. Many of the constraints that S&T and other federal R&D organizations face result, often indirectly, from processes and authorities suited to a past era of relatively less competition for technical expertise and less emphasis on organizational agility and responsiveness to rapid change. The homeland security mission encompasses numerous complex threats (e.g., in cyber or aviation environments) that evolve quickly and strain operational capabilities running on traditional, multi-year development and acquisition cycles. From my first day at S&T, one of my main focuses was reshaping S&T's approach to R&D to overcome those constraints. That meant finding ways to mine sources of innovation like start-ups that may not traditionally work with government. To achieve this, we set up interdisciplinary teams working closely with field operators to accelerate translation of operational challenges into real, user-driven solutions. And that meant speeding up our internal processes to the maximum extent possible to ensure long-term relevance of solutions that become operational and enter widespread use.

To foster this approach to R&D and to take advantage of opportunities for improvement within S&T, I came to the Directorate with five priorities:

- Develop visionary goals for the organization.
- Produce an actionable strategy.
- Foster an empowered workforce.
- Deliver force multiplying solutions to homeland security stakeholders.
- Energize a Homeland Security Industrial Base.

Those five priorities grew out of feedback from staff within S&T, from around the Department when I joined, and from Congress during my confirmation. I am proud to say that as an

organization, S&T has progressed across the board in each of these areas, and we are beginning to reap significant benefits inside the Directorate, across the Department, and with a growing group of homeland security stakeholders. I look forward today to sharing some of our more significant organizational milestones and accomplishments.

Visionary Goals

In the past, S&T had a very operational focus in helping to bridge capability gaps identified by component partners and stakeholders. While S&T continues to work daily with Component partners, first responders, and other stakeholders on immediate issues, the organization undertook an effort to create comprehensive, far-reaching visionary goals that look 20 or more years into the future. These visionary goals serve as our strategic direction and will ultimately improve DHS's capabilities and make our nation more secure.

S&T shared draft goals with the Department and the public through a crowd-sourcing website where we received more than 1,000 comments and suggestions. Participants from all of S&T's major stakeholder groups were represented including state and local entities, academic and nonprofit groups, industry, and international partners. The final S&T Visionary Goals, with input from the entire HSE, are the following:

- *Screening at Speed: Security that Matches the Pace of Life*
  Noninvasive screening at speed will provide for comprehensive threat protection while adapting security to the pace of life rather than life to security. Unobtrusive screening of people, baggage, or cargo will enable the seamless detection of threats while respecting privacy, with minimal impact to the pace of travel and speed of commerce.
- *A Trusted Cyber Future: Protecting Privacy, Commerce, and Community*
  In a future of increasing cyber connections, underlying digital infrastructure will be self-detecting, self-protecting, and self-healing. Users will trust that information is protected, illegal use is deterred, and privacy is not compromised. Security will operate seamlessly in the background.
- *Enable the Decision Maker: Actionable Information at the Speed of Thought*
  Predictive analytics, risk analysis, and modeling and simulation systems will enable critical and proactive decisions to be made based on the most relevant information, transforming data into actionable information. Even in the face of uncertain environments involving chemical biological, radiological or nuclear incidents, accurate, credible, and context-based information will empower the aware decision maker to take instant actions to improve critical outcomes.
- *Responder of the Future: Protected, Connected, and Fully Aware*
  The responder of the future is threat-adaptive and cross-functional. Armed with comprehensive physical protection, interoperable tools, and networked threat detection and mitigation capabilities, responders of the future will be better able to serve their communities.
- *Resilient Communities: Disaster-Proofing Society*
  Critical Infrastructure of the future will be designed, built, and maintained to withstand naturally-occurring and man-made disasters. Decision makers will know when disaster is coming, anticipate the effects, and use already-in-place or rapidly-deployed

countermeasures to shield communities from negative consequences. Resilient communities struck by disasters will not only bounce back, but bounce forward.

These goals will serve as our strategic direction and will ultimately improve DHS's capabilities and make our nation more secure. S&T will continue to provide operational support and help stakeholders nationwide meet near-term requirements while, with the Visionary Goals as a guide, also facilitating longer-term R&D opportunities with public and private sector communities.

National Conversation
Based on our successful online, enterprise-wide conversations, it became clear to us that the public desires an opportunity for involvement and input. That was the basis for S&T's launch last year of the National Conversation on Homeland Security Technology. The National Conversation is a public engagement strategy to connect partners and the public on R&D supporting the homeland security missions. It is a series of online and in-person discussions across the Nation to drive dialogue between the public as well the Nation's first responders, industry representatives, academia, and government officials that shapes the future of homeland security technology.

We turned what was typically a one-way exchange of information with our stakeholders into a multi-directional exchange. The National Conversation is an enabler for the work we do. It helps us get real-time insight into the work we are doing and stimulates innovative thinking informing future work. The fact that DHS Components including the Federal Emergency Management Agency (FEMA) and U.S. Customs and Border Protection (CBP) used S&T's National Conversation to reach and connect with stakeholders reflects the traction the program gained. The National Conversation's discussions, to date, have included the following:

- Responder of the Future
- Enable the Decision Maker
- Screening at Speed
- A Trusted Cyber Future
- Transforming Airport Borders
- Resilient Communities
- Bio/Agro Security Innovation

The Apex Program
Grounded in our Visionary Goals and working in mission areas that cut across our DHS Component partners, S&T launched six new Apex projects. These ambitious programs look strategically at the Nation's security and address future challenges while continuing to support today's operational needs. It is worth noting that in order to create the new Apex projects, we reduced the overall number of programs at S&T to have fewer, but more impactful, projects. New Apex project areas include the following: biothreat awareness, aviation screening, next-generation cyber infrastructure, flood awareness, next-generation first responder, and border situational awareness. In addition to existing Apex projects with CBP on passenger screening (the Apex Air Entry/Exit Re-Engineering Program) and U.S. Immigration and Customs Enforcement (ICE) on data analytics (the Apex Border Enforcement Analytics Program), Apex projects represent some of the highest-profile and most promising projects in the Directorate.

Engines

S&T's Apex program is supported by a new category of projects called Apex Technology Engine Teams (Engines) that provide expertise in focused topic areas and enable cross-cutting R&D across that moves S&T's entire portfolio forward. Engines represent a novel approach in S&T for realizing S&T's Visionary Goals and powering innovation. The first wave of Engines includes the following:

- Data Analytics
- Situational Awareness and Decision Support
- Communications and Networking

- Behavioral Economics and Social Sciences
- Identity and Access Management
- Modeling and Simulation
- Manufacturing

Our Engines harness subject matter expertise and capabilities across the Department and leverage technological, scientific, industrial, and academic communities to provide continuous support in areas of need common to multiple, and sometimes all, DHS Component agencies. S&T's Engines identify and share subject matter expertise, technical solutions and tools, best practices, lessons learned, and reusable products and solutions on behalf of Apex and other S&T projects. Collaboration to leverage knowledge from the DHS enterprise and external stakeholders are core components of the Engine approach.

Because Engine services, solutions, and knowledge will be applied, reapplied, and repurposed across multiple projects, as opposed to starting from scratch with each new effort, S&T is also able to realize efficiencies compared to previous S&T approaches. As the Engines mature, the collective experience and awareness of emerging technology trends will result in a robust knowledge base and network to continually serve the dynamic needs of S&T and the DHS enterprise.

In less than a year, the Engines model has already begun to take root. As one example, the Data Analytics Engine works with nearly every operational Component in DHS. It recently won an award for work with FEMA on the U.S. Fire Administration's National Fire Incident Records System, has a highly successful program underway with ICE's Homeland Security Investigations, and continues to support customer projects like TSA's third-party pre-screening by providing technical evaluation of analytics software.

Actionable Strategy

When I joined S&T, I recognized a need to promote openness and transparency between S&T and the public, particularly with industry stakeholders. An S&T Strategic Plan would serve as an ideal starting point for our interaction inside the Department, with industry and academia, as an interagency contributor, and with non-federal government partners.

I am proud to say that earlier this year, we published the S&T Strategic Plan. Importantly, we do not see the plan as something that will be published every four years. Rather, I asked that we keep it regularly updated and aligned to our organizational direction, allowing the document to serve as an anchor for outside stakeholders. We already updated the document once within

months of its initial publication by adding an appendix with more detailed technology roadmaps and descriptions of investment areas, visions, and strategic drivers across the Directorate. As we move forward, we are exploring an even more interactive web-based capability that we can continuously update for an even more current product.

Empowered Workforce

During my confirmation hearing, I shared my commitment and dedication to empowering the S&T workforce and focusing on improving the Directorate's morale. In pursuit of this goal, we have enacted several initiatives:

- Commissioning a root cause analysis
- Acting on the findings of the root cause analysis
- Establishing an Employee Council to facilitate staff and leadership engagement and communications
- Enhancing our internal collaborations and communication between our groups and divisions to foster more innovation and cooperation

Organizational Health Assessment and Root Cause Analysis
In late March, S&T completed its Root Cause Analysis. The complementary Organizational Health Assessment was tailored specifically to S&T and was a multi-phased effort to determine root causes and drive action and results. It included a combination of questionnaires, focus groups, and interviews of staff at every level of the organization. The study identified multiple areas in which we can improve as a leadership team – decentralizing power and decision making, improving leadership communications tone, and improving communication around strategic vision and direction for the organization. The study raised several excellent points and provided a blueprint for actions that S&T leadership – and staff – can take to improve the culture of the Directorate.

S&T Employee Council
A key part of our implementation for the report was the stand-up of the S&T Employee Council. The Council is a vehicle for communication between staff and leadership; it provides input into S&T initiatives, programs, processes, and strategic investments; and it creates and assists with the implementation of action plans to address priority focus areas. It is a voluntary body comprised of federal non-supervisory employees with 38 staff currently serving.

S&T leadership leverages the Council in a variety of ways. The Council has several Action Planning Teams responsible for implementing specific actions related to the Organizational Health Assessment. For example, the Decentralizing Authority Action Planning Team is evaluating ways in which decisions and authority can be devolved to lower levels of management while maintaining accountability and traceability for decisions made. Additionally, the Deputy Under Secretary, S&T Chief of Staff, and I use the Employee Council as a means for staff input in management challenge areas. In one recent case, we used the Council to help us understand how to most effectively communicate with staff, which existing methods are successful, and how information sharing and communication can improve going forward. I am grateful for the extra time and efforts put in by Council members and believe their participation

has been a useful vehicle for expanding communication, participation, and transparency between leadership and staff.

Finally, to foster a more effective team environment, I asked my leadership team to actively break down internal barriers that may hamstring or prevent collaboration. The results so far are promising. To use one example, our recently-launched Silicon Valley presence is a collaboration between every group within S&T – from our R&D program staff, to our partnership team, to human resources, to our finance and budgeting staff. Another encouraging example is S&T's Partnering for Innovation and Operational Needs through Embedding for Effective Relationships (PIONEER) program for embedding staff with operators. The program (described in greater detail below) was conceived, designed, and marketed by S&T staff at their own initiative to address an area where they identified potential for significant positive change. We also now offer new ways for employees to engage each other, such as through academic lectures delivered by staff to internal groups on topics of personal and professional interest. Taken as a whole, examples like these indicate emergence of a more open and collaborative culture within S&T.

Federal Employee Viewpoint Survey scores
I am pleased to report that the Directorate is making tangible progress with all of these efforts. While the Directorate still has a long way to go, I am personally heartened to see that we have seen significant gains in our Federal Employee Viewpoint Survey (FEVS) scores. I believe actions above have contributed to a significant positive impact on morale within the Directorate, and our most recent scores saw substantial increases in several key indices.

Across FEVS scores, S&T saw ten point or higher gains in a variety of questions related to recognition, policies and practices of senior leaders, respect for senior leaders, and creativity and innovation being rewarded. While I am pleased with the upward trend, the job is not finished. S&T will continue to execute the efforts outlined here while also seeking and developing new ways to engage employees and build on our positive momentum.

Force Multiplying Solutions

When I joined the Directorate, one message I consistently received inside and outside S&T was that we needed to sharpen our value proposition to homeland security stakeholders. Science and technology are near-universally acknowledged as critical elements to future operational success. By prioritizing solutions that substantially multiply the effects of manpower and other existing assets, Components and customers are more likely to recognize S&T's value and integrate a jointly-developed R&D portfolio into their procurement cycles and, ultimately, their operations. In the last year, we have made significant strides in this area. We re-established the Department's Integrated Product Teams (IPT), focused S&T's resources in the most pressing homeland security challenge areas, started the PIONEER program to put more of our technical staff into the field directly with operators, and started a rapid prototyping and experimentation program that will speed up our development and delivery of capabilities.

Integrated Product Teams
To begin with, S&T embraced the Secretary's April 2014 Unity of Effort initiative. S&T leads or participates in a broad range of Unity of Effort-focused activities in the Department. From

providing subject matter and analytical support to the U.S. Coast Guard's (USCG) leadership of the Joint Requirements Council to bringing a technical and R&D-focused perspective to the Deputy's Management Action Group, I believe that Unity of Effort has had an empowering effect on organizations like S&T that by nature work across the entire Department.

A great accomplishment so far under the Unity of Effort umbrella has been the re-establishment of our IPT process. In August, the Secretary approved S&T's plan to reboot these cross-IPTs for the purpose of identifying technological capability gaps and coordinating R&D to close those gaps across the mission areas of the Department. The overall effort is led by S&T, but the individual IPTs will be led by senior representatives from the operational Components with representation from Joint Requirements Council Portfolio Teams and support from S&T.

IPTs will initially address the following five topic areas: Aviation Security, Biological Threats, Counterterrorism, Border Security, and Cyber Security. S&T will also continue its ongoing IPT supporting our Nation's first responders through the First Responders Resource Group, and additional sub-IPTs will be created to address key issues such as resilience. Going forward, the IPTs will be one mechanism by which the Department identifies and coordinates its R&D efforts to DHS priority missions. We moved quickly since August to build membership on these teams, and I am proud to say the first (Border Security) has a signed charter and held its first meeting at the end of last month. We continue to move out quickly to populate and stand up the remainder of the teams to begin informing the Department's R&D portfolio.

Reprioritization of R&D programs and funding
A second area we have made progress in since I joined S&T has been prioritizing S&T's budget and R&D programming more effectively. One of the first efforts I initiated when I became Under Secretary was a program review. I realized that S&T had too many projects in too many areas and, as a result, was spreading itself too thin and undermining its investments. Further, the investments the organization made were, though certainly important, not always strategically driven or linked explicitly to homeland security priorities.

Re-establishment of the IPTs will help address this, but I also directed my leadership team to make a concerted effort to explicitly tie S&T's investments to specific areas including the following: national priorities, Secretary priorities, S&T priorities, and other priorities as they arise. In an austere fiscal environment, and at the same time a time of increasing threats, we must be strategic about our R&D work and how we prioritize our investments to make the largest impact in securing the country. By making this shift, we avoid being overly internally-driven or too focused on highly-specific end user requests, instead focusing on investments with greater reach and impact in the most pressing homeland security challenge areas.

This shift is exemplified in S&T's growing attention, including resources as needed, to two urgent areas for the Department: countering unmanned aerial systems (UAS) and countering violent extremism (CVE). Regarding UAS, S&T has grown into a major coordinating role for the Department in the area of countering the systems. As several events in the last year illustrate, the boom in availability of UAS paired with advances in UAS capability pose significant challenges and potential threats to security. Regarding CVE, S&T is able to leverage existing investments in its university-based Centers of Excellence to plug directly into the research

community and characterize and measure the effects of existing CVE programs and to help the Department determine the most appropriate and effective administration of CVE programs. As a result of the prioritization, S&T slated significant resources for each of these two priority areas.

Innovation Centers and the PIONEER program
In industry today, many corporate labs are under increased pressure to prove a direct impact to profits. Some laboratories are seen by business unit leaders as a resource burden, and successful laboratories ensure that their researchers have a baseline understanding of the business context of their work. One way that these laboratories enable this understanding is by cycling researchers between business units and work in the lab. This is a straightforward, deceptively simple-sounding concept, but it can make the difference between a lab disconnected from its customers and one ultimately providing a strong return on investment and expanding business through attunement to operational reality and generation of usable, imaginative solutions. This is the model I intended to implement at S&T for interaction with DHS's operational Components.

To accomplish this, S&T developed Innovation Centers as a means to bring together Component operational staff, Component technical expertise, and S&T core technical expertise in a single location. With joint facilities and staffing, Innovation Center activity is Component-driven with S&T support and focuses on later-stage, fast-turn projects. The first Innovation Center is underway with the USCG and located at Research and Development Center in New London, Connecticut. The USCG has been an excellent partner in the Innovation Center conceptualization, and both of our organizations look forward to seeing it in action and demonstrating the value of the model for wider adoption.

As a complement to Innovation Centers, S&T also launched its PIONEER program. As part of the Unity of Effort initiative and reflected in S&T's Strategic Plan, PIONEER was created to assist identification and prioritization of operational requirements and capability gaps through direct collaboration in the field with operators. By merging the technical knowledge of our staff with operators in everyday field environments, S&T would cultivate user-driven solutions based on critical needs. The PIONEER program launched as a pilot in FY15 and included seven short-term embeds with Components. One embed opportunity involved an S&T program manager aboard the USCG cutter Legare on a 10-day north Atlantic fisheries patrol. This short-term embed was highly successful, yielding firsthand understanding of capability gaps faced by the operational Components, a potential test partner for an S&T-developed contraband detection capability, and numerous new relationships with operators. We look forward to implementing the program more broadly in FY16 and 17.

Operational Experimentation
A final area S&T has moved the needle toward force multiplying solutions has been with our rapid prototyping and operational experimentation programs. Operational experiments are a means for rapid, user-driven assessment and adaptation of technologies identified through accelerators, IPTs, prize competitions, and other technology scouting activities. These allow developers to shorten their design cycle and time to market.

One example of this kind of experimentation is our new Collaborative Innovation Experiments (CIX), in which S&T takes existing relationships with traditional partners and combines them

with our programs to reach non-traditional performers. CIX deviate from the Department's traditional approaches to operational experimentation by coordinating with DHS Joint Task Forces, IPTs, and Component leadership to ensure focus on near-term, high-priority operational needs and by creating enduring relationships with technologists to rapidly prototype and experiment with cutting-edge technology. The first CIX occurred on the southwest border over roughly 120 days. It was a whole-of-government effort that leveraged millions of dollars' worth of research at another government agency to create a unique capability. Based on the success of this pilot for the CIX program, we look forward to continuing and expanding the approach in the future.

S&T National Laboratories and Centers of Excellence
S&T offers unique laboratory- and university-focused capabilities to the HSE that contribute to force multiplying solutions for the Department. In the past year and a half, S&T continued to refine and expand these capabilities.

Earlier this year, the Secretary broke ground on the National Bio and Agro-Defense Facility (NBAF) in Manhattan, Kansas. NBAF will replace S&T's Plum Island Animal Disease Center, which is at the end of its lifecycle, with new, cutting-edge capabilities for the study and mitigation of foreign animal, emerging, and zoonotic disease-based threats. NBAF will drive innovation and unify industry, government, and universities around R&D that safeguards the Nation's trillion dollar agriculture industry. NBAF will join S&T's existing laboratory assets, each of which fill unique niches not found elsewhere in the national laboratory system.

In the last year, S&T also stood up three new DHS University Centers of Excellence (COE) including one new COE directed by Congress. These include the Coastal Resilience Center, led by University of North Carolina-Chapel Hill; the Center for Borders, Trade, and Immigration, led by the University of Houston; and the Center for Critical Infrastructure Resilience, led by the University of Illinois. Cumulatively, these COEs represent potential S&T investments of more than $60 million in university research and education supporting homeland security missions. The stand-up of these three new COEs was a true departmental effort and engaged more than 40 senior leaders within DHS Components.

Energized Homeland Security Industrial Base

DHS more than many federal agencies and much more so than the Department of Defense, as one example, is dependent on commercially-available, off-the-shelf products to achieve its mission. Because of this, partnership with industry including specifically in product development is essential. R&D projects can yield isolated, one-off solutions, but a truly successful portfolio must strategically shape the shelf by inserting homeland security applications, if not as primary use cases or applications, at least as considerations during companies' product development cycles. If successful, that approach produces numerous products on the shelf that operators may use, and to that end, my final and perhaps most critical priority as Under Secretary was to activate a private sector community around homeland security challenges.

I am proud to say that this is an area where we have enjoyed considerable success over the last year. We developed a fresh public face by overhauling S&T's website to be more informative and transparent. We launched innovative accelerator and prize competition platforms to reach innovators and communities that may have never heard from or worked with government before. S&T expanded our Silicon Valley presence with a pilot program that aims to maintain constant, face-to-face contact with venture capital and start-up communities outside the Beltway including in the Silicon Valley area. Combine these with previously mentioned accomplishments at S&T such as the Strategic Plan publication along with willing partners within the Department including in the Management Directorate and Office of General Counsel, and we are beginning to see real interest in the private sector in participating in a Homeland Security Industrial Base.

Accelerators
As has already been clear, identifying and tapping into sources of innovation is critical to our ability to support frontline operators keeping the nation safe, and accelerators (i.e., seed funding and mentorship for entrepreneur teams and start-up companies to help them attract investment) are a valuable tool to do just that. This year, S&T piloted a business accelerator program to see if accelerators would work in the homeland security mission space. Within one year, S&T delivered on our promise to get S&T's first accelerator up and running and to assess the potential for accelerators to succeed in this space.

Last month, S&T hosted the pilot accelerator's graduation and demonstration day to showcase our program and the wide range of innovative technologies discovered in the area of wearables for first responders. There were more than 150 start-up applicants to participate in the program. Eighteen were selected for the first stage, and over half of them already have or will shortly receive investment from the venture or private equity community. This program has successfully passed each of our initial tests, demonstrating interest in the private sector in participating and graduating as well as the ability for companies to successfully develop products that attract private investment and simultaneously meet the needs of homeland security operators. We look forward to future homeland security accelerators in S&T and seeing what additional topics we can leverage the start-up community to address.

Prize Competitions
In March of this year, S&T introduced the InnoPrize Program to assist DHS planning and executing prize competitions as a fresh approach to operational challenges, problem solving, and spurring innovation. The InnoPrize Program utilizes the America COMPETES Act to execute part of President's 2011 Strategy for American Innovation, which made it easier to use competition programs to encourage innovation, solve tough problems, and advance the core missions of the Department. For each competition, a well-defined problem or question is posed to the public along with specific response criteria. Innovative problem solvers are encouraged to contribute promising ideas, products, prototypes, and solutions for judging. Winners are assessed based upon the stated competition criteria using a diverse set of practitioners, end users, engineers, subject matter experts, and other industry or R&D leaders as judges.

S&T announced its first prize competition in March 2015 in support of the DHS S&T First Responders Group's Next Generation of First Responders Apex Program. The winners were announced in May 2015. In the coming months, S&T will work across the Department and its

leaders to assess other programs and identify mission gaps suited for prize competitions. Through S&T, DHS is expanding its collaboration with a new community of innovators and problem solvers. In S&T's most recent prize competition – the National Bio and Agro-Defense Facility Think and Do Challenge – S&T is looking for fresh approaches and unique ideas to jumpstart implementation of a public-private ecosystem around S&T's state-of-the-art facility slated to open in 2022. Future prize competitions will be announced on S&T's website, on Challenge.gov, and through social media announcements.

Silicon Valley Presence
Last Spring, the Secretary announced that DHS will establish an outreach program in Silicon Valley to keep pace with the innovation community and tackle the hardest problems faced by the DHS operational missions. I am pleased to tell you this initiative continues to move forward under S&T's leadership.

The Silicon Valley outreach will expand our ability to find new technologies that strengthen national security and will reshape how government, entrepreneurs, and industry work together to find solutions. Start-ups, incubators, and accelerators have typically been hard for government to attract, but we are beginning to change that. We will co-invest in promising R&D to accelerate transition-to-market and, by the same turn, transition to homeland security operations. Silicon Valley and all of the innovation communities across the Nation like hard challenges. Our outreach with Silicon Valley and other hubs will help us better harness commercial R&D for homeland security applications.

S&T next steps

As I stated, I joined S&T with five priorities and an expectation that those objectives would begin to evolve S&T's approach to homeland security R&D. I believe that we have begun to see significant progress across the board. At S&T, we are trying out numerous new ideas and ways of doing things. We look at what works well, build it up, and stop what does not. In the process, I believe we are reinventing federal R&D and preserving it as an engine of innovation within government. Given the reality of homeland security today, with threats that move quickly and do not wait for government to react, we must keep improving at S&T.

In ten years, I expect S&T to be even better integrated into the Department and the HSE. I expect our technical staff to live and breathe with operators as trusted technical advisers and innovation agents who make operational missions safer and easier to achieve. I see a Homeland Security Industrial Base that rallies around homeland security challenges and helps make the public safer.

I thank you for the opportunity to testify before the Committee today, and I welcome your questions and the opportunity to further discuss how we can work with Congress to make that opportunity a reality.

Dr. Reginald Brothers,
Undersecretary, DHS Science & Technology Directorate

Dr. Reginald Brothers was confirmed by the U.S. Senate on April 7, 2014, for the position of Under Secretary for Science and Technology at the U.S. Department of Homeland Security (DHS). As Under Secretary for Science and Technology, Dr. Brothers is the science adviser to the Secretary and Deputy Secretary of Homeland Security and is responsible for oversight and management of the Science and Technology Directorate (S&T), the Department's primary research and development arm and technical core. Through his leadership of S&T, Dr. Brothers is responsible for a science and technology portfolio that includes basic and applied research, development, demonstration, testing, and evaluation with the purpose of helping DHS operational elements and the Nation's first responders achieve their missions in the most effective, most efficient, and safest manner possible.

From December 2011 until April 2014, Dr. Brothers served in the U.S. Department of Defense's Office of the Assistant Secretary of Defense for Research and Engineering as the Deputy Assistant Secretary of Defense for Research. In this position, he was responsible for policy and oversight of the Department's science and technology programs from basic research through advanced technology development. Dr. Brothers was also responsible for the Department's laboratories and, as architect of the long-term strategic direction of the Department's science and technology programs, oversaw scientific advancements necessary for the continued technological superiority of U.S. Armed Forces.Dr. Brothers is a science and technology leader and expert with more than 20 years of demonstrated success across the private and public sectors. He has held a variety of positions within the scientific and technological community that demonstrate his leadership and technical aptitude. This includes his prior service as a Technical Fellow and Director for Mission Applications in the Communications and Networking Business Area at BAE Systems, as a member of the Board on Army Science and Technology within the National Academy of Sciences, and as a Program Manager for the Defense Advanced Research Projects Agency. This also includes his experience as a Group Leader at the Charles Stark Draper Laboratory and as Chief Architect at Envoy Networks, a successful 3G wireless start-up company.Dr. Brothers received a B.S. in Electrical Engineering from Tufts University, an M.S. in Electrical Engineering from Southern Methodist University, and a Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology.

Chairman SMITH. Thank you, Dr. Brothers, and I'll recognize myself for questions.

My first question is a lookback earlier this year at the perhaps as many 25 million federal employees who had their computers hacked. Almost all of them had applied for security clearances, so this was sensitive information that presumably was accessed.

What are you all doing to prevent another such cyber-attack on federal employees?

Dr. BROTHERS. That's a good question, sir. We have a robust cyber strategy, cyber research and development strategy. We look at how can we protect infrastructure. We look at a variety of different technologies and techniques to secure this infrastructure. We work——

Chairman SMITH. What tangible steps, though, have you all taken to try to prevent this from occurring again, not just strategies, but what have you actually implemented?

Dr. BROTHERS. I understand. I understand, sir. So I can go back to—so right now, because of—right now we're working with NPPD. We are working with the Secret Service. We're working with the stakeholders to actually understand their systems, to understand where we can actually make some improvements. So I can say based on—we have some cyber technologies, some enhancements that I can talk about that we've done in the past.

Regarding your current question, I can look to the types of things we're doing. We are doing research and cybersecurity research for the infrastructure. We're looking at software assurance. For example, when folks make—when software designers develop software, we've developed a research credibility so they can more—so they're able to actually determine whether or not their software is valid or not, and whether it has coding problems.

Chairman SMITH. Is it fair to summarize what you're saying by noting that you're still studying the problem as opposed to having taken any specific preventative measures?

Dr. BROTHERS. So we have continuously since 2003 or so been working in cyberspace, and we have had a number of successes over the time. We've had something like 35 successful transitions of cyber technology into industry and into our stakeholders. The particular problems that you're talking about now working with government, we have been working, but we are now working to develop an enhanced strategy given some of the newer technologies.

Chairman SMITH. Well, it does sound like you haven't taken any specific, tangible steps. When you do, would you let us know?

Dr. BROTHERS. Absolutely.

Chairman SMITH. And I hope it's sooner rather than later. It seems like by now there would have been some tangible steps taken.

Dr. BROTHERS. I think—I'll be glad to come back with a classified briefing on the work we're doing.

Chairman SMITH. That's a fair response. Thank you.

Next question is this, and this is something that I've been thinking about for a long time, and I think I'm grateful that it hasn't occurred yet, but what specifically is Homeland Security doing to prevent, say, a terrorist, would-be terrorist, from flying a small drone over a packed stadium of 60,000 people perhaps watching a

pro football game and having this drone release anthrax and killing most of the people who are present? What are we doing to prevent that kind of physical attack?

Dr. BROTHERS. So your first question involves technology that, as you know, is rapidly changing. So the threats are changing with respect to cyber, with respect to the small drones, and the technology capabilities are changing rapidly as well.

In order to address those, we are doing a lot to understand what the capabilities are, what the potential threats are. We have taken the lead in the interagency to look at the whole community response because there are a number of interrelated issues here with the drone problem. One is, how does a community actually respond, how do first responders respond. The other issue is, what technologies can we use to effectively detect, track, classify——

Chairman SMITH. I assume DHS is working with the FAA on various rules that would govern the flights of——

Dr. BROTHERS. We are absolutely working with the FAA. We've got briefings with the entire Department of Transportation. The Secretary has convened a meeting of stakeholders across the government to discuss this issue. I think it's safe to say that we have already done a data call across the interagency to look at what capabilities not only do we have but the Department of Defense and others have to mitigate this threat, and we are moving forward with both these areas of, how does the whole community with respect to policy procedures and how to respond with technology.

Chairman SMITH. And that may be a subject of a classified hearing or discussion as well.

Dr. BROTHERS. Absolutely.

Chairman SMITH. Last question is this. We have something on the order of 250,000 criminal immigrants at large in the United States. Clearly, these individuals are not supposed to be here, and just as clearly, they will commit many more crimes while they are present in the United States. A significant fraction will go on to be re-arrested. What is your S&T Directorate doing to assure real-time identification of illegal immigrants while they are still in custody?

Dr. BROTHERS. We have a three-prong strategy in our Borders and Maritime Division. The strategy includes securing the land, maritime borders as well as cargo security. If I can talk about one of our programs when we look at land crossings, we're actually trying to combine information that can be shared by federal, state and local first responders. We're also developing——

Chairman SMITH. But I'm talking about criminal aliens, criminal immigrants who are actually in custody, and the identification problem we have with them. Do you have any progress reports on that?

Dr. BROTHERS. I, sir, do not have progress reports on that. Again, as a science advisor, we are dealing mostly with how we protect and secure the borders, not necessarily some of the issues that you're dealing with.

Chairman SMITH. Okay. Thank you, Dr. Brothers. I appreciate it. And the gentlewoman from Texas is recognized for her questions.

Ms. JOHNSON. Thank you very much, Mr. Chairman.

Mr. Under Secretary, you're not the first Under Secretary to completely reorganize the Directorate in an effort to make things work better. What steps are you taking to try to institutionalize your reforms or at least those that show early success?

Dr. BROTHERS. Thank you for the question. Let me—if you don't mind, let me talk about some of those areas.

I think one of the challenges that I saw coming into the Department was how do we prioritize what do we do with respect to our investments because if you look at the QHSR, Quadrennial Homeland Security Review, for example, there's a tremendously broad set of challenges that we face, but yet we have a—we're resource-limited like all organizations. As such, the question becomes, what do—we should—how do we prioritize these investments. We've looked at then this Integrated Product Team that I mentioned in my opening statements. These teams are cross-departmental teams. They're made up of actually operational component leads. They're chaired by the component leads, and their charter, if you will, is to develop capability gaps the Department has in terms of what we can do. I think the chairman mentioned the challenge that we have on the border with respect to, they can't necessarily be solved just with more people, and this is where we really do expect to make a—we do plan to make a difference. So we have set up a set of five different Integrated Product Teams that are new.

Getting to your point, how do we make sure this doesn't go away, we put—the Secretary signed a memo instituting these Integrated Product Teams. Part of that memo had to do with how we impact acquisition as well. So one of the comments earlier that I think you made, ma'am, was on test and evaluation, and one of the challenges that major acquisition programs have is that they tend to fail if you only do rigorous test and evaluation from rejected source at the endpoint, at operational test and evaluation point, you may not catch some of the issues in the beginning. So what we're doing now is, we're going in the early part for developmental test and engineering. So that's another area that we're looking for codification of what we're trying to do as well as the work that we're doing in system engineering at the front end of the acquisition work.

So I think what some of the changes I've made and I made a point when I first came into the office was to say form follows function. My goal wasn't to do some kind of overall very disruptive type of reorganization, just for the sake of reorganization, but to really look at what do we need to do to be more effective and impactful organization. And I think the ability to reprioritize—not—but the ability to properly prioritize, the ability to track R&D because, as you may know, the Secretary has also signed out a list of R&D criteria. So how do we actually determine what R&D is within the Department compared to what our investments are? That will help us—getting to your point about the GAO report, that will help us actually define what R&D spends across the Department. Then using the IPT process, we're able to prioritize what kind of research and development we're doing.

Ms. JOHNSON. The Homeland Security Science and Technology Advisory Committee, or HSSTAC, has some concerns of feeling underutilized. Have you attempted to include them?

Dr. BROTHERS. Again, thank you for the question. Yes, we have. So what I've taken, I've taken the model from the size of the Defense Science Board, quite frankly, has been trying to reinvigorate the committee. I realize that our problems aren't just only science and technical based in the Department—the Directorate. What we really need is strategy and management help as well.

So what I've asked for is to increase the number of members of that Science and Technology Board so that part of that board, half the board, roughly, will be science technologists. The other half roughly will be folks from management and strategic and strategy communities. The sense—you know, my goal is to have a diverse set of thought leaders to help us in all these areas that we face across the Directorate.

Ms. JOHNSON. Thank you.

Thank you very much, Mr. Chairman.

Chairman SMITH. Thank you, Mrs. Johnson.

The gentleman from Illinois, Mr. Hultgren, is recognized for his questions.

Mr. HULTGREN. Thank you, Mr. Chairman.

Thank you, Dr. Brothers. Good to see you again. I appreciate your work, and I'm glad you're here with us today.

Dr. BROTHERS. Thank you.

Mr. HULTGREN. I can say that we all do appreciate the opportunity to be able to hear about ways that we can help the Department of Homeland Security better align its Science and Technology Directorates certainly to better serve our dedicated Homeland Security professionals but ultimately to keep our constituents safe.

I see technology as a force multiplier that can keep our Homeland Security professionals safe by avoiding unnecessary danger while also giving them a reach that if we do our job is unmatched by our adversaries.

I also applaud your goals of energizing a Homeland Security industrial base and producing an actionable strategy based on visionary goals.

The last time you were here before us, I asked you a number of questions on our technology transfer capabilities and the disconnect that sometimes exists between our end-users and those who are charged with developing new technologies. At our previous hearings with Mr. Mower regarding your Directorate, I discussed how DHS is utilizing our other assets outside of your agency.

Today I'd like to ask some questions about how DHS is best utilizing and perhaps investing in the numerous federal research assets we have available to meet your goals. To me, this is really about deriving a maximum efficiency from our taxpayer dollars. It's my understanding that DHS primarily interacts with DOE through a modified work for others process, or WFO process. Is this still a satisfactory process, and are there other forms of agreement such as the cooperative research and development agreement, or CRADAs, or agreements to commercialize technology which may better serve your agency while emerging your industrial base?

Dr. BROTHERS. I think that we have a very strong relationship with the DOE laboratories. I think that because of the way the relationship between us is structured, I think we're able to leverage that relationship effectively and efficiently.

You brought up other issues including how do we reach out to industry, and you brought up CRADAs. I think CRADAs is a way that we can talk to industrial partners effectively. I think OTA—other transaction authority—is also an effective way that we can actually deal with our industrial partners in this as well.

Mr. HULTGREN. So you think there are some opportunities to use some of these other forms and that just sticking with the work for others, modified work for others process maybe isn't sufficient, that there needs to be some other things as well.

Dr. BROTHERS. I think that we have a number of potential vehicles at our disposal. I think a challenge is determining where they're best used and using them as such. I think sometimes we don't necessarily use all of them as effectively as we could, and I've been pushing to do that. I can mention the OTAs as well as the Prize Challenge Authority.

Mr. HULTGREN. Let me move on. In your written testimony, you highlighted your need to screen cargo with a minimal impact to the pace of travel and speed of commerce. I wondered how familiar your agency is with the capabilities at the DOE National Labs. In particularly, DHS works extensively with a few of the larger multi-purpose labs but it is familiar with the equally important and unique capabilities that reside at single-purpose labs. One I have special interest in is Fermilab, which is a leader in accelerator technologies that I believe could be applied for these cargo screening missions. How familiar is the lab with these unique and individually focused labs?

Dr. BROTHERS. So I can't speak to all of our leadership. I do know that we have had many visits to all the laboratories. I know that in our Transportation Security Laboratory, for example, that we are demonstrating prototypes of screening technology from the DOE laboratories, so we make a point of actually going to laboratories, understanding what they have. For example, our Director of HSARP is taking a tour through DOE laboratories. This is important because one of the major things that we can do as an organization is to understand what the state of art is across what I like to call the S&T ecosystem. That ecosystem is our laboratories, our industry, et cetera. And so that is a charge I've given to our leadership and it was taken very seriously and very passionately.

Mr. HULTGREN. And I would hope you look again at these unique labs, as I mentioned, Fermilab. I think there could be some real synergy there that would make some sense. I wonder, would DHS be willing to invest in infrastructure at the national labs, whether lab space or specialized equipment, to advance the Homeland Security mission. DOE or other national labs cannot always afford to maintain the types of capabilities needed for a broad variety of national security missions.

Dr. BROTHERS. I think we're always interested and determined to give the best technical solutions to our stakeholders, and we do what is needed to make that happen, whether it's investing in grants for universities or contracts for laboratories, what have you.

Mr. HULTGREN. I do think the labs are a perfect spot. I talk about the ecosystem of science as well. But it might take some investments, you know, certainly on the infrastructure side of things,

but I think the payoff could be huge again for those that we're called to serve.

My time is expired. I yield back, Chairman. Thank you.

Chairman SMITH. Thank you, Mr. Hultgren.

The gentleman from Virginia, Mr. Beyer, is recognized for his questions.

Mr. BEYER. Thank you, Mr. Chairman.

Dr. Brothers, thank you for being with us.

Dr. BROTHERS. Thank you.

Mr. BEYER. I've always felt that one of the most important jobs of the leader is to create a culture where workers are happy, motivated, filled with passion for the mission, and yet poor Homeland Security tends to rank last in the federal employee viewpoint. But you've taken the step——[audio lost for 3 minutes and 12 seconds].

Dr. BROTHERS. I have to have flex capacity, so as such, from a research perspective, we develop these Integrated Product Teams but we've also developed a set of priorities based on Presidential priorities, Congressional priorities, Secretarial priorities and some of my own priorities that go into the same mix of how we prioritize all these things.

So for example, the Chairman mentioned UAVs, small drones. That's part of the Secretary's priorities. Countervailing extremism is another one of those as part of the Secretary's priorities.

So the way this all works is we have these Integrated Product Teams across the areas—aviation security, cybersecurity, border security, counterterrorism and biosecurity. I might say we also have work on our first responders as well. That information—they come up with capability gaps working with the components heads. That information is flowed up to what we call the senior research council chaired by my deputy. That senior research council then prioritizes all of those lists. To that are added these pop-up things that we were talking about because, again, I've got to have flex capacity to deal with some of these pop-ups that we didn't anticipate, so-called black swan events. So that's how we're actually prioritizing these kinds of things.

Mr. BEYER. Okay. Quickly, you're the fourth Under Secretary for S&T. You've reorganized. I love your five Visionary Goals. But from a Congressional perspective, it looks like every time we get a new Under Secretary, everything gets reorganized and new goals. Should we institutionalize this Congressionally, or how do you give us some sense of stability and long-term action?

Dr. BROTHERS. So I think there's always this tradeoff between how much do you codify versus how much flexibility do you give an incoming Under Secretary. My goal was not to do a tremendous reorganization. In fact, it's not so much—I've actually maybe pointed in what I consider a more focused way. I've tried to actually align our resources towards these Visionary Goals with a five-year strategy and with given realistic prioritization based on the IPTs.

I think it's important that we move—we continue to have IPTs, that we continue S&T's involvement in the acquisition process in the front end, not just the back end. I think these things are important. I think in terms of specific areas, the specific ways the organization is structured, because of the fluid nature of the threat, and we discussed cyber, we discussed UAVs because the fluid nature of

the threat, I would hate to hamstring the next Under Secretary's hands by being overly prescriptive in the actual structure of S&T, but there's certain aspects of it, like I said, IPTs, the importance of us being involved in the front end of acquisition that I think are really important to be ongoing.

Chairman SMITH. Thank you, Mr. Beyer.

The gentleman from Alabama, Mr. Palmer, is recognized.

Mr. PALMER. Thank you, Mr. Chairman. Thank you, Dr. Brothers, for being here this morning.

I want to ask you about an audit from the Office of Inspector General regarding a contract with NVS dealing with technology that the Chairman mentioned in regard to a biothreat. According to OIG, S&T may have wasted $23 million without getting adequate deliverables. One of the things that the OIG report found was that you had a lot of employee turnover in the program management. Is that an issue?

Dr. BROTHERS. So right now I don't see that as being an issue. I think that we have new controls that we put on that the report recommended that we take three types of actions.

Mr. PALMER. Right.

Dr. BROTHERS. We've taken those actions. We're developing a program tracking. We've improved our program management guide. So I think that we have responded to the GAO in kind. I would mention, though, that this program was stopped after four years, and while the way it was stopped may not have been optimal, which is we actually went to the IG ourselves, technology changes over four years, and I mentioned earlier how quickly technology changes. There's another case of rapid technology change in the capability of industry as well.

Mr. PALMER. I think in your response to OIG, you said that there's still a need for this technology. Is that being pursued through other contracts?

Dr. BROTHERS. Quite honestly, because it's ongoing litigation, I can't get into a lot of details of this right now.

Mr. PALMER. Okay. I have a couple other questions too for you, Dr. Brothers.

The President's budget requests a substantial cut to S&T Directorate's budget compared to fiscal year 2015. How do you account for this?

Dr. BROTHERS. I'm sorry. Could you repeat the question, please?

Mr. PALMER. The President's budget requests a substantial cut to the S&T Directorate budget compared to fiscal year 2015, and I'm just asking, how do you respond to that reduction?

Dr. BROTHERS. We support the President's budget. I think this is something that we have to deal with within our capabilities. This gets back to how we prioritize the type of investments we have and why we can't respond to all threats across the entire domain of impact versus probability of occurrence.

Mr. PALMER. And then my last question is, a 2012 report by the GAO recommended that S&T develop policies and guidance for reporting R&D activities across the Department, nothing that DHS didn't even know the total amount being spent on R&D at DHS. Has Science and Technology developed these policies?

Dr. BROTHERS. So yes, and so that's what I was mentioning earlier, that part of the problem we had when that report came out was, there wasn't a definition of R&D. So when folks were reporting the R&D, they didn't necessarily have the same guidelines for what R&D was. The Secretary has signed a definition of research and development, which is—which goes along with what the Department of Defense and NASA has as well, and now we're working on a directive to do a data call based on those—based on that criteria.

Mr. PALMER. And lastly, so are you confident that S&T has a clear idea of all the research and development that's being done at DHS?

Dr. BROTHERS. I'm confident that we now have the structures to figure that out.

Mr. PALMER. Are you looking at overlaps, duplications?

Dr. BROTHERS. We are. So we're going to start having annual reviews. When I was at the Department of Defense, I was part of a team that set up annual reviews of the Service's research and development budgets across the Department. That is something that we will be doing in DHS as well.

Mr. PALMER. Well, obviously we need metrics to show how effective S&T has been. So how would you recommend Congress measure return on the investments in regard to appropriations to S&T?

Dr. BROTHERS. So we have a portfolio review process. That portfolio review process has a variety of metrics in it. I'd be happy to come and brief you on that process.

Mr. PALMER. Thank you very much.

I yield the balance of time, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Palmer.

The gentleman from Texas, Mr. Weber, is recognized.

Mr. WEBER. Thank you, Chairman, and thank you, Dr. Brothers.

In your discussion with Congressman Palmer, you talked about employee turnover. How many employees is in your organization?

Dr. BROTHERS. We have, I think, on the order of 400 civilian federal workers.

Mr. WEBER. Four hundred?

Dr. BROTHERS. It's on that order.

Mr. WEBER. And you talked about turnover, and you said you didn't see it as an issue, and you've been there since 2014. Is that right?

Dr. BROTHERS. 2013.

Mr. WEBER. 2013. Okay. What was the rate of turnover before you got there? Are you able to look at those two comparison numbers?

Dr. BROTHERS. I can. I don't have the numbers off the top of my head. I'll be glad to get them back to you, though.

Mr. WEBER. Okay. So have you taken a look at what they were historically before you got there than what you got there and compared those to other agencies?

Dr. BROTHERS. I don't have the—we have. I don't have those numbers. I do know that since I've been there, the turnover has dropped. We can get to you those numbers, though.

Mr. WEBER. Either that's a good thing or you've made it a lot easier on them. I'm not sure, so——

And do you categorize—in your—well, let me do it this way. The mission statement says that you all's mission is to improve Homeland Security by working with partners to provide state-of-the-art technology and solutions that help them to achieve their missions, quote, unquote. Have you taken a look at that statement and decided in your matrix a measurable matrix to, number one, improve, number two, who all your partners are, number three, what is state-of-the-art technology and solutions, number four, what are their missions, and number five, what it doesn't say is, do you have a way to measure your success in those four areas?

Dr. BROTHERS. So I think from my time in industry, from my time in Department of Defense and here, there's always of a challenge for research and development to quantify a return on investment. That said, I understand the need for the Committee to understand what kind of metrics we can have for success. I do understand that.

I think that we have done a—now with the processes that I talked about with respect to these IPTs, we will have agreed-upon priorities across the Department. We will be developing a research and development plan that was signed out by the Secretary. So the Department will agree on a research and development plan. Then the question is, how do we actually achieve that—achieve those solutions. So I think that then you start measuring our success based on how we start closing those gaps that will determine the capabilities from the IPTs.

Mr. WEBER. You mentioned, talking about the IPTs, and I forgot who it was in dialog with, that there were four priorities. You call them Presidential, Congressional, Secretary, and then your own. Would you take those four mission statements, again, improving Homeland Security, helping your partners, state-of-the-art technology, and their missions—are you able to integrate those into the four? I mean, because those are four priorities that actually in those four areas, there would be some overlap. Some things would happen in the Presidential realm that wouldn't happen in the Congressional realm and vice versa.

Dr. BROTHERS. That's absolutely true.

Mr. WEBER. How do you make those priorities?

Dr. BROTHERS. So these are—so those priorities are really made in discussions and conversations with leadership.

Mr. WEBER. Do you have a team that's designated to Congressional priorities and a team that's designated to President and Secretarial and then your own, to use your words?

Dr. BROTHERS. So I can't say there's a team right now. This is a work in progress. We just started this based on input that we've gotten from our working with staff members, with Hill members. I'm trying to understand what Congressional priorities are as well as working directly with the Secretary but we're working on formalizing this process. A question came up earlier, how—you know, how do we codify these things. This is one of the things again that has to be more formal.

Mr. WEBER. What do you see as Homeland Security threats? And I've just listed a few—drugs. I mean, you talk about drones, terrorists, weapons of mass destruction. Do you categorize and prioritize those threats?

Dr. BROTHERS. So the—yes and yes. The IPTs are where you're categorizing the threats based on QHSR, again, aviation security, border security, these kinds of things, and then those threats, based on capability gaps, are prioritized through the IPT process and they're prioritized through discussions in partnership with our operational components.

Mr. WEBER. Okay. Well, obviously, we wish you all the success and we want to, you know, make sure that you get your job done. Is is there a mechanism in place where in the process of achieving that success you can share that with states, especially and particularly the border states?

Dr. BROTHERS. Yes.

Mr. WEBER. And so you have that mechanism in place already?

Dr. BROTHERS. So there's a mechanism in place right now with our first responders. The first responders group right now has publicly available information on what some of the capability gaps are, so that's available, and that's the goal for the other IPTs as well.

Mr. WEBER. Okay. Mr. Chairman, I yield back.

Chairman SMITH. Thank you, Mr. Weber.

The gentleman from Texas, Mr. Babin, is recognized for his questions.

Mr. BABIN. Thank you, Mr. Chairman. Thank you, Dr. Brothers.

How does S&T determine the allocation of resources to basic research, applied research, and development? How do you prioritize that?

Dr. BROTHERS. So when I first came on board, the previous Under Secretary, Dr. O'Toole, because of external pressures, she had put most of our investment in nearer-term research. One of the comments that I've made a couple times has been I think that it's important that we have a more balanced portfolio than just all near term. I think it's important because as we start looking at, as I mentioned earlier, as we start looking at what industry has to offer, what university research has to offer in terms of potential solutions, we also have to realize there's some things industry does invest in, and those areas we have to be willing to put in a long-term investment profile. So therefore, we have to look at—we can't just look at what comes up in the next 18 months. We have to say if we're going toward these visionary goals, how do we actually do that? If these visionary goals are 15, 20, 30 years out, what do we need to put in place to actually start approaching those things? And I think that requires an investigation profile that's not just near term but involves—can involve some aspects of basic research as well.

Mr. BABIN. Thank you. And what has S&T done to improve state and local government access to technology that improves the safety and effectiveness of law enforcement?

Dr. BROTHERS. Sure. So I think we have a SAVER program with our first responders group, which——

Mr. BABIN. Did you say SAVER?

Dr. BROTHERS. It's called the SAVER program, which frankly is—it starts to compare and contrast different technologies for first responders. We have another group that looks at capability gaps for first responders. So I think—and this is all shared with state and locals.

Mr. BABIN. Okay. Let's see. A July 31st, 2014, GAO report entitled "Continued Actions Needed to Strengthen Oversight and Coordination of Research and Development" states that DHS had not yet determined the most effective path to guide R&D across the Department. Does DHS now have an effective way to guide R&D?

Dr. BROTHERS. As of the signing of the memo on IPTs, I think we do. I think we absolutely do.

Mr. BABIN. Okay. If that's so, then how does DHS determine the most effective path to guide R&D and why didn't DHS do this since its very inception?

Dr. BROTHERS. So the IPT process, that is something I'm bringing back. It did exist in the past for a variety of reasons. I think one thing that was not codified, it was an S&T-only process. The process is now one that spans the Department based on the memo I mentioned. So I think there's more institutional buy-in, if you will, to the IPT process. So this is something that was done before, it was stopped, and now we're starting it again, and I think on better, more solid footing.

Mr. BABIN. Well, I congratulate you, but what happened to your predecessors?

Dr. BROTHERS. What happened to them?

Mr. BABIN. Well, why——

Dr. BROTHERS. Why didn't they do that?

Mr. BABIN. Yes.

Dr. BROTHERS. So two predecessors ago started the IPT process. Admiral Cohen started the IPT process. He started it based on his knowledge of something called future naval capabilities in the Navy. I'm familiar with them from when I was in DOD. My immediate predecessor chose to discontinue those. Again, I think part of the challenge was, the original IPTs were not necessarily supported as strongly by the entire Department as they are right now.

This has to do with the Secretary's Unity of Effort. You know, the Secretary's Unity of Effort has made a significant difference in the entire Department, and right now the IPTs are part of this Unity of Effort that the Secretary has codified.

Mr. BABIN. Okay. Do you have reason to believe that GAO would concur with this?

Dr. BROTHERS. I can't speak for GAO but I think it's a compelling argument.

Mr. BABIN. Okay. I yield back the balance of my time, Mr. Chairman. Thank you.

Chairman SMITH. Thank you, Mr. Babin.

Mr. BABIN. Thank you, Dr. Brothers.

Chairman SMITH. The gentleman from Illinois, Mr. Lipinski, is recognized for his questions.

Mr. LIPINSKI. Thank you, Mr. Chairman, and I want to thank you, Dr. Brothers, for your testimony.

You stated in your testimony that you're using Centers of Excellence to plug into the research community, especially on urgent issues such as countering unmanned aerial systems and violent extremism. I understand that S&T currently has eight Centers of Excellence and set up three more last year. One of these new centers is the Center for Borders, Trade, and Immigration. There's also a Border Security Integrated Product Team. So I want to ask, how

do you ensure that the research being done at the Centers of Excellence is integrated with the overall R&D priorities of the Directorate and that findings from the university partners make their way past the basic research phase to the development and testing work?

Dr. BROTHERS. Thank you. Having done university work myself, having sponsored university work both from industry and from department of Defense, I can tell you that I was really amazed at how different the S&T is doing university-funded research, sponsored research. We're actually coming in the front end. So a lot of grants that go to universities are just that, they're grants. They don't necessarily have a research plan that's defined outright. Our team—our team in the Office of University Programs does an excellent job developing a research program before the work actually begins, and that research plan quite frankly involves the components. I spoke at one of the starting points for one of the Centers of Excellence, and I really had to remark at the engagement of the components of the science engineers at S&T in developing an effective and a relevant research plan for these universities. So my goal of aligning the research of the University Centers of Excellence with those of the IPTs, with those of the priorities, I think is a reality based on the way these programs are structured.

Mr. LIPINSKI. Thank you. I also wanted to move on and talk a little about the partnerships with the private sector. In your written testimony, you state that the new Collaborative Innovation Experiments program helps S&T reach out to non-traditional performers. Who's your target audience, and how are they an asset to the R&D program?

Dr. BROTHERS. Sure. So coming on board from DOD, I was very familiar with the DIB, defense industrial base, large companies, the Lockheeds, the General Dynamics, BAEs, et cetera. One of my concerns coming in, though, was what companies are going to provide the equivalent Homeland Security industrial base to S&T. We're different than DOD. A lot of what we buy is off the shelf, and as such, we have to strategically shape our shelf. To strategically shape our shelf, we have to be able to have visibility, have influence and impact on all of the creative individuals in the country and internationally as well. So a lot of what we've been doing recently is reaching out to strategically shape their shelf, has been reaching out to the companies in Silicon Valley and Dallas and Austin and Chicago and L.A., et cetera, as a way to increase the creative minds that are tackling our problems.

And I was out in Silicon Valley, and I started asking some of the investment professionals, the venture capitalists out there, you know, what would really get the creative people out there involved in solving our problems, and their answer was very simple. They said look, we've got a lot of smart people here, a lot of smart people, and they're interested in solving hard problems that make a difference. Hard problems that make a difference. And I think that as an organization, as a Department, Homeland Security has an incredibly compelling mission, and what you find when you talk to these folks, these new companies, potential entrepreneurs, they get really excited by solving these problems. They just haven't necessarily known about them in the past.

So what we've done then is, we've had a coordinated outreach, and I'm very proud to say that last year we had an idea. The idea was, could we in this whole sense of strategically shaping the shelf, could we indeed develop accelerators. Just a simple question, right? Can we actually develop business accelerators in our field, in the field of solving Homeland Security problems, that also represent effective businesses. So we tried that, and there were three fundamental questions we needed to answer. One question was, does anyone care, will we get responses from the solicitation to have accelerators? The second question was, if anybody cares, will there be good answers, will we get relevant, effective solutions? The third question was, are these viable businesses?

Last September—so this was a little over a year ago, actually about a year ago—in September after we'd done this, we had 150 companies or so actually apply. So the first question was affirmative. There are a lot of creative professionals out there who are interested in solving our problems. Coming through this accelerator program—one of the accelerators was based in Dallas and one was based in Chicago—we had 18 companies. These companies had excellent solutions that not only had applicability to first responders because our accelerators are based on first responder technology, and if I can segue, it was really concerned with giving first responders situational awareness: where am I, where are my team, these kinds of things. And then we had these companies, and they solved problems with situation awareness for first responders but they also had commercial value as well. About half of these have interest from follow-on funding.

So what we've found is that the hypothesis we had, can we get creative individuals across the country interested in solving our problems, is yes. Yes, we can. Not only that, I've reached out to larger companies, and one of the things that I think is unique about our strategy is we've tried to make roadmaps that are in the back of our strategy, technology roadmaps, that a CTO at a large company would get that would match what they're looking for. Because one of the challenges large companies have is, how do you use your IRAD—your independent research and development dollars—effectively? Well, if you have a roadmap, which you know that your potential government customer is using, that can help a lot, and that can help the leadership of those companies make the effective business case to their leadership to work in a particular area.

Mr. LIPINSKI. Thank you, and I want to—I know I'm out of time. I just want to say I just started, with Mr. Hultgren, a prize caucus here, and I want to ask you following up about the Directorate's plans to use prize authority. But thank you. I yield back.

Dr. BROTHERS. Thank you.

Chairman SMITH. Thank you, Mr. Lipinski.

The gentleman from Georgia, Mr. Loudermilk, is recognized.

Mr. LOUDERMILK. Thank you, Mr. Chairman, and thank you, Dr. Brothers, for being here.

What you're doing is very broad, and I applaud the efforts that you've taken so to kind of get you prepared for the direction I'm going, I want to talk about transportation security and then port security as well.

I applaud you at the screening at speed. Those of us who travel often really appreciate that. But at the same time, I have some grave concerns. As you know, the DHS IG released a report a few months ago where they failed 95 percent of the time of inspectors getting banned items through TSA checkpoints, and also within the last few months, I personally know of three individuals who inadvertently made it through screening points with scissors, a flathead screwdriver, and one who actually in his checked bags had live rounds loaded in a magazine that were not detected.

Through researching some of where we are, and where I'm getting is, I'd like your input as to where is that balance and where are we going in this because that concerns me greatly. I'm also on the Homeland Security Committee. I've been on foreign fighter task force. And so yes, we definitely appreciate the speed of life going through security checkpoints but to balance that with security, we weigh heavily on the technology aspect, and I do know in my research that we were close to having a new set of standards for next-generation screening technologies but that was put on hold recently to go back to the drawing board.

I do know, and I've visited some new technologies out there that use high-energy X-ray to give not only three-dimensional but four-dimensional view of what's in a bag using basically medical technologies such as biopsies to be able to tell the contents or the material, what is likely in the material that's in a bag.

Can you tell me where are we in advancing to actually field the new generation of scanning technologies and, you know, and also maybe opine, have we gone too far in the speed and efficiency and we've given up on some of the security?

Dr. BROTHERS. So let me go back—thank you. Let me go back to the vision. I think the vision, while it talks about screening at the speed of light, there's always, as you know, this tradeoff between security and the speed of commerce. I don't think in any means did that vision mean that we're not trying to improve security. I think what it means is, you need to look at the airports, ports of entry holistically. So right now, you know, you may look at just the screening equipment. What are other aspects of the process from ticketing on out that you can actually impact to improve security?

I think with respect to the particular technologies, we're looking a different technologies, different phenomenologies as a way of screening for a variety of threat materials, if you will. We have a transportation security laboratory in New Jersey that works with TSA to test these types of technologies. There's an integration facility in DC. that is used for further—more operational testing.

So I think that there is an understanding across the Department to look at this problem holistically, to use as much of the newer technology as possible, but there's another issue as well. Quite frankly, I learned this going back to DOD as well, the importance of the human dimension. So I was involved in some studies when I was in the Department of Defense, and what was quickly apparent to me was how important the human dimension really is. We can get caught up in the importance of technology as much as we want but the tactics, techniques and procedures that the humans perform are incredibly vital to this combined function of the human-machine subsystem if you will. And so we're also involved

in research in looking at how to do better training of the transportation security officers as well.

So I think we're looking at it not just from the checkpoint perspective, we're looking at the entire point of entry perspective and we're also looking at it from the training perspective.

Mr. LOUDERMILK. All right. Thank you.

And quickly, as we're going to look at port security very quickly, I perceive we're going to have some challenges with potential of the TPP coming through as well as lifting sanctions on Iran. How are we going to ensure that cargo coming into the United States is safe, especially that may be coming from a nation that is sworn to the destruction of the United States, but also opening up free trade, which I'm all in favor of, but also knowing that we have a responsibility to ensure that what is coming into the nation is safe, is secure, it's legal, and it doesn't bring harm to the United States? Are you guys looking at advanced technologies and techniques to deal with the increased load of imports coming into the United States?

Dr. BROTHERS. Absolutely. We're also working with our partners with DNDO as well to look at the different modalities of threat to come in. We're looking at it from the perspective of integrated systems assistance, whether that's the actual screening technology itself or whether that's bringing information from disparate sources and infusing it in a way to get better decision support.

Chairman SMITH. Thank you, Mr. Loudermilk.

The gentleman from Illinois, Mr. LaHood, is recognized of his questions.

Mr. LAHOOD. Thank you, Mr. Chairman, and Dr. Brothers, thank you for being here today and for your testimony.

Following up on Congressman Loudermilk's line of questioning there on the Inspector General's report that found the failure of TSA to find the mock explosives and the banned weapons over 95 percent of the time, so since that occurred and the analysis that was generated from that, if another say, mock test was done today, what would be different?

Dr. BROTHERS. I believe the results would be different but I think this type—it'd be good to get back to you on a classified discussion of some of the changes, if you like, that have been made.

Mr. LAHOOD. Are you confident there would be a different outcome of that was done today?

Dr. BROTHERS. I believe there would be a different outcome, yes.

Mr. LAHOOD. And in terms—I know there was a reference earlier—and by the way, I'd love to have a follow-up on that——

Dr. BROTHERS. Sure.

Mr. LAHOOD. —to learn more about that and what's occurred with the new technology.

There was a reference earlier about drones, and I guess thinking about how we balance drones and the technology with the private sector and letting them innovate and expand and privacy rights and also security, can you comment a little bit on the direction we're headed on that and that appropriate balance moving forward.

Dr. BROTHERS. So you know, the FAA is looking at regulations of having folks register, drone users register. One of my approaches, quite frankly, has been, when I was in Silicon Valley a

couple weeks ago was to talk to some of the manufacturing community and say, you know, you really need to get involved in these discussions because they're important. There's a tremendous trade-off between the commerce potential for these devices as well as the threat, and so I've been personally engaged with some of the manufacturing community of drones to understand their potential capabilities going forward as well as to get their input into what makes sense in terms of counter-drone technologies as well as some policy issues.

Mr. LaHood. And are you working actively with the FAA on their——

Dr. Brothers. We are.

Mr. LaHood. And when do you anticipate that will be ready to go?

Dr. Brothers. I can't tell you. I do not know. I cannot tell you that. That's something that I think is still a work in progress.

Mr. LaHood. Another issue that we discussed last week in this Committee was the issue of cybersecurity, and in looking at your particular Department and investing appropriately in research and development programs that will address rising security concerns as it relates to cybersecurity, can you comment on that a little bit?

Dr. Brothers. I'm sorry. Could you repeat the question?

Mr. LaHood. Yeah. We had a hearing last week on cybersecurity and specifically involving power systems and some of the issues related there in looking at the threats that are out there. In looking at your Department and specifically with research and development, can you comment on how your Department's addressing that?

Dr. Brothers. I can. We've put a focus on cyber-physical systems, which one substantiation of cyber-physical systems is a SCADA system, control systems for, let's say, power plants, these kinds of things. I think this is an area of increasing concern, and we're working with our partners at Infrastructure Protection over at NPPD as well. So we're putting together a program to address the threats to not just the power grid but also financial sector and the other critical infrastructure sectors as well.

Mr. LaHood. Thank you. I yield back, Mr. Chairman.

Chairman Smith. Thank you, Mr. LaHood.

The gentleman from Michigan, Mr. Moolenaar, is recognized for his questions.

Mr. Moolenaar. Thank you, Mr. Chairman, and Dr. Brothers, thank you for being here with us today.

I was looking through your background, and I noticed you were with the Department of Defense, and I wondered if you could tell me what the research and the work that you're doing now versus the research that's done at the Department of Defense, what are the similarities and differences between Homeland Security Science and Technology and Department of Defense?

Dr. Brothers. A major similarity is the importance of the missions. I mean——

Mr. Moolenaar. I'm sorry. The——

Dr. Brothers. Of the fundamental importance of the missions with the Department of Defense, the Department of Homeland Security. Major differences have to do with the difference in the budg-

ets of the departments, the fact that a lot of what we do buy, what our components buy are off the shelf. The fact that, for example, particularly for our first responder stakeholders affordability is a big concern. So whereas the Department of Defense you may find work in hypersonics, for example, you would not find that type of work in DHS.

That said, where our challenges may not be to exploit new types of propulsion technologies, our challenges are to get effective capabilities to our stakeholders that have minimal training time and much smaller budgets. So whereas the Department of Defense, the resources are there to do significant training, that's not necessarily so with our stakeholders.

Mr. MOOLENAAR. And then I noticed the Integrated Product Teams, you have five different areas. Is that too many? I mean, it seems like a pretty—I mean, they're all very complicated, challenging areas. Are there one or two that you prioritize over the other ones?

Dr. BROTHERS. I don't think so. I think these—the Integrated Product Teams actually came from QHSR, so if you look at the different mission sets, that's where they were derived, and I think that there was strong reasons for having that set of missions defined in the QHSR and that's why we have the IPTs set up that way.

Mr. MOOLENAAR. Okay. And then when you have agencies that would have a common interest, is there ever kind of this concept of skin in the game where you have agencies contributing to pooling resources to fund a project?

Dr. BROTHERS. So for example, we have some of the work we do at the borders, sir. Customs and Border Protection is working with us, is co-funding some of that work. So the answer to your question is yes.

Mr. MOOLENAAR. Okay. And have you been able to find—I'm sure just with your experience in defense as well as, you know, the other areas, do you feel like we're doing this the most efficient way or—you know, I could imagine at a large corporation when they have a research component, you know, sometimes it's centralized and different entities feed into that, and there're places each of the different entities would have their own research component. Do you feel that we're doing things the best way, most efficient way possible here in the Federal Government?

Dr. BROTHERS. So I appreciate you bringing that up because of time constraints, I wasn't able to talk about that in my opening statement, but I think that structure is one that we're trying to implement right now. So when I was in the Department of Defense, one of my challenges was trying to understand how to make the Department of Defense laboratories more effective, if you will, and I started looking at different business models, corporate models, and it's just like what you say. If you go to a lot of the large corporations, what you find is, they'll have a central research facility that tends to look at cross-cutting, more basic research areas. Then the business areas, whether—let's take a defense contractor that might have an electronic warfare business unit that might have a platform business unit, communications business unit. Each one of

these business units independently have their own R&D section as well. This will be more applied.

What I found with the more effective of these corporations was, there was a constant interplay between the staff at the central research facility and those at the business unit. Why is that important? It's important because you need the researchers to understand the market dynamics and you need the applied engineers to understand the art of the possible from the basic research. And so we've done that. We started with our Pioneer program. The Pioneer program actually puts our staff into, right now into the Coast Guard, for example, into their R&D center. We've also put our staff on the borders to understand how the border operators operate.

So I think, getting to your point, a more efficient operation is that type of model, and that's something we're trying to do right now. We've already had a number of these Pioneer events. We're setting up work with the Coast Guard to collaborate on research right within the Coast Guard. So I think that is an effective model.

Mr. MOOLENAAR. Okay. Thank you very much.

Dr. BROTHERS. Thank you.

Mr. MOOLENAAR. Mr. Chairman, I yield back.

Chairman SMITH. Thank you, Mr. Moolenaar.

The gentleman from Louisiana, Mr. Abraham, is recognized.

Mr. ABRAHAM. Thank you, Mr. Chairman, and thank you, Dr. Brothers, for being here.

Let me pony a little bit on Mr. Moolenaar's first question because we are actively in budget talks even as we speak today and hopefully being good stewards of the people's money, what is S&T doing to ensure that DHS is not duplicating other research in other federal agencies, and the second part of that question, how do you guys prioritize your research?

Dr. BROTHERS. The first part of the question, right now in one of the Secretary's Unity of Effort initiatives, we're involved in the Joint Requirements Council. The Joint Requirements Council really does the vetting of acquisition programs and these kinds of things, developing the requirements, et cetera. We're part of that process, and as being part of that process, we're able to give our input into the art of the possible, into what technology's out there.

Internally in S&T, what we tried to do, and I think we've done an effective job of this, is to give our program managers, our leaders, access to a variety of different tools to understand what is out there. So Centers of Excellence were mentioned earlier. So access to university programs. Laboratories were mentioned earlier as well. There are laboratories.

Mr. ABRAHAM. Do you guys hear of any computer programs that would actually send an alert if you're doing research on the same topic?

Dr. BROTHERS. I can't—so what we do have is the ability to influence the acquisition through the process of the Joint Requirements Council. I can't say we have a computer program that generates alerts on everyone's desk but we have effective input into the acquisition review board information.

Mr. ABRAHAM. And the second part, the prioritization of the research.

Dr. BROTHERS. The prioritization of research is now being done based on the Secretary's direction through this Integrated Product Team structure, and this is where we have components who collectively evaluate what capability gaps there are. We then base our research on what those gaps—what gaps come out of that process.

Mr. ABRAHAM. And I'm assuming you guys have regular meetings that you look at this research and say well, this one needs to go to the top and this one can be——

Dr. BROTHERS. Correct. So we have portfolio reviews as well. So once we have defined what direction we'll take in terms of our prioritization of our investments, we then do an annual review on these investments.

Mr. ABRAHAM. And what is S&T's role in the DHS acquisitions?

Dr. BROTHERS. So we have authority to do operational tests, to oversee operational tests and evaluation, and we're now getting involved in the system engineering up front for acquisition programs as well as developmental testing as well. So it's the testing and engineering up front. The back end is system engineering up front.

Mr. ABRAHAM. Thank you, Mr. Chairman. I yield back.

Dr. BROTHERS. Thank you.

Chairman SMITH. Thank you, Mr. Abraham.

We have no other Members who are here to ask questions but we had a nice, full contingent today. So Dr. Brothers, thank you for appearing, thank you for the information, and to follow up on a couple of things that you said earlier, we'll look forward to a classified briefing at some point to address some of the issues that were brought up earlier.

But I appreciate what you're doing at the Department of Homeland Security, and we'll be in touch. Thank you very much.

[Whereupon, at 11:25 a.m., the Committee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

Responses by The Hon. Reginald Brothers

Question#:	1
Topic:	R&D investments
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

"A Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate"

Responses to Questions for the record, The Honorable Reginald Brothers, Under Secretary, Science and Technology, U.S. Department of Homeland Security

Questions submitted by Rep. Lamar Smith, Chairman

Question: How does S&T measure return on investment from its R&D investments of taxpayer dollars?

Response: The Science and Technology Directorate (S&T) recognizes the need to demonstrate value in its R&D investments and quantify their value to our customers. While strict calculation of Return on Investment (ROI) is difficult in this domain, S&T nevertheless has a structured approach to ROI, value generation, and risk. In 2010, the Directorate adopted a portfolio review system adapted from the Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) and similar to existing approaches in the federal government and private sector. The process targets detailed project-level reviews as well as an overall systemic evaluation. S&T employs outside experts to help maintain the rigor of the overall portfolio review and also uses internal and external subject matter experts to contribute to project and portfolio-level assessments. S&T applies and improves this process annually.

There are a number of features in the S&T portfolio review process that tie projects back to ROI. The Assessment Framework consists of Evaluation Metrics and Scoring Guidelines used by evaluators. Projects are evaluated in this framework according to operational relevance, customer buy-in and partnership, transition likelihood, innovation, novelty, technical feasibility, project clarity, cost realism, and other factors are measured. The combined measures approximate impact and feasibility, and the process identifies strengths and weaknesses of the portfolio.

A core element of S&T's strategy to maximize ROI is to leverage existing R&D work from other federal agencies, industry, universities, and international partners to capitalize on existing technologies that could readily be adapted to the Department of Homeland Security (DHS). For example, S&T adapted and applied tens of millions of dollars' worth of basic science and research in technologies from the Defense Advanced Research

Question#:	1
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Projects Agency and universities and applied it to the critical need of detecting homemade explosives in aviation. S&T applied these basic research investments to yield quantifiably more effective and less costly walkthrough checkpoint screening technology – homemade explosives that previously were not easily or efficiently identifiable were now much more likely to be detected in screening checkpoints.

Question#:	2
Topic:	cybersecurity
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: What is S&T's appraisal of cybersecurity across the federal government? What critical unmet needs and vulnerabilities? How much variation in preparedness and prophylactic capabilities among federal agencies?

Response: The issue of cybersecurity in general is a very complex issue and is not easily separable between the private sector and government in terms of its core challenges. The government's cyber infrastructure, like that in the private sector, is largely based on commercial technology built around the world. Much of the software that runs federal infrastructure is commercial; commercial practices are often cited as best practices and are used or emulated in government. For cybersecurity, the federal government and private sector operate in a codependent market.

Likewise, the common problem of cybersecurity is increasingly capable adversaries and rapidly advancing technology in a market where security is traditionally not the highest priority. Which leaves us where we are now, where the cybersecurity of major infrastructure areas is more "bolted on" afterwards rather than organic to the infrastructure system and its operation.

For federal cybersecurity, keeping pace technologically with adversaries is daunting. S&T has actively partnered with other government agencies, industry, academia and our international partners to advance the state of technology. This will allow agencies, as well as stakeholders in industry, to deploy technology in the operational defense of our cyber infrastructures and data. While S&T has not played a role in providing scientific evaluation of the internal operational cybersecurity practices of U.S. Government agencies, we maintain strong working relationships with technologists across government. A comprehensive look into the specifics of how well these agencies perform and the variations between them may best be found in the Government Accountability Office (GAO) report to the Committee on Homeland Security, House of Representatives, GAO-16-194T, Federal Agencies Need to Better Protect Sensitive Data and report to Committee on Homeland Security, House of Representatives, GAO-16-79, Sector-Specific Agencies Need to Better Measure Cybersecurity Progress. S&T fundamentally concurs with these reports, specifically two statements are of particular importance:

- Cybersecurity starts with a thorough understanding of what operations and data need to be protected (GAO-16-194T, page 12).
- The advancement of cybersecurity is unlikely to occur without clearly stated outcomes and well thought out metrics. These must be understood in the context

Question#:	2
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Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

of vulnerabilities, cost, and the needed technical and operational improvements (GAO-16-79, pages 35-39).

Question#:	3
Topic:	portfolio review process
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Please describe the portfolio review process between DHS component agencies and S&T. How frequent? Are findings and recommendations set forth in writing? How is progress tracked over time? How is accountability determined and assured?

Response: S&T formally reviews its R&D portfolio on an annual basis. Since 2010, S&T has invited customer component agencies and other stakeholders in the Homeland Security Enterprise (e.g., First Responders) to participate in the evaluation of R&D investments. A panel of these customers and stakeholders, together with members of the S&T leadership evaluate R&D investments against several measurable criteria and programmatic performance thresholds. The results of individual programs are compared against their assessment in prior years. The aggregate portfolio has also been compared against previous years' assessments with respect to operational impact and feasibility to transition value-added technology and knowledge to the enterprise. Each year, the data from the portfolio review is analyzed, distilled and compiled into a final report. The analysis is used by S&T to clearly communicate input, output and outcome goals and to inform decision making at execution and strategic levels. In fiscal year (FY) 2016, S&T is strengthening the R&D portfolio review process with improved data and more detailed analysis to provide better insight into the ongoing value of the R&D programs. We are also integrating findings with the Integrated Product Team (IPT) process to provide greater awareness for S&T's portfolio decision making and for informing DHS. While S&T oversees the overall effort, the mission-specific IPTs are led by operational components, with subject matter experts from DHS headquarters participating as members. IPTs will identify capability gaps to gain a better understanding of current and emerging needs at DHS components and to prioritize these for DHS leadership review.

Question#:	4
Topic:	customer survey
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: S&T finalized a project management guide to improve R&D management in 2013, which includes a customer survey template to obtain feedback on deliverables. How often to the other components actually fill out these feedback surveys?

What have you learned from customer feedback?

Response: Programs are centrally assessed at a minimum annually as a part of the S&T Portfolio Reviews. This review process gathers customer feedback and analyzes operational relevance (i.e. how well do the deliverables align with the customer's existing or anticipated concept of use), customer buy-in, technical feasibility, transition likelihood and a variety of other project qualities. The customer survey referenced in the question was added to the program management guide as another means to gather feedback. While there have been limited project management guide survey forms completed by the components, information gleaned from S&T customer feedback has been extensive in numerous other ways. S&T has meetings regularly with DHS component customers and other members of the Homeland Security Enterprise (e.g., state and local first responders) to assess project progress, as well as to conduct evaluations and receive feedback on deliverables. From the various technical, design, and portfolio reviews conducted with the customer, valuable feedback is received at various junctures during the project development phase.

The analysis of portfolio reviews with the customers over four years reflects significant increases in customer buy-in and reflect better S&T customer engagement and attention to components' operational requirements. Having the customers involved early and often provides much needed feedback that increases the probability of technology transition. The most effective method of gathering customer feedback is to put the developed technology in the hands of the operators/users in an operational environment for a sustained period of time (in the form of an operational pilot). The feedback garnered from an operational pilot is invaluable in determining the usability and effectiveness of the developed technology. From this variety of customer engagements, S&T has learned important feedback including desired design changes, usability, and a better understanding of the operational relevance of technology that aids future development. Specific feedback examples include:

- Following development of the prototype Small Dark Aircraft detection and tracking system, the unit underwent a nine month operational pilot where it was operated by Border Patrol agents in an operational environment on the northern U.S. border. From this pilot, invaluable user feedback was obtained as well as

Question#:	4
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Committee:	SCIENCE (HOUSE)

critical experience of operating and maintaining the system through the harsh northern border winter. From this customer feedback, numerous design modifications were identified and incorporated into the final system design.

- Similarly, the Border Tripwire system and the Tunnel Activity Monitoring system are currently undergoing year-long operational assessments on the southern border. The feedback garnered from these assessments will be used to identify potential design modifications with the goal of improving the usability and effectiveness, and ultimately the likelihood of transition of the final design.

Question#:	5
Topic:	adapted to DHS
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Can you describe any instances of an existing technology that was adapted to DHS needs?

Response: S&T has numerous government and commercial technologies to meet DHS needs. These include:

- S&T has leveraged several Navy anti-submarine acoustic technologies for the purpose of detecting illegal activity in the air and between ports-of-entry. Our Tripwire program utilized that same technology to detect illegal ground incursions, and our Small Dark Aircraft program exploited the technology to detect illegal cross-border entries by small aircraft.
- We have also leveraged DOD/Navy software systems in our Coastal Surveillance System/Integrated Maritime Domain Awareness project for the DHS maritime community and the Apex-Border Situational Awareness program in order to baseline information sharing platforms between DHS customer components.
- S&T's First Responder Group (FRG), in partnership with NASA's Jet Propulsion Laboratory, transitioned the final prototype of the Finding Individuals in Disasters for Emergency Response (FINDER) technology to the commercial market in 2015. FINDER is a low-power microwave radar technology designed to detect heartbeats of victims trapped in wreckage. This program employs research by both NASA and the U.S. Army. The technology proved successful during its first real-world operational use in Nepal following the April 25, 2015 earthquake to support international search and rescue efforts. Using FINDER, rescue workers were able to detect heartbeats of four victims trapped beneath two different collapsed structures, allowing the rescue workers to find and save the victims. FINDER was also demonstrated through multiple test searches over the past two years with urban search and rescue teams in Virginia, Oklahoma, Indiana, New Jersey, Georgia, California and Illinois.

S&T is using several important risk models that were based on existing methodologies that were previously developed by other agencies to inform the risk modeling and analysis. For example the Bioterrorism Risk Assessment (BTRA), the Chemical Terrorism Risk Assessment (CTRA), and the DNDO Radiological and Nuclear Risk Assessment (RNTRA), which culminate into the Integrated CBRN Integrated Terrorism Risk Assessment (ITRA), are examples of using software tools based on previously developed methodologies to provide important homeland security threat analysis. For

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potential outdoor threat releases, we use a Defense Threat Reduction Agency (DTRA) product called Hazard Prediction and Assessment Capability (HPAC) model, to predict plume dispersion. This tool is used in real time to support a 24/7 response capability in the event of a CBRN release situation.

S&T Data Analytics Engine (DA-E) transitioned the initial "Big Data Environment" (BDE) solution to Immigration and Customs Enforcement (ICE) Homeland Security Investigations (HSI) that is now supporting the Counter-Proliferation Investigations unit and Export Enforcement Coordination Center. DA-E adapted existing and emerging capabilities to design, prototype, and build a solution consisting of advanced computing architecture, equipment, and software. Solution combines millions of trade data records from various sources to discover patterns of illicit shipments of sensitive U.S. technologies and weapons. BDE's capabilities have prevented sensitive U.S. technologies and weapons from reaching terrorists, criminal organizations, and foreign adversaries.

Other instances of existing technologies that were adapted to DHS needs include:

- Through the S&T/Cyber Security Division (CSD)'s Transition to Practice (TTP) program, the CodeDNA and the Network Mapping System (NeMS) technologies were identified, developed, and piloted in government organizations, so that they can now be applied in DHS networks. These technologies will help DHS detect malware by identifying binaries and linking variants, and enable network characterization and discovery to identify what is connected to networks, what needs to be most protected, and how to protect it.
- MobileIron, a mobile configuration manager that improves policy enforcement and assists enterprise users in keeping their mobile devices secure, was evaluated against the federal mobile security baseline from the Digital Government Strategy and adopted by the Federal Emergency Management Agency (FEMA) as its solution of choice going into 2015. Integration is ongoing, but in September 2015, FEMA purchased 10,000 device license subscriptions (100 percent adoption of working mobile devices).
- CodeDx is a commercial software tool that automatically consolidates, correlates, and normalizes software weaknesses detected by multiple static analysis tools to minimize time spent by users in software testing and reporting. CodeDx is currently integrated into S&T's Software Assurance Market Place (SWAMP) and is used by S&T/CIO, Domestic Nuclear Detection Office (DNDO), and other federal agencies.

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- Under a Small Business Innovation Research (SBIR) project aimed at developing tools to acquire and analyze information from NAND flash memory chips in cell phones, the company NowSecure significantly enhanced its forensic software commercial offering and developed a free version of the software for law enforcement. Through the SBIR, S&T funded NowSecure Forensics via licenses to use technology to develop new capabilities that were deployed to the Montgomery County Police Department, Loudoun County Sheriff's Office, U.S. Secret Service (USSS), and the DHS Office of the Chief Security Officer.

- A commercial off-the-shelf bottle liquid scanner was modified to scan personal electronic devices (phone, tablet, MP3 players). Starting with a Commercial Off-the-Shelf (COTS) device has accelerated the development schedule and this device is going through developmental test and evaluation.

- Response and Defeat Operations Support (REDOPS) – Technology Assessment and Test Bed – FRG conducted operational field assessments of three response and defeat commercial tools resulting in a knowledge product to assist the Federal Bureau of Investigation (FBI) and state and local bomb squads with acquisition and deployment decisions for electronic counter measures, X-ray, and disrupter tools. This is a joint FBI and S&T investment in how SWAT and bomb technicians will attack and conduct render safe activities for improvised explosive devices and people borne improvised explosive devices.

- The Response and Defeat Operations Support (REDOPS) – Micro Research and Development (Micro R&D) and Rapid Prototype for IED Defeat (RAPID) project identified and transitioned systems that were developed by individual bomb squads for use by the broader bomb squad community. These tools aim to support the tactical bomb technician who is closely integrated with SWAT. This is a joint FBI and S&T investment that focuses on: Identifying and transitioning technologies developed by individual bomb squads for the entire community via publication in FBI Special Technicians Bulletins; and developing advanced render-safe techniques with bomb squads performing the majority of the testing.

- Multi-Band Radio (MBR) technology allows first responders to communicate with partner agencies across the disparate radio bands on which they operate. FRG identified DOD joint tactical radio technology research that was under development and leveraged millions of dollars of research and development costs from the DOD and industry to adapt that technology into a commercially available product for first responder use. The MBR initiative sparked industry interest that led to the development of this equipment. S&T transitioned over 100 radios to more than 20 pilot partners, including the United States Coast Guard, so that those partners can continue to use the radios in the field. MBR technology is

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included on FEMA's Authorized Equipment List (AEL) and therefore qualifies for purchase using FEMA grant dollars.

Question#:	6
Topic:	strengthen collaboration
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
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Question: Another way to strengthen collaboration between S&T and the DHS component agencies is to jointly fund pilot projects (e.g., to test and evaluate a new piece of equipment or technology). Have S&T used this option?

Response: S&T has numerous examples of collaboration with DHS components to jointly fund and develop projects. These jointly funded projects are highly preferred because they exhibit commitment in developing capabilities. In addition to funding, components provide test ranges, personnel, equipment, and other resources to aid program development. Some examples include:

- Tunnel Detection Prototype Development – U.S. Customs and Border Protection (CBP) provided 66 percent of the total project funding
- Ground Based Technologies – CBP provided 44 percent of the total project funding
- Rapid Response Prototyping – 50/50 cost-share with CBP
- Border Tripwire – In FY15 CBP provided funding to install a prototype system on the northern border after S&T successfully prototyped a system on the southern border
- Robotic Aircraft for Maritime Public Safety (RAMPS) – U.S. Coast Guard (USCG) provided 50 percent of the funding to perform operational evaluations of commercially available small unmanned aircraft systems
- Port and Coastal Surveillance – Cost shared with DOD a Joint Capability Technical Demonstration (JCTD) to exploit commercial space-based technology for maritime surveillance.

S&T has recently collaborated with the DHS Office of Health Affairs (OHA) to jointly fund the production, characterization, and use of a safe particulate surrogate for an aerosolized biological threat (e.g., Bacillus anthracis) in a planned field test in the New York City (NYC) subway during May, 2016. S&T is partnering in this project with the Metropolitan Transportation Authority New York City Transit and collaborating with the New York Police Department (NYPD) Counter-terrorism Bureau, New York City Department of Health and Mental Hygiene, Port Authority of New York and New Jersey, and other local agencies. This surrogate will enable: a) determination by airflow models of where a biological cloud would travel, and deposit in, the subway; b) exercise of BioWatch Phase I sampling protocols following a BAR (BioWatch Actionable Result) and c) inform potential re-siting of BioWatch collectors in the NYC subway.

S&T's Chemical Security Analysis Center continues to provide valuable chemical spill

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data. The recent Jack Rabbit II test at Dugway Proving Grounds in Utah was co-sponsored by DHS S&T, the Defense Threat Reduction Agency (DTRA), and Transport Canada. These field tests provided the data for the Transportation Security Administration (TSA), private industry (Dow Chemical), DTRA, the Environmental Protection Agency and allied countries (Canada) and others on how to respond to a major chlorine spill.

During FY15, CBP obtained funding through an Unfunded Request process to fund the inaugural CBP focused Adaptive Red Team/Technical Support and Operational Analysis (ART/TSOA) CBP-16 event in El Paso, Texas. Key operational participants included U.S. Border Patrol Special Operations Group (SOG) and Office of Field Operations Special Response Team (SRT) along with the air support from Air and Marine Operations (AMO) in El Paso, Texas. This process provides DHS/CBP the ability to experiment with the technology in order to make informed decisions and realize cost savings.

S&T's DA-E lab is standing up capability to address data analytic problems across the Homeland Security Enterprise. Component end-users and DA-E subject matter experts work together to conduct rigorous testing of computing technologies and analytic tools. The evaluation process included extensive market research, hands-on testing of tools on real data to evaluate vendors' claims of functionality against the requirements, and cost-of-ownership assessments to ensure that the proposed solutions are feasible. Many projects are co-funded, including:

- ICE HSI BDE – Design, prototype, and build a solution consisting of advanced computing architecture, equipment, and software to combine millions of trade data records from various sources to discover patterns of illicit shipments of sensitive U.S. technologies and weapons to terrorists, criminal organizations, and foreign adversaries.
- U.S. Citizenship and Immigration Service (USCIS) – Fraud analytics: evaluate entity resolution tools helped determine the best, most cost-effective ones that match data from various sources to determine or validate someone's identity. Entity resolution tools help prevent USCIS from granting benefits, including citizenship, to criminals, watchlisted individuals, etc.
- Transportation Security Administration (TSA) – Test & Evaluation Support to Third Party TSA Pre✓® Expansion: evaluate private commercial companies' methods to validate identity and conduct criminality screening to support increasing the number of enrollees in the TSA Pre✓® program.

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- USCG – Standardize Analytic Work Stations: identify a suite of tools that will enable better enterprise collaboration and information sharing for USCG intelligence analysts
- Transportation Security Administration – Proof-of-Concept: collaborate with experts from the University of Southern California – Center for Risk and Economic Analysis of Terrorism Events (CREATE), a DHS Center of Excellence, to build a framework for evaluating a cutting-edge approach to screening strategies and resources.
- Intelligence & Analysis – Data Framework: evaluate solutions to accelerate ingestion and analysis of datasets from DHS components, apply data tagging standards, and enable insights DHS-wide.

Question#:	7
Topic:	performance measures
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Knowing if IPTs are succeeding depends on objective performance measures and accountability for results. What metrics will be used to measure performance? Who will be accountable?

Response: 1) The IPT Process will be assessed on two basic parameters; first, did the process generate a DHS- wide profile of research and development activities, and did the process provide a defendable mechanism that is Component driven that results in the DHS High Priority R&D Gaps and a collaborative effort that will provide solutions to close those Gaps. 2) The accountability of the DHS-wide R&D IPT Process resides solely with the Under Secretary of Science and Technology (USST). In the August 25, 2015 memorandum from Secretary Johnson to the DHS Components, he appoints the S&T to lead the overall effort. The success of individual technologies identified via the IPT process will be based on the following metrics: (1) likelihood of transition to use, (2) technical feasibility, (3) affordability, (4) partnerships/resource leveraging, and (5) visionary goal alignment. As stated in Secretary Johnson's August 25, 2015, memo, "The overall IPT effort will be led by S&T, but the individual IPTs will be led by senior representatives from the operational components with representation from Joint Requirements Council portfolio teams and support from S&T."

In the short-term, the IPT process will provide an immediate initial assessment of the level of success based on the five criterions noted above that benchmark R&D efforts within DHS, with longer term validation taking 2-3 years based on the data and type of technology.

Question#:	8
Topic:	organizational chart
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Since our last hearing on this subject, in September of 2014, the Science and Technology Directorate's organizational chart has been updated by, among other changes, eliminating the Director of Acquisition Support and Operations Analysis. Can you explain the reasoning behind these changes, and how these changes are expected to impact S&T going forward?

Response: While it may appear that S&T eliminated the Director of Acquisition Support and Operations Analysis, we renamed the group and realigned resources to accomplish three major outcomes, namely:

- Improve support to the Secretary's Unity of Effort initiative;
- Improve support to S&T Visionary Goals and Apex R&D programs; and
- Improve support to the Department's acquisition efforts.

S&T changed the name from Acquisition Support and Operations Analysis to Capability Development Support, and the group continues to be led by a career SES. The name change was intended to reflect an expansion of its mission space encompassing support to the research and development portfolio in S&T and not being limited to the acquisition programs. The Capability Development Support organization has four divisions:

- Operations and Requirements Analysis;
- Systems Engineering;
- Test and Evaluation; and
- Standards.

The Operations and Requirements Analysis division continues to provide the Components with the operations analysis support as before, but now includes S&T's dedicated support to the Joint Requirements Council, created as part of the Unity of Effort initiative. S&T reconstituted Systems Engineering as a division to provide systems engineering support to acquisition and R&D programs, and provide technology assessments in support of the acquisition review board and IPTs. The Test and Evaluation division continues to provide the independent oversight of operational test and evaluation while becoming increasingly involved in developmental test and evaluation to improve support to acquisition and R&D program throughout the program lifecycle. Finally, the Standards division coordinates standards development, adoption, and integration activities across the Department.

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Topic:	organizational chart
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Question#:	9
Topic:	R&D deliverables
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: How does S&T determine the usefulness of its R&D deliverables to the other components?

Response: An S&T product's usefulness is determined in large part by how it contributes to the component's mission effectiveness. Deliverables such as hardware, software or knowledge products are deemed useful if they make a positive contribution in executing the customer's mission. Working closely with the customers during the R&D cycle answers key questions to ensure usefulness at the end of development. Ensuring products align with the customer's concept of operations and agreement with the customer on metrics, and test and evaluation parameters all contribute to product usefulness. A preferred means of also determining the usefulness of our R&D deliverables is to put them in the hands of the operators/users in an operational environment for a sustained period of time (in the form of an operational pilot). The feedback garnered from an operational pilot is invaluable in determining the usability and effectiveness of the developed technology. The feedback is evaluated and in many cases we are able to make modifications prior to transition to further improve a product's usefulness.

S&T divisions participate in a number of inter-component and interagency working groups, which provide a forum for receiving both input and feedback regarding R&D gaps and needs. Additionally, by piloting technologies with other components as referenced in Question 6, S&T is able to coordinate with and receive feedback from components with regard to their specific needs.

Additionally, S&T's FRG has close relationship with first responders from across federal, state, local, territorial and tribal agencies. FRG engages end users at every stage of the technology development process. By engaging end users at the beginning of the technology development cycle for requirements and then continuing throughout the R&D process, FRG fosters user-produced innovation and ensures that the solutions developed have a high probability of being transitioned to the field.

Specifically, FRG uses its First Responder Resource Group, consisting of more than 120 first responders and representatives of national first responder associations, to translate broad capability gaps and needs into defined, validated requirements, performance measures, and concepts of operations that can be incorporated into FRG's solicitations for projects. Recent technologies developed through the FRRG include:
- Improved Fire Fighter Structure Glove: Firefighters need protective gloves in the field that fit properly, improve dexterity, and are not bulky, while still meeting the

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heat and water-resistance criteria. When a firefighter is required to perform tasks that involve fine motor skills, they oftentimes remove their gloves to complete the task. This exposes their hands to the dangerous conditions of a fire. S&T developed the Improved Structure Firefighting Glove—a less bulky, updated glove that merges the needs of firefighters with available technology and improved materials. The new material and design allows firefighters to make more precise movements without having to remove their gloves. In FY15, the glove received National Fire Protection Association (NFPA) certification and was made commercially available.

- Prepaid Card Reader: FRG developed a software solution capable of reading any magnetic strip card to determine the exact amount of monetary value for the card. This prepaid card reading software solution has the ability to identify the amount stored on the card using any magnetic strip reader and seize and freeze illicit funds before they can be transferred to another individual. Law enforcement will use this technology to stop criminal organizations from being able to use prepaid credit cards to smuggle money into and out of the United States. The project produced an initial 10 prototypes in FY2014. The product is now commercially available to law enforcement agencies.

- Wildland Firefighters Advanced Personal Protection System: In partnership with the California Department of Forestry and Fire Protection, the U.S. Forest Service, the U.S. Army Natick Research Development and Engineering Center National Protection Center and multiple local California Fire Departments, FRG developed a wildland firefighter ensemble that meets National Fire Protection Association Standards 1977 and 1975. The certified garment system improves radiant thermal protection; reduces heat stress; and improves form, fit, and function of the garments. FRG designed and tested approximately 1,000 new garment ensembles for wildland firefighters over the course of two fire seasons during 2012 and 2013. Testing was conducted in both laboratory and real-world fire scenarios; the conclusions of each indicated the garment ensembles reduced heat stress burden on the wearer and fully met program goals, including the intent for the government to own the garments' designs so it could be used by first responders without a fee.

Ultimately, S&T teams with the first responder community and commercial sector to transition technologies so they are available for purchase in the commercial marketplace. As solutions develop into mature, commercial products, they ultimately can be purchased by first responder organizations through FEMA's AEL, which is a list of equipment approved for purchase using FEMA grants. As a service to first responders, FRG also provides objective buying advice for first responders looking at the AEL to help them

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make informed purchase decisions. The System Assessment and Validation for Emergency Responders (SAVER) program conducts objective assessments and validations of commercial off-the-shelf equipment and publishes explanations for different tools and technologies and their application. After S&T has helped commercialize a product and published it on the AEL, we still work with responders through FirstResponder.gov and other federal R&D agencies such as the National Institute of Justice to promote awareness and enable informed procurement decisions in the first responder community.

Question: Does S&T have set timeframes and milestones for evaluating feedback from its customers regarding how deliverables are meeting customers' needs?

Response: Timeframes and milestones for evaluating customer feedback are project specific. Operational pilots are typically months long, sometimes up to a year in duration. Also, we provide operating and maintenance support to transitioned technology for a year after transition during which we solicit and evaluate user feedback.

S&T uses milestones (with anticipated completion dates), negotiated with customers, for project deliverables. From the development of requirements, evaluation of project schedule and milestones, participation in working groups, and rigorous pilot testing to the transition plans for assisting technology transition into commercial use, S&T relies on its customer feedback as a key and effective way to ensure its deliverables are meeting customer needs.

Question#:	10
Topic:	lessons learned
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: How does DHS S&T leverage lessons learned among components? For instance, Customs and Border Protection and the Transportation Security Administration both focus on screening people. What has DHS done to share lessons learned and avoid duplication?

Response: As mentioned in the Undersecretary's testimony as part of Secretary Johnson's Unity of Effort initiative, S&T is spearheading the establishment of IPTs to coordinate and prioritize most of the Department's R&D efforts. These cross-cutting IPTs are proving to be very effective in coordinating R&D, combining efforts where possible, and eliminating duplication. Specifically for screening people, S&T has started a Screening at Speed Apex program. While the initial focus is aviation security, the intent of this Apex program is to gather requirements and development screening technologies for all of the Homeland Security Enterprise.

DNDO has their own research, development, testing and evaluation authorities related to radiological and nuclear detection and forensics. These responsibilities extend beyond DHS and across the entire Global Nuclear Detection Architecture (GNDA), including US Government (USG)-wide programs, and national technical nuclear forensics (NTNF) capabilities. These R&D activities are not currently covered under the new S&T IPT process with the exception of radiological and nuclear threats as related to Border and Aviation security.

S&T is also co-leading the DHS Strategic Sourcing Program for explosives and contraband (guns, knives, etc.) detection equipment. This program is focused on gathering specific detection equipment requirements across DHS. The goal is to develop a DHS-wide contract or agreement that has been established for use by multiple DHS components for purchasing detection equipment for both screening people and baggage. In a similar function, DNDO is the DHS Strategic Sourcing Manager for all radiation detection equipment and performs similar activities in that threat area.

S&T also has numerous activities underway to gather and share lessons learned and to avoid duplicative efforts. Here are specific examples of S&T/ Cyber Security Division's (CSD) communication and participation in various working groups that are also key to sharing lessons learned with other components and avoiding duplication:

- In 2008, S&T/CSD created the Cyber Forensics Working Group (CFWG), which is composed of representatives from federal, state, and local law enforcement

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agencies. Members meet biannually to provide requirements, discuss capability gaps, prioritize the areas of most immediate concern to focus technology development and participate as test and evaluation partners of resultant solutions. CFWG's last meeting was held in November 2015, during which a prioritized list of forensics research requirements was developed.

- S&T/CSD participates in component and industry-wide initiatives to share experiences and lessons learned, such as its work on the Linking the Oil and Gas Industry to Improve Cybersecurity (LOGIIC) program. LOGIIC is an ongoing collaboration with oil and natural gas companies that was formed in 2004 to facilitate cooperative research, development, testing and evaluation procedures to improve cybersecurity in petroleum industry digital control systems. Similarly, S&T/CSD worked with the Department of Energy and industry on the Trustworthy Cyber Infrastructure for the Power Grid (TCIPG) effort to address the challenge of protecting the nation's power grid by improving the security, reliability, and safety of grid infrastructure. Both of these efforts provided ideal opportunities for sharing lessons learned with relevant DHS components, other federal stakeholders, and industry.
- S&T/CSD was also heavily involved in the development of the National Critical Infrastructure Security and Resilience (CISR) R&D Plan required by Presidential Policy Directive (PPD) 21. As part of the two-year, collaborative process to develop the plan, CSD worked intensely with other DHS components and with public and private stakeholders from across the critical infrastructure sectors to develop National CISR R&D Priority Areas that inform R&D investments, promote innovation, and guide research activities.

Question#:	11
Topic:	FY 2016 presidential budget request
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: The FY 2016 presidential budget request includes $616 million in support of the President's Climate Resilience Initiatives. How much, if any, of this would come from the S&T directorate?

Response: No part of the requested funding was included in the S&T budget request.

Question#:	12
Topic:	passenger security screening
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Regarding your goal of achieving screening at speed, most Americans think of the gauntlet of airport passenger security screening. If you can fix this, the American traveling public will cheer you, your team, and DHS. The DHS Inspector General found last month that TSA failed to find mock explosives and banned weapons over 95 percent of the time. What are we going to do to create a reliable one-stop, integrated screening process?

Response: The Apex Screening at Speed (SaS) is a multi-year program that will research and develop new technology, techniques, and processes so that aviation checkpoints can screen a minimum of 300 passengers and their carry-on belongings per lane per hour to the Transportation Security Administration's (TSA) highest security standards. New systems will reduce the need for divestiture of clothing or removal of liquids and electronics from carry-on bags, and adapt dynamically to information provided by risk-based screening. Raising throughput and lowering costs will also enable highly secure screening technology to support other Homeland Security customers. Apex SaS will seek novel technologies and techniques complementary to other explosives detection efforts, most notably Primary Screening for Passengers, Primary Screening for Carry-On Baggage, and Secondary Screening Technology Development. Apex SaS is starting to identify priority areas for technology investment, invest in innovative technologies, and establish new contract vehicles to continue engaging the technology base. Apex SaS has engaged its stakeholders at TSA and is working closely with DHS's Aviation Security Integrated Product Team to focus its resources. Apex SaS will adapt its investment strategy to accommodate the teams' evolving needs and gaps.

Apex SaS engages the private sector (industry) by leveraging current S&T contracts, S&T's Targeted Innovative Technology Acceleration Network (TITAN), an S&T initiative to encourage interaction with the Homeland Security Industrial Base, new contracting opportunities and information sharing opportunities. To capture the great ideas that are outside S&T's structured solicitations, S&T accepted and encouraged proposals from several Long Range Broad Agency Announcement (LRBAA) applications (a tool that allows unsolicited proposals). One LRBAA contract was already awarded to develop computed tomography (CT) scanners, similar to those used for checked bags, appropriate for the checkpoint application. Apex SaS held an industry day in June of 2015 resulting in a better understanding of the market and development potential. S&T is leveraging its In-Q-Tel investment to fund advancements in flat panel multi-antenna detection arrays with the potential to spur development of novel checkpoint passenger screening systems. S&T has established a strong partnership with

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In-Q-Tel, a nonprofit organization founded by the Intelligence Community to capitalize on emerging commercial innovation and make strategic investments to deliver mission-critical capabilities. We will leverage our ALERT Center of Excellence to engage the academic fields of expertise. We plan to solicit both industry and government for additional ideas for specific topics in the near future.

Apex SaS will work closely with TSA and other operational component partners to develop technologies they can procure through their own acquisition process. S&T can develop technology and ready it for operational use, but the ultimate procurement responsibility is left to the operational arms of DHS. This is one of the main reasons for the Integrated Product Teams. This helps ensure S&T is funding technologies that will address the component's most urgent needs and have the highest likelihood for operational transition.

Question#:	13
Topic:	drug destruction technology
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Customs and Border Protection seized 2.5 million pounds of illegal narcotics in 2014. Guarding these drugs is a distraction from their primary mission, but there does not seem to be a uniform or reliable method for drug destruction. Our understanding is that both CBP and the DEA are interested in developing this portable drug destruction technology that would make drug destruction less costly and more efficient, but that they do not have research and development funds to do so. What is S&T doing to engage CBP and industry to develop new portable technologies to destroy drugs?

Response: S&T is leading Secretary Johnson's mandated establishment of Integrated Product Teams (IPTs), including a Border Security IPT, to coordinate and prioritize the Department's R&D efforts. In addition, in 2011, CBP requested a review of product data to support a new narcotics destruction capability program. In response, S&T conducted a thorough technology foraging effort, ultimately providing a list of available narcotics destruction systems. This included product information regarding respective performance, procurement cost, operating and maintenance costs, throughput rate, and a record of performance and reliability.

Question#:	14
Topic:	Transportation Security Acquisition Reform Act (P.L. 113-245)
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Last year, the President signed into law the Transportation Security Acquisition Reform Act (P.L. 113-245) requiring TSA to produce a biennial five year acquisition plan (Plan). As such, TSA provided the Plan on August 12, 2015. The law required consultation with the DHS Science & Technology Directorate on plan development.

a. Please describe the nature of participation with TSA on development of Plan.

b. Please describe how the Plan conforms to or alters S&T's planned explosive and threat detection technology investments and informs the Integrated Product Teams (IPTs) on TSA 5-year technology acquisition priorities.

c. Please explain if TSA has established a formal process for including S&T consultation, review, and priority setting in the iterative planning process.

d. This plan was completed in October 2013. Please provide the committee with examples of successful technology transfer as a result of RDT&E Strategic Plan coordination.

e. Which of the following capability gaps identified by TSA is supported by S&T research investments at this time? Please provide a brief synopsis of research efforts and to what IPT these gaps have been assigned.
i. Enhance the ability to resolve alarms;

ii. Enhance operators' ability to screen passengers' carry-on and checked baggage;

iii. Support risk-based screening throughput goals;

iv. Enhance the ability to verify a passenger's identification and determine vetting status;

v. Minimize physical contact with passengers;

vi. Reduce divestiture screening requirements;

vii. Enhance the ability to identify and screen a passenger and his baggage based on an assigned risk level;

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viii.   Enhance the ability to integrate systems to support risk-based screening;

ix.   Support remote access and data collection from TSE; and,

x.   Enhance the ability to adjust security posture based on risk.

Response:
    a.   Please describe the nature of participation with TSA on development of Plan.

- S&T/EXD had several opportunities to participate in the plan development. EXD personnel attended and participated in several of the industry days and topical working group meetings designed to provide input from industry for the plan. These meetings were hosted by the Washington Homeland Security Roundtable and Security Manufacturers Coalition on behalf of the Transportation Security Administration (TSA). In addition, TSA and S&T personnel discussed the plan content informally during the course of normal interactions. Finally, S&T/EXD had the opportunity to review and comment on the plan during the DHS clearance process.

    b.   Please describe how the Plan conforms to or alters S&T's planned explosive and threat detection technology investments and informs the Integrated Product Teams (IPTs) on TSA 5-year technology acquisition priorities.
- The recently formed Aviation Security (AVSEC) IPT with associated sub-IPTs use the capability gaps from TSA's Transportation Security Capability Analysis Process (TSCAP), which were summarized and highlighted in the plan, as the basis for prioritizing ongoing S&T projects and investments. One of the primary purposes of the IPTs is to ensure the planned R&D activities are aligned with component (TSA) capability gaps.
- S&T is mentioned numerous times throughout TSA's plan, a reflection of the close relationship and alignment between our organizations. TSA and S&T have worked together since both Agencies' inception to identify strategic goals and capability gaps and to create an R&D portfolio serving TSA's operational needs. This will continue through the IPT process, through which TSA is able to review and align S&T's plans for explosives threat detection technology investments to its short and long term acquisition priorities.

    c.   Please explain if TSA has established a formal process for including S&T

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consultation, review, and priority setting in the iterative planning process.
- The recently formed AVSEC IPT with associated sub-IPTs use the capability gaps from TSA's TSCAP, which were summarized and highlighted in the plan, as the basis for prioritizing ongoing S&T projects and investments. One of the primary purposes of the IPTs is to ensure the planned R&D activities are aligned with component (TSA) capability gaps.

d. This plan was completed in October 2013. Please provide the committee with examples of successful technology transfer as a result of RDT&E Strategic Plan coordination.
- At the request of TSA's Explosive Operations Branch, S&T completed live fire testing of TSA developed Modified Least Risk Bomb Location (M-LRBL) procedures. M-LRBL procedures are in-flight emergency protocols for responding to a known suicide bomber threat while in flight. During the course of the effort, CAV&M successfully conducted multiple (7) instrumented live fire tests of M-LRBL procedures in both wide and narrow body commercial aircraft test assets for a range of explosive threat conditions. Cumulative results of CAV&M's M-LRBL testing were presented to TSA components including; TSA's Office of Security Operations Explosive Operations Branch (OSO-EOB), Office of Security Policy and Industry Engagement (TSA OSPIE) and Office of Law Enforcement Federal Air Marshalls Service (TSA OLE-FAMS). As a result of the test effort, TSA's Explosive Operations Branch has implemented training of M-LRBL procedures to TSA's Federal Air Marshalls Service.
- S&T through the National Institute of Standards and Technology, developed pressure sensitive wands (PSWs) and used these wands to train Transportation Security Officers (TSOs) on how to best sample explosives from a surface. This directly supported TSA in enhancing operational effectiveness. TSA is currently planning to incorporate PSW training into the nationwide TSO training curriculum.
- S&T delivered the Physical and Thermal Sensitivity of Technical Grade Ammonium Nitrate (TGAN) Based Improvised Explosives Report to DHS to enable agency planning for countermeasures to specific explosive power, initiation sensitivity, and threat potential of TGAN. The report evaluated Technical Grade Ammonium Nitrate and Ammonium Nitrate based explosive mixtures (containing commonly available fuels) for critical diameter, physical sensitivity and thermal stability. Terrorist groups are continually interested in producing these types of explosives; however, little data previously existed regarding their explosive behavior at various charge sizes.

Question#:	14
Topic:	Transportation Security Acquisition Reform Act (P.L. 113-245)
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
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- Another product of S&T's work in mitigating Homemade Explosives (HME) is the Incident Management Preparedness and Coordination Toolkit (IMPACT), which has transitioned to TSA and law enforcement, and is used in Bomb Incident Protection Plan and Emergency Vulnerability Assessments planning.

e. Which of the following capability gaps identified by TSA is supported by S&T research investments at this time? Please provide a brief synopsis of research effects and to what IPT these gaps have been assigned.

   i   Enhance the ability to resolve alarms;
- Technology gaps related to alarm resolution were identified by the Checkpoint sub-IPT. The Apex SaS project will develop new technologies to transition to the checkpoint which will improve detection and reduce false alarms.

   ii   Enhance operators' ability to screen passengers' carry-on and checked baggage;
- Technology gaps related to the passenger checkpoints were identified by the Checkpoint sub-IPT. The Apex SaS project will develop new technologies to transition to the checkpoint which will increase passenger screening and increase checked baggage screening.

   iii   Support risk-based screening throughput goals;
- Currently risk based screening (RBS) is not in the S&T portfolio. RBS is performed by TSA but will be a consideration in APEX SaS.

   iv   Enhance the ability to verify a passenger's identification and determine vetting status;
- Not in S&T research portfolio as it is a TSA function

   v   Minimize physical contact with passengers;
- The Apex SaS project is developing new technologies that will minimize physical contact with passengers.

   vi   Reduce divestiture screening requirements;
- Technology gaps related to reducing divestiture of passengers were identified by the Checkpoint sub-IPT. The Apex SaS project will develop

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new technologies which reduce the amount of divestiture required for passengers at the checkpoint.

vii   Enhance the ability to identify and screen a passenger and his baggage based on an assigned risk level;
- S&T is facilitating an independent validation and verification (IV&V) via the Homeland Security Studies and Analysis Institute (a Federal Funded Research and Development Corporation) of two aspects of TSA's approach to assessing the passenger risk and applying differentiated physical screening based on that risk judgment.

viii   Enhance the ability to integrate systems to support risk-based screening;
- Not in S&T research portfolio as it is a TSA function

ix   Support remote access and data collection from TSE; and,
- Not in S&T research portfolio as it is a TSA function

x   Enhance the ability to adjust security posture based on risk.
- S&T is currently working with TSA and researchers from the University of Southern California – Center for Risk and Economic Analysis of Terrorism Events (CREATE), a DHS Center of Excellence, on evaluating a proof-of-concept framework that will adjust security posture and application of security resources based on passenger risk (initial focus) and the overall risk associated with individual flights.

Question#:	15
Topic:	APEX Screen at Speed Program
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Please provide an update on the APEX Screen at Speed Program.

Response: Apex Screening at Speed (SaS) is a multi-year program that will research and develop new technology, techniques, and processes so that aviation checkpoints can screen a minimum of 300 passengers and their carry-on belongings per lane per hour to the Transportation Security Administration's (TSA) highest security standards. New systems will reduce the need for divestiture of clothing or removal of liquids and electronics from carry-on bags, and adapt dynamically to information provided by risk-based screening. Raising throughput and lowering costs will also enable highly secure screening technology to support other Homeland Security customers. Apex SaS will seek novel technologies and techniques complementary to other explosives detection efforts, most notably Primary Screening for Passengers, Primary Screening for Carry-On Baggage, and Secondary Screening Technology Development. Apex SaS is starting to identifying priority areas for technology investment, investing in innovative technologies, and establishing new contract vehicles to continue engaging the technology base. Apex SaS has engaged its stakeholders at TSA and is working closely with DHS's Aviation Security Integrated Product Team to focus its resources. Apex SaS will adapt its investment strategy to accommodate the teams' evolving needs and gaps.

Apex SaS engages the private sector (industry) by leveraging current S&T contracts, S&T's Targeted Innovative Technology Acceleration Network (TITAN,) new contracting opportunities and information sharing opportunities. To capture the great ideas that may be outside S&T's structured solicitations, S&T accepted and encouraged proposals from several Long Range Broad Agency Announcement (LRBAA) applications. One LRBAA contract was already awarded to develop computed tomography (CT) scanners, similar to those used for checked bags, appropriate for the checkpoint application. Apex SaS held an industry day in June of 2015 resulting in a better understanding of the market and development potential. S&T is leveraging its In-Q-Tel investment to fund advancements in flat panel anomaly detection technologies. We will leverage our Awareness and Localization of Explosives-Related Threats (ALERT) Center of Excellence in the 3rd quarter of FY16 to engage the academic fields of expertise in algorithm development for Advanced Imaging Technology (AIT). Another avenue of engagement is through the Advanced Development for Security Applications (ADSA) Workshops held annually by ALERT with attendees from academia, industry and government. We plan to solicit both industry and government for additional ideas for specific topics in FY16.

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Apex SaS will work closely with TSA and other operational component partners to develop technologies they can procure through their own acquisition process. S&T can develop technology and ready it for operational use, but the ultimate procurement responsibility is left to the operational arms of DHS. This is one of the main reasons for the Integrated Product Teams. This helps ensure S&T is funding technologies that will address the component's most urgent needs and have the highest likelihood for operational transition.

Question#:	16
Topic:	S&T programs
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: DHS S&T has made a commitment to the High Resolution Trace Detection Program. The Committee understands DHS S&T will also make investments in Next Generation Desktop Explosives Trace Detectors. Please outline specific actions S&T has taken to fully leverage industry in these areas and any lessons that can be applied to other S&T programs.

Response: Recognizing synergistic benefits of leveraging industrial partners, S&T continues to seek out, engage, and collaborate with industrial partners early and often during our process of developing Next Generation Desktop Explosives Trace Detectors (ETDs). There are three timelines of engagement that we practice:

- Pre-award engagement
- Engagement during technology development process
- Engagement throughout all phases of development

Pre-award engagement: S&T organized a two-day Industry Day in July 2013 prior to releasing a targeted Broad Agency Announcement (BAA) for Advanced Trace Detection Instrumentation and Methodologies. This Industry Day provided information on the latest explosives trace detection methods being developed by EXD's industrial partners. EXD also use this event to inform these partners of selected operational requirements. Selected representatives from DHS components such as the Transportation Security Administration (TSA), USCG, CBP, and USSS were invited to present and to chair sessions at this event. These presentations and sessions served to foster a strong understanding of challenges facing ETD operators so industry can focus their in-house R&D efforts on developing solutions to address these challenges.

Engagement during technology development process: S&T released BAA 13-03 which has a focus on developing the next generation benchtop ETDs and tools and methodologies to improve detection. Eleven proposals were selected for award with an expected twelve companies receiving awards, seven as prime contractors. Four of these awards funded industrial partners to develop Next Gen Desktop ETDs. To date, S&T conducted two Preliminary Design Reviews (PDRs) of two ETD prototypes. In each PDR, DHS components' representatives actively participated, deliberated on development progress, and provided feedback to industry partners. These partners used the feedback to enhance performance of their ETD prototypes. An added benefit of having these representatives' participation is the partners received the most up-to-date information on explosives detection from the field.

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Topic:	S&T programs
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Engagement throughout all phases of development: The S&T Program Manager and staff continue to engage trace explosives detection community consisting of industry, academia, and government laboratories to seek out innovative solutions to explosives trace detection. We participate in annual national conferences, organized four semiannual workshops, and nurtured budding scientists via postdoctoral fellowships and students through the DHS Center of Excellence program. These students graduate and find jobs in industry. These outreach efforts create a comprehensive feedback loop for members of the community to leverage knowhow and to disseminate information. This creates a resilient network of experts that can respond quickly and advance innovative solutions to meet emerging challenges of explosives detection.

Question#:	17
Topic:	S&T research model
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Is the current S&T research model designed to enable current technology evolution or is it directed at next generation detection platforms? (If both, please identify the Departmental priority.)

Response: Our research efforts are guided by the Transportation Security Administration's (TSA) Transportation Security Capability Analysis Process (TSCAP) capability gaps, produced by our primary stakeholder TSA. The current technology approach is for technology evolution that provides both short-term and mid-term improvements in explosives threat detection. Near-term solutions such as retrofits and algorithm revisions, prompted primarily by user/performance concerns, are ongoing and are communicated through sub-IPT engagements with TSA components. Next Gen solutions are communicated though additional engagements to the TSA components and are prompted by new detection standards and the upcoming TSA acquisition efforts and recapitalization plans. One example is our research in improving detection algorithms which can enhance the capabilities of the existing machines. Next generation platforms require more extensive research and development because entire system components must be redesigned to function with newer screening technologies, and hence directed at next generation detection platforms within the Apex SaS Program. Another example is research targeting the next generation of explosive trace detectors used primarily in secondary screening. Producing benchtop mass spectrometry systems with an expanded homemade explosives library is of near to mid-term interests as well as efforts in enhancing trace sampling which could be utilized in currently fielded or those systems pending fielding.

Question#:	18
Topic:	S&T research tracks
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: Please explain how S&T research tracks enable industry and S&T to be transformative, as the TSA Administrator has called for.

Response: Our research tracks are two-fold. The approach enables the exploration of both basic and applied research which cross pollinate each other. Basic research is primarily addressed by university partners and National Laboratories. Applied research is primarily addressed by industry partners. Though Technical Collaboration Meetings hosted by the program office, university partners collaborate with industry partners and are in the process of transitioning basic research efforts into applied research applications The goal of this transformative process is to progressively move from basic research, to applied research, to operational deployment for the Transportation Security Administration, through the effective implementation of Go-No-Go decision points and down selects in alignment with stakeholder interests, leading to improvements in threat detection in passenger and checked baggage.

Question#:	19
Topic:	air cargo screening
Hearing:	Review of Progress by the Department of Homeland Security (DHS), Science and Technology Directorate
Primary:	The Honorable Lamar Smith
Committee:	SCIENCE (HOUSE)

Question: The Implementing the 9/11 Commission Recommendations Act of 2007 (P. L. 110-53) required TSA to establish a system to screen 100% of the cargo transported on passenger aircraft within three years of enactment (i.e., by August 2010) in a manner that provides a level of security commensurate with the level of security applied to passenger checked baggage. According to TSA this mandate has been met. Much of the fleet of air cargo screening equipment, however, will have reached its useful life in the next few years.

a.   Please classify whether S&T views investment in air cargo R&D as a near, mid-, or long-term priority, both in terms of focus and resourcing.

b.   Has TSA provided strategic direction on capability gaps that exist for air cargo?

c.   Has S&T conducted a review of the current air cargo screening process and technologies with particular attention to security and through-put requirements of next generation screening technology?

d.   TSA was appropriated $11 million for air cargo screening technologies in FY2015 and has requested the same amount for FY2016. This funding supports the evaluation and qualification testing of existing and emerging air cargo screening technologies and procedures, but does not include research and development costs, which are borne by screening equipment product vendors.   What research is S&T performing to improve air cargo screening as current technology (deployed to meet the 100% screening requirements) is replaced?

Response:

a. Please classify whether S&T views investment in air cargo R&D as a near, mid-, or long-term priority, both in terms of focus and resourcing.
    •   S&T has continuously supported the Transportation Security Administration's (TSA) air cargo goals since our inception. We review R&D projects in this vital mission area for all three areas (near/mid/long term) and work with TSA each year to adjusts goals and projects as necessary. TSA's qualification process is designed to accommodate technology advances and the newest industry products. Vendors update their products frequently to maintain competitive position in the marketplace and, in the case of Explosives Trace Detectors (ETD); systems are modernized or replaced in order to meet most current detection and performance

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requirements

b. Has TSA provided strategic direction on capability gaps that exist for air cargo?
   • TSA and S&T have worked together since both Agencies' inception to identify strategic goals and capability gaps. This effort continues through the IPT process.

c. Has S&T conducted a review of the current air cargo screening process and technologies with particular attention to security and through-put requirements of next generation screening technology?
   • S&T and TSA continuously review current processes and existing technologies to evaluate all capabilities, including through-put, to determine capability gaps and future requirements.

d. TSA was appropriated $11 million for air cargo screening technologies in FY2015 and has requested the same amount for FY2016. This funding supports the evaluation and qualification testing of existing and emerging air cargo screening technologies and procedures, but does not include research and development costs, which are borne by screening equipment product vendors. What research is S&T performing to improve air cargo screening as current technology (deployed to meet the 100% screening requirements) is replaced?
   • The R&D for new air cargo screening systems is borne by both S&T and vendors. S&T has several recent and ongoing R&D projects with respect to improving air cargo screening. The following three are representative but not all inclusive: 1) Screening Palletized Air Cargo; 2) Opacity and Complexity Assessment Software Tool; and 3) Ground-Truth Chemical Measurements in Support of Air Cargo Security. The first is currently undergoing further development and evaluation with a foreign government at no expense to the U.S. Government (S&T funded the initial development). S&T and TSA will monitor developments to determine readiness to enter TSA's qualification process. The second project demonstrated a means to determine what cargo x-ray images could be screened with human eyes and what cargo x-ray images were too convoluted to screen with human eyes and would require a second method to screen. Finally, the third project will help determine the viability of using existing trace explosive detectors to screen various air cargo instead of more expensive X-ray systems i.e., is there enough threat material to enable detection using trace detection methods.

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