

Background

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Rethinking Research, Development, and Acquisition for Homeland Security

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In 2004, a joint research project by The Heritage Foundation and the Center for Strategic and International Studies (CSIS) offered extensive recommendations on how to improve the organization and operations of the newly established Department of Homeland Security (DHS).¹ After appointment as Secretary of Homeland Security, Michael Chertoff undertook a “Second Stage Review” that adopted many of the recommendations in The Heritage Foundation/CSIS report.

However, both efforts at rethinking the department gave scant attention to the Directorate for Science and Technology (S&T Directorate). At the time, the directorate was still establishing its organization and research priorities. Now, five years after its creation, its track record is clear enough, and it is not good. Reorganization of the S&T Directorate is unfinished business that the department can no longer ignore.

Flawed from the Start

The Homeland Security Act of 2002² charged the newly created DHS with coordinating the federal government’s civilian efforts to produce and deploy technologies for homeland security. Within the department, the law established the S&T Directorate to promote research and development (R&D) and to test and evaluate technologies related to homeland security in cooperation with private companies, academic institutions, and other government agencies.

It was also tasked with making these new capabilities available to operational end users in the DHS and the rest of the federal government and to other public and private actors, including state and local emer-

Talking Points

- After five years, the Directorate for Science and Technology (S&T Directorate) has amassed a mediocre track record. Reorganization of the S&T Directorate is unfinished business that the Department of Homeland Security can no longer ignore.
- The S&T Directorate has failed to produce the results suggested by its elaborate organization design and ambitious research efforts.
- The S&T Directorate requires a more focused mission, new thinking, and a more streamlined organization.
- The directorate should draw more heavily on the Defense Department’s substantial experience in developing cutting-edge defensive technologies.
- The S&T mission needs to become more focused, and the directorate needs to learn to partner better with other agencies and international partners and to manage its assets and resources better.

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gency responders. Given the immensity of the task, the DHS tried to mobilize the nation's diverse scientific and technical communities to support homeland security projects.

Since its establishment, the S&T Directorate has assembled a full-time staff of approximately 400 people consisting of regular DHS employees, Public Health Service officers, Intergovernmental Personnel Act employees, individuals on assignment from other agencies, and government contractors. To manage the diverse requirements and to assign program responsibility among the various S&T offices, the directorate organized R&D projects into portfolios, each focused on a particular discipline or activity, such as biological countermeasures.

In practice, the S&T Directorate has failed to produce the results suggested by its elaborate organization design and ambitious research efforts. The problems include:

- **Lack of response to customer needs.** From the beginning, agencies within the DHS have complained that the directorate's portfolios do not adequately reflect their requirements and are not sufficiently responsive to operational needs. In June 2006, the Senate Committee on Appropriations attached a bipartisan report to the DHS budget submission for fiscal year 2007 castigating the S&T Directorate as "a rudderless ship without a clear way to get back on course." The report said

the Senators were "extremely disappointed" with how the DHS was managing its R&D activities.³

- **Inability to manage complex programs.** The directorate's most prominent accelerated R&D effort—the attempt to rapidly deploy new technologies to defend against smuggled nuclear and radiological weapons—failed so badly that in April 2005 the Administration established the separate Domestic Nuclear Detection Office (DNDO) to manage these programs.⁴ The move substantially reduced the roles of both the DHS and the directorate in nuclear and radiological matters.
- **Limited success in partnering with other federal agencies and international partners.** The S&T Directorate faces significant challenges in sharing homeland security responsibilities and resources with other federal departments and agencies that are not incorporated within the DHS. These entities retain key roles in researching and developing scientific, engineering, and medical technologies relevant to homeland security.⁵ The DHS itself manages only about one-third of all federal R&D spending on homeland security and competes with other activities for a leadership role in homeland security research.⁶ It also lacks an effective tool for international cooperation.⁷
- **Failure to convert technologies for use by non-federal customers.** Of particular note, the S&T Directorate has yet to develop a clear strat-

1. James Jay Carafano, Ph.D., and David Heyman, "DHS 2.0: Rethinking the Department of Homeland Security," Heritage Foundation *Special Report* No. SR-02, December 13, 2004, at www.heritage.org/Research/HomelandDefense/upload/72759_1.pdf.
2. Public Law 107-296.
3. These criticisms are reviewed in Spencer S. Hsu, "DHS Terror Research Agency Struggling; Science and Technology Unit Crippled by Turnover, Budget Cuts, Priority Shifts," *The Washington Post*, August 20, 2006, p. A8, at www.washingtonpost.com/wp-dyn/content/article/2006/08/19/AR2006081900846.html (October 19, 2006), and "A Rudder for Homeland Security," *The Ledger*, August 16, 2006, at www.theledger.com/apps/pbcs.dll/article?AID=/20060816/NEWS/608160333/1036 (October 19, 2006).
4. Spencer S. Hsu, "U.S. Weighs How Best to Defend Against Nuclear Threats," *The Washington Post*, April 15, 2006, p. A3, at www.washingtonpost.com/wp-dyn/content/article/2006/04/14/AR2006041401369.html (October 19, 2006). Homeland Security Presidential Directive 14 consolidated nuclear countermeasure programs previously located in the DHS, Department of Defense, Department of Energy, and other federal agencies. The DNDO commands a budget of approximately \$500 million and a staff of nearly 200 from the Departments of Homeland Security, Defense, State, and Energy and the intelligence community. In July, Homeland Security Secretary Michael Chertoff and DNDO Director Vayl Oxford announced over \$1 billion in new investments to strengthen nuclear detection. A Cabinet-level Interagency Coordination Council informs the R&D investments of the new office to reinforce government-wide returns. Additionally, the DNDO is responsible for designing an interagency-approved "global architecture" to guide the strategies for deploying nuclear detection capabilities overseas as well as domestically. For more information, see Michael L. Moodie, "A Long-Term Response to Biological Terrorism: Homeland Security Leaders Need Shared Intellectual Framework and Greater International Cooperation," Center for the Study of the Presidency *Issue Paper* No. 12, August 2005, at www.thepresidency.org/pubs/IssuePaper12.pdf (August 8, 2006).

egy for acquiring and converting technologies for use by the state and local governments and the private sector.

Science and Technology 2.0

The S&T Directorate needs a makeover. The initial strategy of creating a research and development arm that serves the needs of the entire homeland security community has failed badly. Its overreaching mission has created a sprawling plethora of activities that does nothing well. The S&T Directorate requires a more focused mission, new thinking, and a more streamlined organization.

Putting First Things First. The directorate needs to tighten its focus on its primary customer base—the agencies within the department. The DHS should get out of the business of brokering and developing technologies and supporting research for state and local responders and the private sector. Rather, government should limit its support to these other users by setting national standards in coordination with established government agencies such as the National Institute of Standards and Technology and nongovernmental organizations such as the American National Standards Institute. With a foundation of national standards, the needs of these groups can be served by commercial off-the-shelf technologies.

Getting a Bigger Bang for the Buck. Rather than treating collaborative research with other federal agencies and international partners as an afterthought, the

directorate should give first priority to establishing effective partnerships and leveraging the capabilities of these other efforts. The directorate needs to establish a capability and an office to promote cooperation between the DHS and its allies in the global war on terrorism. As a part of this effort, it should assist in establishing a global clearinghouse of information on technologies, requirements, and research.

Reorganizing and Reprioritizing. To ensure that R&D programs best serve the operating agencies within the DHS, the department should put the R&D facilities directly under the operating agencies, thereby allowing their directors to establish programs and priorities that will best serve their needs. The S&T Directorate should instead focus on providing the DHS with overall acquisition guidance and basic science and technology.

Rethinking Acquisition. In many cases, R&D and procurement are not the best answers to the department's technological needs. Rather than developing and purchasing technology and infrastructure, the DHS should look more toward buying services. For example, instead of attempting to field, install, and maintain a new generation of scanning equipment at airports, the department should buy the needed services from the private sector.

In addition, Washington should not specify particular technological solutions. Government should specify performance needs and let the private sector figure out how best to meet the challenge. This will

5. For a listing of the many federal departments and agencies involved in researching and developing S&T projects in the area of critical infrastructure alone, see Executive Office of the President, Office of Science and Technology Policy, and U.S. Department of Homeland Security, Science and Technology Directorate, *The National Plan for Research and Development in Support of Critical Infrastructure Protection*, 2004, pp. 7–11, at www.dhs.gov/xlibrary/assets/ST_2004_NCIP_RD_PlanFINALApr05.pdf (January 17, 2007).
6. Genevieve J. Knezo, “Homeland Security Research and Development Funding, Organization, and Oversight,” Congressional Research Service, June 9, 2005. Several offices in the executive branch attempt to optimize collaboration among these separate entities and provide integrated strategic direction for their homeland security R&D efforts. The Homeland Security Council establishes general guidelines and priorities for all U.S. homeland security policies. The Office of Science and Technology Policy (OSTP) advises the President on R&D issues, including those related to homeland security, and provides technical support to the DHS. The Office of Management and Budget establishes priorities and allocates resources among the agencies. Finally, the Technical Support Working Group (TSWG), operated jointly by the Departments of State and Defense, oversees the most important interagency R&D programs designed to develop and deploy counterterrorism technologies in the United States. Its executive committee has representatives from the Departments of State, Defense, Justice, and Energy. The DHS participates in TSWG R&D contract solicitations for new counterterrorism technologies.
7. James Jay Carafano, Ph.D., Jonah J. Czerwinski, and Richard Weitz, Ph.D., “Homeland Security Technology, Global Partnerships, and Winning the Long War,” Heritage Foundation *Background* No. 1977, October 5, 2006, p. 1, at www.heritage.org/Research/HomelandDefense/bg1977.cfm.

provide cheaper capabilities sooner and allow agencies to upgrade quickly as the commercial sector brings new products and services on line.

Funding for the Long Term. Since its inception, the DHS has devoted only approximately 2 percent of its budget to basic research. In contrast, about 80 percent is regularly allocated to applied research and approximately 20 percent to advanced technology development.⁸

This mix needs to change. Agency R&D programs should focus on the near term, while S&T should address long-term objectives. This will require adequately funding basic research designed to advance fundamental knowledge across a wide range of relevant disciplines. It will also require sustaining—and in some disciplines developing—communities of scientists and technologists interested in researching homeland security issues. The establishment of an S&T Chief Financial Officer—a position created only in the past year to oversee the directorate’s finances, budget, planning, and program analysis and evaluation—should focus on boosting longer-term funding of basic research within the framework of the S&T Strategic Plan, which provides a five-year–10-year vision for the directorate’s R&D, testing, and evaluation.

Building Systems of Systems. Using offices such as the DNDO and programs like the Secure Border Initiative to ensure that the department fields integrated sets of capabilities for major mission areas such as border security makes great sense.

Avoiding Becoming an Operating Agency. The S&T Directorate has occasionally had to manage programs (most notably BioWatch) that are not assigned to a DHS operational agency. Becoming the default operator for fielded systems diverts attention and resources away from the directorate’s primary responsibilities.

Improving Threat Assessment Capabilities. In January 2005, DHS Acting Inspector General Richard

Skinner told a Senate committee that the S&T Directorate needed greater access to other agencies’ threat assessments to optimize selection of its R&D projects and avoid duplicating S&T initiatives: “It is critical for the S&T [Directorate] to have a clear understanding of the terrorist threat picture facing the nation and the current technical capabilities and ongoing research and development initiatives of other DHS elements.”⁹ The directorate needs the capacity to perform assessments similar to those that the Office of Net Assessment performs in the Department of Defense (DOD).

Using the Centers of Excellence More Effectively. Researching and developing homeland security technologies requires years of intense effort by an integrated team of scientists, engineers, and managers. Repeated reorganizations only disrupt this challenging effort and should be avoided. Some Senators have proposed that DHS Centers of Excellence rotate every three years. Implementing such a procedure would disrupt existing research programs, impose unnecessary relocation costs, and weaken faculty and staff interest in making a long-term commitment to research related to homeland security. The research conducted at the centers cannot be completed, disseminated, and then integrated into S&T policy within three years.

Rather than make such relocation mandatory, Congress could require centers to reapply for their grants every three years with a presumption of renewal. Only if a subsequent evaluation finds serious performance failures should the DHS open a contract to wider competition. In addition, S&T needs to treat the centers less as simply grant recipients and more as research collaborators.

Learning from the Pentagon. The S&T Directorate should also draw more heavily on the Defense Department’s substantial experience in developing cutting-edge defensive technologies.

- **The Advanced Concept Technology Demonstration (ACTD) program** aims to move new

8. Charles E. McQueary, Under Secretary for Science and Technology, U.S. Department of Homeland Security, statement before the Committee on Science, U.S. House of Representatives, February 16, 2005, at www.science.house.gov/commdocs/hearings/full05/feb16/McQueary.pdf (January 17, 2007).

9. Richard L. Skinner, Acting Inspector General, U.S. Department of Homeland Security, statement before the Committee on Homeland Security and Governmental Affairs, U.S. Senate, January 26, 2005, p. 15, at www.dhs.gov/xoig/assets/testimony/OIG_MmngtChalTestimonySkinner_012605.pdf (October 19, 2006).

technologies into operational use more rapidly and at a lower cost by shortening their acquisition life cycles. The program consciously accepts trading off speed for effectiveness by supporting innovative technologies and concepts that provide only partial (80 percent) solutions to emerging requirements.

During the 1990s, the ACTD process achieved several notable successes, including the rapid development of the Predator and then the Global Hawk unmanned aerial vehicles.¹⁰ Recently, the DOD began implementing an improved ACTD procedure involving Joint Capabilities Technology Demonstrations (JCTDs). The change is intended to accelerate developments through a more comprehensive “cradle to grave” approach, sustaining technologies through the challenging “valley of death”—the time between the maturation of a technical solution and its insertion into a product—minimizing situations in which developed technology remains “on the laboratory shelf” due to funding shortfalls.¹¹

- **The Defense Acquisition Challenges (DAC) program** provides opportunities (“on-ramps”) to enable any actors, inside or outside the DOD, to propose technological and other innovations that they believe might improve the affordability, manufacturability, or capabilities of a current acquisition program. The DAC program team, which actively seeks contributions from smaller firms that have not previously participated in DOD acquisition programs, evaluates submissions for possible testing and insertion into existing R&D programs.¹²

- **The Technology Transition Initiative** seeks to reduce the time between the demonstration and production of new technologies.¹³
- **The Quick Reaction Fund** is a recently established program designed to field test promising new technology prototypes rapidly. It aims to allow the department to respond flexibly to emerging DOD needs within a single budget cycle.¹⁴

Finally, the Homeland Security Advanced Research Projects Agency (HSARPA) should consider following more in the footsteps of the DOD’s Defense Advanced Research Projects Agency (DARPA). DHS-sponsored projects should attempt not only to anticipate innovations in the technologies and tactics employed by adversaries, but also to generate technological surprises to enhance the counterterrorist tools available for homeland defense. Meanwhile, Homeland Security Policy Institute projects need to be integrated more closely with other research activities within the S&T Directorate.

Moving Forward

Rethinking the S&T Directorate remains unfinished business within the Department of Homeland Security. It is time for the directorate to focus on its priorities, partner better with other agencies and international partners, and better manage the assets and resources at its disposal.

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10. In recent years, the Government Accountability Office and others have complained about the considerable cost and schedule increases resulting from attempts to incorporate unproven technologies into large-scale weapons programs. It has also proven difficult to secure service funding to sustain programs that the services did not initiate. For example, see, U.S. Government Accountability Office, *Defense Technology Development: Management Process Can Be Strengthened for New Technology Transition Programs*, GAO-05-480, June 17, 2005, at www.gao.gov/new.items/d05480.pdf (October 19, 2006).
11. U.S. Department of Defense, “Advanced Systems and Concepts Strategic Plan 2006,” July 2006, pp. 8 and 12, at www.acq.osd.mil/asc/News/ASC_Strategic_Plan.pdf (October 19, 2006). See also Charles W. Wessner, “Driving Innovations Across the Valley of Death,” *Research-Technology Management*, Vol. 48, No. 1 (January–February 2005), p. 9.
12. U.S. Department of Defense, *Advanced Systems and Concepts Strategic Plan 2006*, p. 10.
13. For more information, see Technology Transition Initiative, Web site, at www.acq.osd.mil/ott/tti (October 19, 2006).
14. U.S. Department of Defense, “Quick Reaction Special Projects (QRSP),” updated November 3, 2003, at www.acq.osd.mil/qrsp/qrsp.html (October 19, 2006).