

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

U.S. House of Representatives

**Committee on Homeland Security,
Subcommittee on Cybersecurity, Infrastructure Protection, and Security Technologies
&
Committee on Science, Space, and Technology
Subcommittee on Research and Technology**

September 9, 2014

Good morning Chairman Meehan, Chairman Buechson, Ranking Member Clark, Ranking Member Lipinski, and distinguished members of the Subcommittees. Thank you for the opportunity to testify before you today on re-authorization of the Department of Homeland Security's (DHS) Science and Technology Directorate (S&T). In this testimony, I will discuss how S&T, one of a handful of components in the Department created from whole cloth under the original Homeland Security Act of 2002, has grown in the last 11 years into a trusted partner for DHS operators and state, local, tribal, and territorial first responders. With S&T's reauthorization, the Committee has an opportunity to help launch a 21st century research and development (R&D) organization that will serve as a model for federal R&D – hyper-connected, exploiting the convergence of scientific and technical disciplines, capable of meeting increasing demand for return on taxpayer dollars, and tailored to the “new digital age.”¹

To frame the conversation about S&T, I have two observations from my time so far as Under Secretary. First, I believe given the current and projected threat environments, technology based solutions (materiel and human centric) will increasingly be an essential force multiplier to providing operators and first responders the upper hand in their respective operational spaces. Technology and R&D are the bridge to the future of homeland security. For example, without harnessing advances in science and technology, we simply cannot, with current resources, screen and secure continuously rising flows of passengers and cargo and counter sophisticated, motivated adversaries at land, air, and sea Ports of Entry. The most effective and efficient changes come with smart application of technical and analytical expertise. Though S&T's value and capabilities are acknowledged by many throughout the Department, we continue to seek new partners and help address the growing need for technology in the Homeland Security Enterprise.

The second observation is that S&T has a passionate and dedicated workforce. Walking the halls, I am invigorated by the widespread enthusiasm for our mission. Our workforce is hungry to contribute, and we have the technical breadth and depth to work with operators and end users across the breadth of the Department's missions.

¹ A term borrowed from Eric Schmidt and Jared Cohen's *The New Digital Age*, which illustrates potential opportunities and challenges in the emerging technological era that we will inhabit.

I believe that given S&T's workforce and the rising urgency for technology as a force multiplier, there is yet-to-be-realized potential for S&T to support the Department and the Nation. In the coming years, my objective is to help S&T actualize that potential and become a full-fledged enabler and trusted performer across the Department. This pursuit, and the ability for S&T to provide the bridge between present and future homeland security capabilities, rest significantly on whether we can transform the Directorate into a 21st century federal R&D organization. For that, we need help from Congress.

As Under Secretary, my thinking is influenced by lessons learned in my time at the Department of Defense (DoD), in industry, and at federally funded laboratories. Many corporate labs today are under increased pressure to prove a direct impact to profits. Some laboratories are seen by business unit leaders as imposing an unjustified tax, and many surviving laboratories ensure that their researchers have at minimum a baseline understanding of the business context of their work. One way that these laboratories are enabling 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 precisely the model I intend to implement at S&T with DHS's operational components.

After my confirmation, I came to S&T with five priorities to execute – *visionary goals, actionable strategy, an empowered workforce, force multiplying solutions, and an energized Homeland Security Industrial Base* – to address how we plan as a Directorate and to ensure that we fully leverage all available resources. As I see it, there are opportunities to further refine and improve how we work and what we focus on as an organization. Those priorities split into two basic categories: first, how we plan and prioritize at S&T and, second, how to bring all available resources to bear in execution of our programs.

It is important to mention one item to provide additional strategic context before covering specifics. To address the range of challenges the nation faces most collaboratively and effectively within the Department, we have recently undertaken an initiative entitled "Strengthening Departmental Unity of Effort." In his April 22, 2014, memorandum, Secretary Johnson directed a series of actions to enhance the cohesiveness of the Department, while preserving the professionalism, skill, and dedication of the people within, and the rich history of, the DHS components.

There are two elements in this initiative: new senior leader forums led by the Secretary and the Deputy, and department-wide strategy, requirements, and budget development and acquisition processes that are tied to strategic guidance and informed by joint operational plans and joint operations. These are building and maturing DHS into an organization that is greater than the sum of its parts – one that operates much more collaboratively, leverages shared strengths, realizes shared efficiencies, and allows us to further improve our important role as an effective domestic and international partner. DHS S&T participates fully in the range of Unity of Effort initiative activities directed by the Secretary, but just as significantly, functions as a Directorate with the same unifying principles.

A strategic focus for homeland security

Effective planning is how we as an organization will translate the basis for our work (e.g., Component priorities, the Secretary's initiatives, congressional mandates, White House policy) into functional programs that ultimately deliver novel or improved capability. This includes a strategic vision spanning the near term, including specific courses of action, through the long term and far horizon, including ambitious goals.

Four visionary goals

As a first step, one of my priorities coming on board was establishing visionary goals that would serve as 30-year horizon points to build toward. When Dr. George Heilmeier, one of the great technology leaders of our time, was Director of the Defense Advanced Research Projects Agency, the organization and its stakeholders were invigorated by his articulation of visionary goals, what he called his "silver bullets." *Make the oceans transparent. Create an invisible aircraft.* Heilmeier's visionary goals strove for previously unachieved capabilities and lower-cost equivalents to existing capabilities. They helped orient the organization and inspired stakeholders, including operators, end users, and performers in industry and academia.

R&D requires creativity and imagination, and we must tap into that enthusiasm to spur big thinking. At S&T, I tasked a working group with representatives from throughout the organization to draft vision statements for consumption and feedback from the rest of the Directorate and our end user stakeholders. Building off of existing policy and doctrine (e.g., the Quadrennial Homeland Security Review, Secretary Johnson's priorities, existing Homeland Security Presidential Directives), the group generated the four following draft goals:

- *Screening at Speed: Matching 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. Whether screening people, baggage or cargo, unobtrusive technologies and improved processes will enable the seamless detection of threats while respecting privacy, with minimal impact to the speed of travel and the pace of commerce.
- *A Trusted Cyber Future: Protecting Privacy, Commerce, and Community*
In a future of increasing cyber connections, users will trust that infrastructure is resilient, information is protected, illegal use is deterred, and privacy is not compromised. Frictionless security will operate seamlessly in the background, based on self-detecting, self-protecting, and self-healing cyber critical infrastructure – all without disruption.
- *Enable the Decision Maker: Providing Actionable Information Ahead of Incident Speed*
The decision maker has improved situational awareness and is better able to understand risks, weigh options, and take action – literally experience the information. The essential element to making informed decisions is access to timely, accurate, context-based information. Supported by new decision support, modeling and simulation systems, critical decisions can be made based on

relevant information, transforming disparate data into proactive wisdom and ultimately improving operational effectiveness.

- *Responder of the Future: Protected, Connected, and Fully Aware*
The responder of the future is threat-adaptive, able to respond to all dangers safely and effectively. Armed with comprehensive physical protection; interoperable, networked tools; technology-enhanced threat detection and mitigation capabilities; and timely, actionable information, the responder of the future will be able to serve more safely and effectively as an integral part of the Nation's resiliency.

Following the development of the initial draft set of visionary goals by the working group, we opened them to Directorate-wide discussion and development. Based on that feedback, changes were made before a second wave of input from a wider group including the Department and external stakeholders outside DHS.

One important note is that these are our visionary goals, but they certainly do not capture our R&D portfolio in its entirety. The homeland security mission space is broad, and many critical efforts are not or are only indirectly included in these goals. That a particular current effort is not captured in a 30-year vision does not necessarily speak to the value of a potential project or place within S&T's portfolio of investments. The visionary goals are devices to capitalize on creativity and serve as North Stars to drive innovation within S&T and our broader community.

An actionable strategy

With the visionary goals as an ambitious end state, the next step is a narrower, 5-to-10 year strategic plan for S&T. This will be a nearer-term roadmap for how our organization seeks to achieve our visionary end goals. Development of a strategy is a platform to think through and communicate our plan internally and, as a result, make the most of our investments. Externally, a good strategy also provides critical signposts to industry, Congress, and other stakeholders for where our priorities lie and the path we seek to reach for long-time horizon deliverables. This is a standard tool in industry and elsewhere. I look forward to using the same approach at S&T to make us more accessible and to be the foundation for how we interface within the Department, as an interagency partner, and with industry and our other non-federal partners.

Drawing on my experience in industry, a strategic plan must be actionable and, in order to be useful, cannot simply be a reiteration of our existing work and tally of our investments over the last five years projected into the future. We need to lay out S&T's next five to 10 years and determine concrete metrics for success. In order to keep the strategy current and account for unanticipated changes or emergent priorities, the strategy will also be revisited as part of a periodic process. Upon completion of the S&T Strategic Plan later this year, I look forward to sharing it with this Committee, the rest of Congress, and our stakeholders in industry and academia at home and abroad.

Delivering force multiplying solutions

In order to position the Directorate more strategically, we are updating our approach to R&D programs. A new approach will allow a more focused, strategic relationship with our partners and will address the need for a jointly calibrated investment risk profile. At times, there will rightly be pressure to fill immediate needs or invest in incremental improvements, but a healthy portfolio must still allow for a portion of projects to carry more technical risk and offer proportionally greater potential returns. My vision for a balanced R&D portfolio is one that makes appropriate tradeoffs between technical feasibility and operational impact of projects, weighs potential event's probability and impact, and that distributes appropriately across types of performers (including non-traditional) and project timelines (less than one year vs. five years).

As such, I plan for a portfolio that spans quick success projects integrating off-the-shelf technologies to potentially disruptive technologies that, out of necessity, will be high risk. S&T and our stakeholders have to embrace the risk-capability tradeoffs if we are to achieve our potential to deliver both near term and game-changing capabilities to our end users. There will also be three categories of programs, outlined below, that will ultimately reduce S&T's total number of programs but will increase overall impact, strategic focus, and sustainability of the R&D portfolio.

The first category will be our Apex programs. Since S&T's first Apex began with the Secret Service in 2010, Apex programs have been some of our most successful and have generated a full range of lessons learned including on front-end assessment and capability baselining, working jointly with DHS operational partners, and joint program execution. Much of the original Apex structure will remain – these will still be cross-cutting, multi-disciplinary efforts intended to solve problems of strategic operational importance – but the projects are being scaled to apply to a wider portion of the portfolio and will operate on longer five-year timelines. The new Apexes will include some current projects rolled up with expanded or new ones. With high-profile programs, concrete deliverables, precise milestones and timelines, and significant increases in dollar and workforce investment, we believe that the new, scaled Apex efforts will bring substantial gains for our operational partners involved with screening, cybersecurity, flood resilience, biodetection, and emergency response.

The second category of programs will be what we currently refer to as our Technology Engine programs. These will focus on technology foraging and the development of specific core capabilities and systems that cut across, and benefit, numerous programs and projects across S&T's portfolio. We see these bringing a push-pull dynamic to the Directorate. They will be pulled as service providers to Apexes and other efforts (e.g., numerous programs have data analytic or network security needs), but they will also push for integration of universal needs and capabilities like interoperability into projects throughout S&T. These technology areas, including data analytics or modeling and simulation as examples, will provide a critical mass of knowledge and expertise to ensure efficiency and proper leverage of previous, current, and future investments.

The final category includes many focused programs not captured under the umbrella of Apexes or Technology Engines but which are still critical for meeting the needs of DHS Components

and our Homeland Security Enterprise partners. Example programs would include our development of bioassays, which are a foundational element of the Nation's biodefense and ability to screen and monitor for pathogens and potential bio-attacks. This would also include investments in research infrastructure and unique testbeds such as our cyber experimental research testbed, which allows cybersecurity researchers to test and refine their tools and technologies in large, Internet-scale conditions.

S&T's process for identifying capability gaps

There are two elements of S&T's work that are complementary but distinct. The first, requirements, is for acquisition programs and deals with physical characteristics and operational necessities (e.g., weight, dimension, ruggedness, look and feel). S&T's contributions in this area include participation in the Department's joint capabilities and requirements process. Operational capability gaps, which are the second element, address missions, or subsets of missions that cannot be met currently or efficiencies which significantly enhance performance; these are based on customer and end user input. These operational capability gaps serve as S&T's primary driver for what we focus on in R&D programs.

Regarding requirements, as you know, the Secretary established a Department-wide Joint Requirements Council (JRC) in June as part of his Unity of Effort Initiative. The JRC identifies common capability needs and challenges across DHS Components, and will work as an essential input into S&T's own R&D process. In addition to JRC membership, S&T currently provides the JRC's primary analytic resources. As such, S&T is helping develop and refine JRC analysis, methodology, and process in addition to partnering with topic-specific teams to conduct capabilities-based assessments. Working under the direction of the JRC Chair and with the other JRC stakeholders, we will establish a lasting and functional framework for the Department's requirements process.

The JRC and corresponding DHS joint requirements process often highlight capability gaps and can generate valuable input for S&T's programs. However, acquisition-related input like physical requirements is not the primary basis for R&D programs. For a successful R&D organization, any programs, strategy, or visionary goals ultimately must grow from and be tied to customers' and end users' capability gaps. A healthy process for identifying capability gaps is an R&D organization's engine for understanding what our stakeholders need to do their jobs, for knowing where and what services to provide (e.g., later-stage acquisition support, engineering services, subject matter expertise), and for validating the effectiveness and the value of the investments that S&T is making.

Moving forward, S&T will formalize and integrate its framework for communicating, documenting, addressing, and reviewing capability gaps and R&D requirements. These generally grow from two complementary categories. The first is conceptual development through embedding directly with operators, analysis of future threats, or other interaction with operators. The second is through hands-on experimentation, also influenced by embedding with operators as well as through types of events like those in the Joint Interagency Field Exploration program.²

² Sponsored by S&T and the Department of Defense and conducted in conjunction with the Naval Postgraduate School, Joint Interagency Field Exploration events bring together operational end users with technology companies

Those R&D requirements will then be the basis for S&T's technology roadmaps and new start programs.

There are several driving principles as S&T locks in its formal process for identifying capability gaps: top-down prioritization by leadership; bottom-up engagement with operational staff and end users for challenge statements, proposals, and validation; documents capturing current efforts, challenges, and strategies; and periodic engagement and review at both the executive and working levels of our organizations. Though this process will feature many of the same elements across our many partner organizations, it will be tailored to each customer in order to ensure functional governance, appropriate resource commitment, and mutual management of expectations.

A 21st century R&D workforce

Going back to the lessons learned from corporate labs that have maintained their value to organizations, I look forward to implementation of a much more robust process for S&T's workforce to embed with operators and to allow operational staff to detail to S&T and provide direct input to our R&D projects. To function in the new digital age, we need scientists who break down firewalls between R&D and operations and who become fluent in the language of operators and end users. These "multi-lingual" program managers that can slide between operational and technical environments have the best track records for successful projects and transition to use.

To achieve this, I would like more opportunities for staff to gain firsthand understanding of DHS operations through a formal program to embed technical subject matter expertise experts in the field with operators. We will have different durations for different purposes and outcomes, perhaps a two-week speed embed in some cases and in others a more comprehensive six-month or one-year stint. There are considerable obstacles to overcome in order to successfully launch such a program – e.g., ensuring staff embed in the right places and see real operations, that staff are in a position that does not disrupt law enforcement or other sensitive operations – but the benefit of deeper connection to customers and a reinforced R&D requirements process speak for themselves.

I also believe that achieving this adaptable, "multi-lingual" workforce requires a more agile and modern hiring authority that is suited to an R&D organization. Part of being responsive to end-user R&D requirements is agility and adaptability in our workforce. This implies that our program managers are able to work across the three categories of programs detailed above and have skillsets that are not limited to a specific line of business or type of project. That also means being able to boost our talented career workforce with more strategic use of our existing hiring authorities in the Homeland Security Act to fill urgent needs and inject outside perspective into our programs. With a fluid workforce strengthened through term-limited outside hires, our external S&T stakeholders are more effectively connected to the organization, we can foster

to explore the potential of new capabilities to address challenges faced by federal agencies. The environment facilitates a collaborative working relationship between government, academia, industry, and non-governmental organizations to promote the identification and assessment of emerging and maturing technologies with the primary goal of accelerating the delivery of enhanced capabilities to the end user.

technical engagement (including with STEM students) on homeland security challenges, and our organization is better positioned to support the Department and first responders.

Leveraging all available resources

In addition to more effective planning, we are also working to ensure that S&T takes advantage of the full spectrum of resources across what I refer to as the S&T ecosystem, which is the broad network of technical expertise inside and outside of government that can be brought to bear for virtually any issue operators face. This S&T ecosystem includes Department of Energy and DoD labs that are national assets and global leaders in many research areas; our Nation's broad base of universities, many of which are DHS Centers of Excellence; and small businesses, the heart of our Nation's innovation, that we engage through specialized vehicles like our Small Business Innovation Research (SBIR) awards. Any potential R&D performer inside and outside government across industry, academia, government-funded and private laboratories, and in the United States or abroad is a part of the S&T Ecosystem.

The Federal Government no longer provides the same share of funding for research and development as it did in the Cold War era, and we can no longer assume we have access to the best minds if we work exclusively through who and what we already know.³ Though it is easy to stovepipe and use known performers, a 21st century R&D organization must tap innovation engines in the venture capital world, Silicon Valley, or universities to name a few. We face a vast homeland security threat space and the entire Homeland Security Enterprise benefits from a wider base of potential performers engaged in homeland security R&D. The more vehicles to reach those potential performers (including DHS Centers of Excellence and SBIR above, cooperative research and development agreements, newly-delegated prize authority, and so on), the more effectively and efficiently we can develop essential security solutions.

An empowered S&T workforce

Tapping the full potential of the S&T ecosystem will require putting effort into improving coordination and collaboration within DHS S&T. Across offices at S&T, we already cover most of the S&T Ecosystem on a piece by piece basis with several offices actively engaged with innovative potential performers. We can be doing more, however, to ensure that S&T is internally unified and using those connections toward a common purpose. I will foster an even greater unity of effort between elements of S&T like the Homeland Security Advanced Research Projects Agency, our university-based Centers of Excellence, our five operational homeland security labs, our Acquisition Support and Operations Analysis group, or our Small Business Innovation Research program. That will allow S&T to tailor our R&D portfolio performers to those suited to greater innovation or greater feasibility based on mission needs and demands.

Having that type of agile, cross-connected, and empowered workforce means recognizing the value of taking a risk if the payout is a disruptive capability, such as total situational awareness at all land borders. In recent years, DHS S&T has not had this freedom or flexibility. But for the

³ The Federal Government was the main provider of the Nation's R&D accounting for 53.9 percent in 1953 and 66.8 percent in 1964. In 2011, Federal spending accounted for 29.6% of the Nation's R&D spending. Source: National Science Foundation (<http://www.nsf.gov/statistics/seind14/content/chapter-4/at04-06.pdf>).

long term health of DHS and the Homeland Security Enterprise, S&T and its stakeholders must be tolerant of more risk in S&T's R&D portfolio. We will still pursue lower risk, more incremental projects where appropriate. But we will also foster innovation at S&T with institutional allowance for more risky projects that carry higher potential of failure but also significant potential for reward if the project succeeds. An R&D organization is not fulfilling its mission if it focuses on minor improvements to the last great thing at the cost of failing to pursue the next great thing; we must balance our workforce and our investments against that.

An energized Homeland Security Industrial Base

Another aspect of leveraging the full S&T ecosystem is fostering deeper engagement with an energized Homeland Security Industrial Base. The Department of Defense has the Defense Industrial Base, a private sector engine for design, production, and maintenance of our military's weapons and systems. When Defense needs a new missile, submarine, or communications network, industrial machinery outside of government develops and delivers a product. While DHS cannot match the DoD's resources, I know from my time in industry that companies of all sizes are interested in doing business in homeland security.

Our Department, similar to much of government, is often criticized by industry for lack of transparency and failure to share information to help private companies align their own investments to where government needs help. S&T will proactively address these criticisms. I have already noted some instances – an updated and actionable S&T Strategic Plan tailored to companies, a refined R&D requirements process, more effective outreach and information sharing, and a more transparent and informative web presence. My hope as Under Secretary is, through sustained and effective engagement with the Homeland Security Industrial Base, that we begin to see industry more closely align their internal R&D budgets to homeland security priorities.

S&T's value to the Department

Before I conclude, I think it is important to recognize that, although R&D is the backbone of our organization, S&T has more responsibilities and provides many more services to the Department than a traditional R&D organization. We coordinate and oversee operational test and evaluation for all major investments across DHS. We oversee implementation of the Support Anti-Terrorism by Fostering Effective Technologies Act of 2002, better known as the SAFETY Act, one of the more innovative approaches to incentivizing private development of homeland security-focused technology and services. With the DHS Office of the General Counsel, we are responsible for the entire Department's intellectual property portfolio. We work with all elements of the Department to ensure DHS compliance with treaties such as the Biological Weapons Convention. We operate laboratories, such as the National Biodefense Analysis and Countermeasures Center and Plum Island Animal Disease Center, whose missions extend beyond R&D to supporting operational homeland security missions. We provide technical support that backstops major departmental initiatives such as end-to-end acquisition reform as part of the Secretary's Strengthening Departmental Unity of Effort initiative. The list goes on.

Because of that wider role, and because our R&D work already connects us with operators throughout the Department, we are one of the elements of DHS that can serve as glue between operational elements. It is critical we preserve this and continue to be viewed as an objective arbiter and trusted partner, not an overseer or disrupter of operations. As this committee contemplates potential new authorities for S&T, please be mindful of this important dynamic. Achieving S&T's mission, bringing technology to the fore for Components and first responders, supporting the Secretary's vision for the Department, and fulfilling our congressional mandates rest largely on being able to leverage a positive relationship with our partners and end users.

Conclusion

Your commitment to S&T's re-authorization validates the role the organization has grown into at DHS and is an important step to shedding the role R&D organizations often fall into today as bill payers for other shorter term needs. Technology will be essential for answering the challenges we face in homeland security today, and S&T has a critical role to fill as the R&D engine of the Homeland Security Enterprise.

I share a vision for the Directorate to help highlight areas where we need your help. S&T today, through considerable work and dedication from its workforce, has made the most of an Industrial Age toolbox in a Digital Age R&D landscape. Re-authorization of S&T is a chance to empower an R&D organization for the 21st century and to give us the flexibility to empower our workforce, engage more effectively with industry and other non-government stakeholders, and bring more and better solutions to our DHS and first responder customers.

Thank you for inviting me today to discuss S&T and share my vision for the Directorate. I am thrilled to be a part of this organization and know that, with your support in Congress, we will continue making great strides and finding new and better ways to support homeland security operators. I look forward to your questions.

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- *Responder of the Future: Protected, Connected, and Fully Aware*
The responder of the future is threat-adaptive, able to respond to all dangers safely and effectively. Armed with comprehensive physical protection; interoperable, networked tools; technology-enhanced threat detection and mitigation capabilities; and timely, actionable information, the responder of the future will be able to serve more safely and effectively as an integral part of the Nation's resiliency.

Following the development of the initial draft set of visionary goals by the working group, we opened them to Directorate-wide discussion and development. Based on that feedback, changes were made before a second wave of input from a wider group including the Department and external stakeholders outside DHS.

One important note is that these are our visionary goals, but they certainly do not capture our R&D portfolio in its entirety. The homeland security mission space is broad, and many critical efforts are not or are only indirectly included in these goals. That a particular current effort is not captured in a 30-year vision does not necessarily speak to the value of a potential project or place within S&T's portfolio of investments. The visionary goals are devices to capitalize on creativity and serve as North Stars to drive innovation within S&T and our broader community.

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With the visionary goals as an ambitious end state, the next step is a narrower, 5-to-10 year strategic plan for S&T. This will be a nearer-term roadmap for how our organization seeks to achieve our visionary end goals. Development of a strategy is a platform to think through and communicate our plan internally and, as a result, make the most of our investments. Externally, a good strategy also provides critical signposts to industry, Congress, and other stakeholders for where our priorities lie and the path we seek to reach for long-time horizon deliverables. This is a standard tool in industry and elsewhere. I look forward to using the same approach at S&T to make us more accessible and to be the foundation for how we interface within the Department, as an interagency partner, and with industry and our other non-federal partners.

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Delivering force multiplying solutions

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As such, I plan for a portfolio that spans quick success projects integrating off-the-shelf technologies to potentially disruptive technologies that, out of necessity, will be high risk. S&T and our stakeholders have to embrace the risk-capability tradeoffs if we are to achieve our potential to deliver both near term and game-changing capabilities to our end users. There will also be three categories of programs, outlined below, that will ultimately reduce S&T's total number of programs but will increase overall impact, strategic focus, and sustainability of the R&D portfolio.

The first category will be our Apex programs. Since S&T's first Apex began with the Secret Service in 2010, Apex programs have been some of our most successful and have generated a full range of lessons learned including on front-end assessment and capability baselining, working jointly with DHS operational partners, and joint program execution. Much of the original Apex structure will remain – these will still be cross-cutting, multi-disciplinary efforts intended to solve problems of strategic operational importance – but the projects are being scaled to apply to a wider portion of the portfolio and will operate on longer five-year timelines. The new Apexes will include some current projects rolled up with expanded or new ones. With high-profile programs, concrete deliverables, precise milestones and timelines, and significant increases in dollar and workforce investment, we believe that the new, scaled Apex efforts will bring substantial gains for our operational partners involved with screening, cybersecurity, flood resilience, biodetection, and emergency response.

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S&T's process for identifying capability gaps

There are two elements of S&T's work that are complementary but distinct. The first, requirements, is for acquisition programs and deals with physical characteristics and operational necessities (e.g., weight, dimension, ruggedness, look and feel). S&T's contributions in this area include participation in the Department's joint capabilities and requirements process. Operational capability gaps, which are the second element, address missions, or subsets of missions that cannot be met currently or efficiencies which significantly enhance performance; these are based on customer and end user input. These operational capability gaps serve as S&T's primary driver for what we focus on in R&D programs.

Regarding requirements, as you know, the Secretary established a Department-wide Joint Requirements Council (JRC) in June as part of his Unity of Effort Initiative. The JRC identifies common capability needs and challenges across DHS Components, and will work as an essential input into S&T's own R&D process. In addition to JRC membership, S&T currently provides the JRC's primary analytic resources. As such, S&T is helping develop and refine JRC analysis, methodology, and process in addition to partnering with topic-specific teams to conduct capabilities-based assessments. Working under the direction of the JRC Chair and with the other JRC stakeholders, we will establish a lasting and functional framework for the Department's requirements process.

The JRC and corresponding DHS joint requirements process often highlight capability gaps and can generate valuable input for S&T's programs. However, acquisition-related input like physical requirements is not the primary basis for R&D programs. For a successful R&D organization, any programs, strategy, or visionary goals ultimately must grow from and be tied to customers' and end users' capability gaps. A healthy process for identifying capability gaps is an R&D organization's engine for understanding what our stakeholders need to do their jobs, for knowing where and what services to provide (e.g., later-stage acquisition support, engineering services, subject matter expertise), and for validating the effectiveness and the value of the investments that S&T is making.

Moving forward, S&T will formalize and integrate its framework for communicating, documenting, addressing, and reviewing capability gaps and R&D requirements. These generally grow from two complementary categories. The first is conceptual development through embedding directly with operators, analysis of future threats, or other interaction with operators. The second is through hands-on experimentation, also influenced by embedding with operators as well as through types of events like those in the Joint Interagency Field Exploration program.²

² Sponsored by S&T and the Department of Defense and conducted in conjunction with the Naval Postgraduate School, Joint Interagency Field Exploration events bring together operational end users with technology companies

Those R&D requirements will then be the basis for S&T's technology roadmaps and new start programs.

There are several driving principles as S&T locks in its formal process for identifying capability gaps: top-down prioritization by leadership; bottom-up engagement with operational staff and end users for challenge statements, proposals, and validation; documents capturing current efforts, challenges, and strategies; and periodic engagement and review at both the executive and working levels of our organizations. Though this process will feature many of the same elements across our many partner organizations, it will be tailored to each customer in order to ensure functional governance, appropriate resource commitment, and mutual management of expectations.

A 21st century R&D workforce

Going back to the lessons learned from corporate labs that have maintained their value to organizations, I look forward to implementation of a much more robust process for S&T's workforce to embed with operators and to allow operational staff to detail to S&T and provide direct input to our R&D projects. To function in the new digital age, we need scientists who break down firewalls between R&D and operations and who become fluent in the language of operators and end users. These "multi-lingual" program managers that can slide between operational and technical environments have the best track records for successful projects and transition to use.

To achieve this, I would like more opportunities for staff to gain firsthand understanding of DHS operations through a formal program to embed technical subject matter expertise experts in the field with operators. We will have different durations for different purposes and outcomes, perhaps a two-week speed embed in some cases and in others a more comprehensive six-month or one-year stint. There are considerable obstacles to overcome in order to successfully launch such a program – e.g., ensuring staff embed in the right places and see real operations, that staff are in a position that does not disrupt law enforcement or other sensitive operations – but the benefit of deeper connection to customers and a reinforced R&D requirements process speak for themselves.

I also believe that achieving this adaptable, "multi-lingual" workforce requires a more agile and modern hiring authority that is suited to an R&D organization. Part of being responsive to end-user R&D requirements is agility and adaptability in our workforce. This implies that our program managers are able to work across the three categories of programs detailed above and have skillsets that are not limited to a specific line of business or type of project. That also means being able to boost our talented career workforce with more strategic use of our existing hiring authorities in the Homeland Security Act to fill urgent needs and inject outside perspective into our programs. With a fluid workforce strengthened through term-limited outside hires, our external S&T stakeholders are more effectively connected to the organization, we can foster

to explore the potential of new capabilities to address challenges faced by federal agencies. The environment facilitates a collaborative working relationship between government, academia, industry, and non-governmental organizations to promote the identification and assessment of emerging and maturing technologies with the primary goal of accelerating the delivery of enhanced capabilities to the end user.

technical engagement (including with STEM students) on homeland security challenges, and our organization is better positioned to support the Department and first responders.

Leveraging all available resources

In addition to more effective planning, we are also working to ensure that S&T takes advantage of the full spectrum of resources across what I refer to as the S&T ecosystem, which is the broad network of technical expertise inside and outside of government that can be brought to bear for virtually any issue operators face. This S&T ecosystem includes Department of Energy and DoD labs that are national assets and global leaders in many research areas; our Nation's broad base of universities, many of which are DHS Centers of Excellence; and small businesses, the heart of our Nation's innovation, that we engage through specialized vehicles like our Small Business Innovation Research (SBIR) awards. Any potential R&D performer inside and outside government across industry, academia, government-funded and private laboratories, and in the United States or abroad is a part of the S&T Ecosystem.

The Federal Government no longer provides the same share of funding for research and development as it did in the Cold War era, and we can no longer assume we have access to the best minds if we work exclusively through who and what we already know.³ Though it is easy to stovepipe and use known performers, a 21st century R&D organization must tap innovation engines in the venture capital world, Silicon Valley, or universities to name a few. We face a vast homeland security threat space and the entire Homeland Security Enterprise benefits from a wider base of potential performers engaged in homeland security R&D. The more vehicles to reach those potential performers (including DHS Centers of Excellence and SBIR above, cooperative research and development agreements, newly-delegated prize authority, and so on), the more effectively and efficiently we can develop essential security solutions.

An empowered S&T workforce

Tapping the full potential of the S&T ecosystem will require putting effort into improving coordination and collaboration within DHS S&T. Across offices at S&T, we already cover most of the S&T Ecosystem on a piece by piece basis with several offices actively engaged with innovative potential performers. We can be doing more, however, to ensure that S&T is internally unified and using those connections toward a common purpose. I will foster an even greater unity of effort between elements of S&T like the Homeland Security Advanced Research Projects Agency, our university-based Centers of Excellence, our five operational homeland security labs, our Acquisition Support and Operations Analysis group, or our Small Business Innovation Research program. That will allow S&T to tailor our R&D portfolio performers to those suited to greater innovation or greater feasibility based on mission needs and demands.

Having that type of agile, cross-connected, and empowered workforce means recognizing the value of taking a risk if the payout is a disruptive capability, such as total situational awareness at all land borders. In recent years, DHS S&T has not had this freedom or flexibility. But for the

³ The Federal Government was the main provider of the Nation's R&D accounting for 53.9 percent in 1953 and 66.8 percent in 1964. In 2011, Federal spending accounted for 29.6% of the Nation's R&D spending. Source: National Science Foundation (<http://www.nsf.gov/statistics/seind14/content/chapter-4/at04-06.pdf>).

long term health of DHS and the Homeland Security Enterprise, S&T and its stakeholders must be tolerant of more risk in S&T's R&D portfolio. We will still pursue lower risk, more incremental projects where appropriate. But we will also foster innovation at S&T with institutional allowance for more risky projects that carry higher potential of failure but also significant potential for reward if the project succeeds. An R&D organization is not fulfilling its mission if it focuses on minor improvements to the last great thing at the cost of failing to pursue the next great thing; we must balance our workforce and our investments against that.

An energized Homeland Security Industrial Base

Another aspect of leveraging the full S&T ecosystem is fostering deeper engagement with an energized Homeland Security Industrial Base. The Department of Defense has the Defense Industrial Base, a private sector engine for design, production, and maintenance of our military's weapons and systems. When Defense needs a new missile, submarine, or communications network, industrial machinery outside of government develops and delivers a product. While DHS cannot match the DoD's resources, I know from my time in industry that companies of all sizes are interested in doing business in homeland security.

Our Department, similar to much of government, is often criticized by industry for lack of transparency and failure to share information to help private companies align their own investments to where government needs help. S&T will proactively address these criticisms. I have already noted some instances – an updated and actionable S&T Strategic Plan tailored to companies, a refined R&D requirements process, more effective outreach and information sharing, and a more transparent and informative web presence. My hope as Under Secretary is, through sustained and effective engagement with the Homeland Security Industrial Base, that we begin to see industry more closely align their internal R&D budgets to homeland security priorities.

S&T's value to the Department

Before I conclude, I think it is important to recognize that, although R&D is the backbone of our organization, S&T has more responsibilities and provides many more services to the Department than a traditional R&D organization. We coordinate and oversee operational test and evaluation for all major investments across DHS. We oversee implementation of the Support Anti-Terrorism by Fostering Effective Technologies Act of 2002, better known as the SAFETY Act, one of the more innovative approaches to incentivizing private development of homeland security-focused technology and services. With the DHS Office of the General Counsel, we are responsible for the entire Department's intellectual property portfolio. We work with all elements of the Department to ensure DHS compliance with treaties such as the Biological Weapons Convention. We operate laboratories, such as the National Biodefense Analysis and Countermeasures Center and Plum Island Animal Disease Center, whose missions extend beyond R&D to supporting operational homeland security missions. We provide technical support that backstops major departmental initiatives such as end-to-end acquisition reform as part of the Secretary's Strengthening Departmental Unity of Effort initiative. The list goes on.

Because of that wider role, and because our R&D work already connects us with operators throughout the Department, we are one of the elements of DHS that can serve as glue between operational elements. It is critical we preserve this and continue to be viewed as an objective arbiter and trusted partner, not an overseer or disrupter of operations. As this committee contemplates potential new authorities for S&T, please be mindful of this important dynamic. Achieving S&T's mission, bringing technology to the fore for Components and first responders, supporting the Secretary's vision for the Department, and fulfilling our congressional mandates rest largely on being able to leverage a positive relationship with our partners and end users.

Conclusion

Your commitment to S&T's re-authorization validates the role the organization has grown into at DHS and is an important step to shedding the role R&D organizations often fall into today as bill payers for other shorter term needs. Technology will be essential for answering the challenges we face in homeland security today, and S&T has a critical role to fill as the R&D engine of the Homeland Security Enterprise.

I share a vision for the Directorate to help highlight areas where we need your help. S&T today, through considerable work and dedication from its workforce, has made the most of an Industrial Age toolbox in a Digital Age R&D landscape. Re-authorization of S&T is a chance to empower an R&D organization for the 21st century and to give us the flexibility to empower our workforce, engage more effectively with industry and other non-government stakeholders, and bring more and better solutions to our DHS and first responder customers.

Thank you for inviting me today to discuss S&T and share my vision for the Directorate. I am thrilled to be a part of this organization and know that, with your support in Congress, we will continue making great strides and finding new and better ways to support homeland security operators. I look forward to your questions.

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

U.S. House of Representatives

**Committee on Homeland Security,
Subcommittee on Cybersecurity, Infrastructure Protection, and Security Technologies
&
Committee on Science, Space, and Technology
Subcommittee on Research and Technology**

September 9, 2014

Good morning Chairman Meehan, Chairman Buehson, Ranking Member Clark, Ranking Member Lipinski, and distinguished members of the Subcommittees. Thank you for the opportunity to testify before you today on re-authorization of the Department of Homeland Security's (DHS) Science and Technology Directorate (S&T). In this testimony, I will discuss how S&T, one of a handful of components in the Department created from whole cloth under the original Homeland Security Act of 2002, has grown in the last 11 years into a trusted partner for DHS operators and state, local, tribal, and territorial first responders. With S&T's reauthorization, the Committee has an opportunity to help launch a 21st century research and development (R&D) organization that will serve as a model for federal R&D – hyper-connected, exploiting the convergence of scientific and technical disciplines, capable of meeting increasing demand for return on taxpayer dollars, and tailored to the “new digital age.”¹

To frame the conversation about S&T, I have two observations from my time so far as Under Secretary. First, I believe given the current and projected threat environments, technology based solutions (materiel and human centric) will increasingly be an essential force multiplier to providing operators and first responders the upper hand in their respective operational spaces. Technology and R&D are the bridge to the future of homeland security. For example, without harnessing advances in science and technology, we simply cannot, with current resources, screen and secure continuously rising flows of passengers and cargo and counter sophisticated, motivated adversaries at land, air, and sea Ports of Entry. The most effective and efficient changes come with smart application of technical and analytical expertise. Though S&T's value and capabilities are acknowledged by many throughout the Department, we continue to seek new partners and help address the growing need for technology in the Homeland Security Enterprise.

The second observation is that S&T has a passionate and dedicated workforce. Walking the halls, I am invigorated by the widespread enthusiasm for our mission. Our workforce is hungry to contribute, and we have the technical breadth and depth to work with operators and end users across the breadth of the Department's missions.

¹ A term borrowed from Eric Schmidt and Jared Cohen's *The New Digital Age*, which illustrates potential opportunities and challenges in the emerging technological era that we will inhabit.

I believe that given S&T's workforce and the rising urgency for technology as a force multiplier, there is yet-to-be-realized potential for S&T to support the Department and the Nation. In the coming years, my objective is to help S&T actualize that potential and become a full-fledged enabler and trusted performer across the Department. This pursuit, and the ability for S&T to provide the bridge between present and future homeland security capabilities, rest significantly on whether we can transform the Directorate into a 21st century federal R&D organization. For that, we need help from Congress.

As Under Secretary, my thinking is influenced by lessons learned in my time at the Department of Defense (DoD), in industry, and at federally funded laboratories. Many corporate labs today are under increased pressure to prove a direct impact to profits. Some laboratories are seen by business unit leaders as imposing an unjustified tax, and many surviving laboratories ensure that their researchers have at minimum a baseline understanding of the business context of their work. One way that these laboratories are enabling 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 precisely the model I intend to implement at S&T with DHS's operational components.

After my confirmation, I came to S&T with five priorities to execute – *visionary goals, actionable strategy, an empowered workforce, force multiplying solutions, and an energized Homeland Security Industrial Base* – to address how we plan as a Directorate and to ensure that we fully leverage all available resources. As I see it, there are opportunities to further refine and improve how we work and what we focus on as an organization. Those priorities split into two basic categories: first, how we plan and prioritize at S&T and, second, how to bring all available resources to bear in execution of our programs.

It is important to mention one item to provide additional strategic context before covering specifics. To address the range of challenges the nation faces most collaboratively and effectively within the Department, we have recently undertaken an initiative entitled "Strengthening Departmental Unity of Effort." In his April 22, 2014, memorandum, Secretary Johnson directed a series of actions to enhance the cohesiveness of the Department, while preserving the professionalism, skill, and dedication of the people within, and the rich history of, the DHS components.

There are two elements in this initiative: new senior leader forums led by the Secretary and the Deputy, and department-wide strategy, requirements, and budget development and acquisition processes that are tied to strategic guidance and informed by joint operational plans and joint operations. These are building and maturing DHS into an organization that is greater than the sum of its parts – one that operates much more collaboratively, leverages shared strengths, realizes shared efficiencies, and allows us to further improve our important role as an effective domestic and international partner. DHS S&T participates fully in the range of Unity of Effort initiative activities directed by the Secretary, but just as significantly, functions as a Directorate with the same unifying principles.

A strategic focus for homeland security

Effective planning is how we as an organization will translate the basis for our work (e.g., Component priorities, the Secretary's initiatives, congressional mandates, White House policy) into functional programs that ultimately deliver novel or improved capability. This includes a strategic vision spanning the near term, including specific courses of action, through the long term and far horizon, including ambitious goals.

Four visionary goals

As a first step, one of my priorities coming on board was establishing visionary goals that would serve as 30-year horizon points to build toward. When Dr. George Heilmeier, one of the great technology leaders of our time, was Director of the Defense Advanced Research Projects Agency, the organization and its stakeholders were invigorated by his articulation of visionary goals, what he called his "silver bullets." *Make the oceans transparent. Create an invisible aircraft.* Heilmeier's visionary goals strove for previously unachieved capabilities and lower-cost equivalents to existing capabilities. They helped orient the organization and inspired stakeholders, including operators, end users, and performers in industry and academia.

R&D requires creativity and imagination, and we must tap into that enthusiasm to spur big thinking. At S&T, I tasked a working group with representatives from throughout the organization to draft vision statements for consumption and feedback from the rest of the Directorate and our end user stakeholders. Building off of existing policy and doctrine (e.g., the Quadrennial Homeland Security Review, Secretary Johnson's priorities, existing Homeland Security Presidential Directives), the group generated the four following draft goals:

- *Screening at Speed: Matching 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. Whether screening people, baggage or cargo, unobtrusive technologies and improved processes will enable the seamless detection of threats while respecting privacy, with minimal impact to the speed of travel and the pace of commerce.
- *A Trusted Cyber Future: Protecting Privacy, Commerce, and Community*
In a future of increasing cyber connections, users will trust that infrastructure is resilient, information is protected, illegal use is deterred, and privacy is not compromised. Frictionless security will operate seamlessly in the background, based on self-detecting, self-protecting, and self-healing cyber critical infrastructure – all without disruption.
- *Enable the Decision Maker: Providing Actionable Information Ahead of Incident Speed*
The decision maker has improved situational awareness and is better able to understand risks, weigh options, and take action – literally experience the information. The essential element to making informed decisions is access to timely, accurate, context-based information. Supported by new decision support, modeling and simulation systems, critical decisions can be made based on

relevant information, transforming disparate data into proactive wisdom and ultimately improving operational effectiveness.

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Delivering force multiplying solutions

In order to position the Directorate more strategically, we are updating our approach to R&D programs. A new approach will allow a more focused, strategic relationship with our partners and will address the need for a jointly calibrated investment risk profile. At times, there will rightly be pressure to fill immediate needs or invest in incremental improvements, but a healthy portfolio must still allow for a portion of projects to carry more technical risk and offer proportionally greater potential returns. My vision for a balanced R&D portfolio is one that makes appropriate tradeoffs between technical feasibility and operational impact of projects, weighs potential event's probability and impact, and that distributes appropriately across types of performers (including non-traditional) and project timelines (less than one year vs. five years).

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There are two elements of S&T's work that are complementary but distinct. The first, requirements, is for acquisition programs and deals with physical characteristics and operational necessities (e.g., weight, dimension, ruggedness, look and feel). S&T's contributions in this area include participation in the Department's joint capabilities and requirements process. Operational capability gaps, which are the second element, address missions, or subsets of missions that cannot be met currently or efficiencies which significantly enhance performance; these are based on customer and end user input. These operational capability gaps serve as S&T's primary driver for what we focus on in R&D programs.

Regarding requirements, as you know, the Secretary established a Department-wide Joint Requirements Council (JRC) in June as part of his Unity of Effort Initiative. The JRC identifies common capability needs and challenges across DHS Components, and will work as an essential input into S&T's own R&D process. In addition to JRC membership, S&T currently provides the JRC's primary analytic resources. As such, S&T is helping develop and refine JRC analysis, methodology, and process in addition to partnering with topic-specific teams to conduct capabilities-based assessments. Working under the direction of the JRC Chair and with the other JRC stakeholders, we will establish a lasting and functional framework for the Department's requirements process.

The JRC and corresponding DHS joint requirements process often highlight capability gaps and can generate valuable input for S&T's programs. However, acquisition-related input like physical requirements is not the primary basis for R&D programs. For a successful R&D organization, any programs, strategy, or visionary goals ultimately must grow from and be tied to customers' and end users' capability gaps. A healthy process for identifying capability gaps is an R&D organization's engine for understanding what our stakeholders need to do their jobs, for knowing where and what services to provide (e.g., later-stage acquisition support, engineering services, subject matter expertise), and for validating the effectiveness and the value of the investments that S&T is making.

Moving forward, S&T will formalize and integrate its framework for communicating, documenting, addressing, and reviewing capability gaps and R&D requirements. These generally grow from two complementary categories. The first is conceptual development through embedding directly with operators, analysis of future threats, or other interaction with operators. The second is through hands-on experimentation, also influenced by embedding with operators as well as through types of events like those in the Joint Interagency Field Exploration program.²

² Sponsored by S&T and the Department of Defense and conducted in conjunction with the Naval Postgraduate School, Joint Interagency Field Exploration events bring together operational end users with technology companies

Those R&D requirements will then be the basis for S&T's technology roadmaps and new start programs.

There are several driving principles as S&T locks in its formal process for identifying capability gaps: top-down prioritization by leadership; bottom-up engagement with operational staff and end users for challenge statements, proposals, and validation; documents capturing current efforts, challenges, and strategies; and periodic engagement and review at both the executive and working levels of our organizations. Though this process will feature many of the same elements across our many partner organizations, it will be tailored to each customer in order to ensure functional governance, appropriate resource commitment, and mutual management of expectations.

A 21st century R&D workforce

Going back to the lessons learned from corporate labs that have maintained their value to organizations, I look forward to implementation of a much more robust process for S&T's workforce to embed with operators and to allow operational staff to detail to S&T and provide direct input to our R&D projects. To function in the new digital age, we need scientists who break down firewalls between R&D and operations and who become fluent in the language of operators and end users. These "multi-lingual" program managers that can slide between operational and technical environments have the best track records for successful projects and transition to use.

To achieve this, I would like more opportunities for staff to gain firsthand understanding of DHS operations through a formal program to embed technical subject matter expertise experts in the field with operators. We will have different durations for different purposes and outcomes, perhaps a two-week speed embed in some cases and in others a more comprehensive six-month or one-year stint. There are considerable obstacles to overcome in order to successfully launch such a program – e.g., ensuring staff embed in the right places and see real operations, that staff are in a position that does not disrupt law enforcement or other sensitive operations – but the benefit of deeper connection to customers and a reinforced R&D requirements process speak for themselves.

I also believe that achieving this adaptable, "multi-lingual" workforce requires a more agile and modern hiring authority that is suited to an R&D organization. Part of being responsive to end-user R&D requirements is agility and adaptability in our workforce. This implies that our program managers are able to work across the three categories of programs detailed above and have skillsets that are not limited to a specific line of business or type of project. That also means being able to boost our talented career workforce with more strategic use of our existing hiring authorities in the Homeland Security Act to fill urgent needs and inject outside perspective into our programs. With a fluid workforce strengthened through term-limited outside hires, our external S&T stakeholders are more effectively connected to the organization, we can foster

to explore the potential of new capabilities to address challenges faced by federal agencies. The environment facilitates a collaborative working relationship between government, academia, industry, and non-governmental organizations to promote the identification and assessment of emerging and maturing technologies with the primary goal of accelerating the delivery of enhanced capabilities to the end user.

technical engagement (including with STEM students) on homeland security challenges, and our organization is better positioned to support the Department and first responders.

Leveraging all available resources

In addition to more effective planning, we are also working to ensure that S&T takes advantage of the full spectrum of resources across what I refer to as the S&T ecosystem, which is the broad network of technical expertise inside and outside of government that can be brought to bear for virtually any issue operators face. This S&T ecosystem includes Department of Energy and DoD labs that are national assets and global leaders in many research areas; our Nation's broad base of universities, many of which are DHS Centers of Excellence; and small businesses, the heart of our Nation's innovation, that we engage through specialized vehicles like our Small Business Innovation Research (SBIR) awards. Any potential R&D performer inside and outside government across industry, academia, government-funded and private laboratories, and in the United States or abroad is a part of the S&T Ecosystem.

The Federal Government no longer provides the same share of funding for research and development as it did in the Cold War era, and we can no longer assume we have access to the best minds if we work exclusively through who and what we already know.³ Though it is easy to stovepipe and use known performers, a 21st century R&D organization must tap innovation engines in the venture capital world, Silicon Valley, or universities to name a few. We face a vast homeland security threat space and the entire Homeland Security Enterprise benefits from a wider base of potential performers engaged in homeland security R&D. The more vehicles to reach those potential performers (including DHS Centers of Excellence and SBIR above, cooperative research and development agreements, newly-delegated prize authority, and so on), the more effectively and efficiently we can develop essential security solutions.

An empowered S&T workforce

Tapping the full potential of the S&T ecosystem will require putting effort into improving coordination and collaboration within DHS S&T. Across offices at S&T, we already cover most of the S&T Ecosystem on a piece by piece basis with several offices actively engaged with innovative potential performers. We can be doing more, however, to ensure that S&T is internally unified and using those connections toward a common purpose. I will foster an even greater unity of effort between elements of S&T like the Homeland Security Advanced Research Projects Agency, our university-based Centers of Excellence, our five operational homeland security labs, our Acquisition Support and Operations Analysis group, or our Small Business Innovation Research program. That will allow S&T to tailor our R&D portfolio performers to those suited to greater innovation or greater feasibility based on mission needs and demands.

Having that type of agile, cross-connected, and empowered workforce means recognizing the value of taking a risk if the payout is a disruptive capability, such as total situational awareness at all land borders. In recent years, DHS S&T has not had this freedom or flexibility. But for the

³ The Federal Government was the main provider of the Nation's R&D accounting for 53.9 percent in 1953 and 66.8 percent in 1964. In 2011, Federal spending accounted for 29.6% of the Nation's R&D spending. Source: National Science Foundation (<http://www.nsf.gov/statistics/seind14/content/chapter-4/at04-06.pdf>).

long term health of DHS and the Homeland Security Enterprise, S&T and its stakeholders must be tolerant of more risk in S&T's R&D portfolio. We will still pursue lower risk, more incremental projects where appropriate. But we will also foster innovation at S&T with institutional allowance for more risky projects that carry higher potential of failure but also significant potential for reward if the project succeeds. An R&D organization is not fulfilling its mission if it focuses on minor improvements to the last great thing at the cost of failing to pursue the next great thing; we must balance our workforce and our investments against that.

An energized Homeland Security Industrial Base

Another aspect of leveraging the full S&T ecosystem is fostering deeper engagement with an energized Homeland Security Industrial Base. The Department of Defense has the Defense Industrial Base, a private sector engine for design, production, and maintenance of our military's weapons and systems. When Defense needs a new missile, submarine, or communications network, industrial machinery outside of government develops and delivers a product. While DHS cannot match the DoD's resources, I know from my time in industry that companies of all sizes are interested in doing business in homeland security.

Our Department, similar to much of government, is often criticized by industry for lack of transparency and failure to share information to help private companies align their own investments to where government needs help. S&T will proactively address these criticisms. I have already noted some instances – an updated and actionable S&T Strategic Plan tailored to companies, a refined R&D requirements process, more effective outreach and information sharing, and a more transparent and informative web presence. My hope as Under Secretary is, through sustained and effective engagement with the Homeland Security Industrial Base, that we begin to see industry more closely align their internal R&D budgets to homeland security priorities.

S&T's value to the Department

Before I conclude, I think it is important to recognize that, although R&D is the backbone of our organization, S&T has more responsibilities and provides many more services to the Department than a traditional R&D organization. We coordinate and oversee operational test and evaluation for all major investments across DHS. We oversee implementation of the Support Anti-Terrorism by Fostering Effective Technologies Act of 2002, better known as the SAFETY Act, one of the more innovative approaches to incentivizing private development of homeland security-focused technology and services. With the DHS Office of the General Counsel, we are responsible for the entire Department's intellectual property portfolio. We work with all elements of the Department to ensure DHS compliance with treaties such as the Biological Weapons Convention. We operate laboratories, such as the National Biodefense Analysis and Countermeasures Center and Plum Island Animal Disease Center, whose missions extend beyond R&D to supporting operational homeland security missions. We provide technical support that backstops major departmental initiatives such as end-to-end acquisition reform as part of the Secretary's Strengthening Departmental Unity of Effort initiative. The list goes on.

Because of that wider role, and because our R&D work already connects us with operators throughout the Department, we are one of the elements of DHS that can serve as glue between operational elements. It is critical we preserve this and continue to be viewed as an objective arbiter and trusted partner, not an overseer or disrupter of operations. As this committee contemplates potential new authorities for S&T, please be mindful of this important dynamic. Achieving S&T's mission, bringing technology to the fore for Components and first responders, supporting the Secretary's vision for the Department, and fulfilling our congressional mandates rest largely on being able to leverage a positive relationship with our partners and end users.

Conclusion

Your commitment to S&T's re-authorization validates the role the organization has grown into at DHS and is an important step to shedding the role R&D organizations often fall into today as bill payers for other shorter term needs. Technology will be essential for answering the challenges we face in homeland security today, and S&T has a critical role to fill as the R&D engine of the Homeland Security Enterprise.

I share a vision for the Directorate to help highlight areas where we need your help. S&T today, through considerable work and dedication from its workforce, has made the most of an Industrial Age toolbox in a Digital Age R&D landscape. Re-authorization of S&T is a chance to empower an R&D organization for the 21st century and to give us the flexibility to empower our workforce, engage more effectively with industry and other non-government stakeholders, and bring more and better solutions to our DHS and first responder customers.

Thank you for inviting me today to discuss S&T and share my vision for the Directorate. I am thrilled to be a part of this organization and know that, with your support in Congress, we will continue making great strides and finding new and better ways to support homeland security operators. I look forward to your questions.