



Science and Technology

The Nation's advantage in science and technology is a key to securing the homeland. New technologies for analysis, information sharing, detection of attacks, and countering chemical, biological, radiological, and nuclear weapons will help prevent and minimize the damage from future terrorist attacks. Just as science and technology have helped us defeat past enemies overseas, so too will they help us defeat the efforts of terrorists to attack our homeland and disrupt our way of life.

The Nation needs a systematic national effort to harness science and technology in support of homeland security. Our national research enterprise is vast and complex, with companies, universities, research institutes, and government laboratories of all sizes conducting research and development on a very broad range of issues. Guiding this enterprise to field important new capabilities and focus new efforts in

support of homeland security is a major undertaking. The Department of Homeland Security, which under the President's proposal will serve as the federal government's lead for this effort, will work with private and public entities to ensure that our homeland security research and development are of sufficient size and sophistication to counter the threat posed by modern terrorism.

The private sector has the expertise to develop and produce many of the technologies, devices, and systems needed for homeland security. The federal government needs to find better ways to harness the energy, ingenuity, and investments of private entities for these purposes. Many businesses that could play a role in homeland security research and development are unaccustomed to working with the federal government and some avoid it entirely due to onerous contracting and oversight requirements. In addition, the

government currently has very few programs that solicit research and development proposals focused specifically on developing new homeland security capabilities. The Department of Homeland Security would take the lead in overcoming these obstacles.

The President has proposed to consolidate most of the federal government's homeland security research and development efforts under the coordination of the Department of Homeland Security to ensure strategic direction and avoid duplication. To date, research and development activities in support of homeland security have been underfunded, evolutionary, short-term in nature, fragmented across too many departments, and heavily reliant on spin-offs from the national security and medical sectors. Many of the involved agencies have little frontline knowledge of homeland security and little or no experience in technology acquisition and supporting research. The new Department would be responsible for overcoming these shortfalls by ensuring the pursuit of research and development activities where none existed previously.

The President's Fiscal Year 2003 Budget request proposed a significant increase in homeland security research and development funding: from nearly \$1 billion in Fiscal Year 2002 to about \$3 billion, with the bulk focused on developing new countermeasures to bioterrorism. This is a crucial first federal step for dealing with one of our most pressing scientific challenges. The Department must build on this down payment to create and implement a long-term research and development plan that includes investment in potentially revolutionary capabilities.

National Vision

In the war on terrorism, America's vast science and technology base provides a key advantage. With the Department of Homeland Security as a focal point, the United States will press this advantage through a national research and development enterprise for homeland security similar in emphasis and focus to that which has supported the national security community for more than fifty years. The Department will establish a disciplined system to guide its homeland security research and development efforts and those of other departments and agencies. As a Nation, we will emphasize science and technology applications that address catastrophic threats. We will build on existing science and technology whenever possible. We will embrace science and technology initiatives that can support the whole range of homeland

security actors. We will explore both evolutionary improvements to current capabilities and development of revolutionary new capabilities. The Department of Homeland Security will ensure appropriate testing and piloting of new technologies. Finally, the Department, working with other agencies, will set standards to assist the acquisition decisions of state and local governments and private-sector entities.

Major Initiatives

Develop chemical, biological, radiological, and nuclear countermeasures. The Nation's research and development agenda will prioritize efforts to deal with catastrophic threats. Key initiatives will include research and development to prevent terrorist use of nuclear weapons, detect chemical and biological materials and attacks, develop high-efficacy vaccines and antivirals against biological agents, and track laboratory use of biological agents. (See *Defending against Catastrophic Threats* chapter for additional discussion.)

Develop systems for detecting hostile intent. Terrorism ultimately requires individual human beings to carry out murderous actions. These individuals, whether they intend to commandeer an aircraft, detonate a suicide bomb, or sneak illicit material through customs, may behave in a manner that reveals their criminal intent. The Department of Homeland Security would work with private and public entities to develop a variety of systems that highlight such behavior and can trigger further investigation and analysis of suspected individuals. This would allow security officials at points of interest such as airports and borders to examine more closely individuals who exhibit such characteristics and also have other indications of potentially hostile intent in their background. The Department would also explore whether appropriate sensors can determine whether individuals have been immunized or otherwise exposed to biological agents, chemical agents, or nuclear materials.

Apply biometric technology to identification devices. As our military, intelligence, and law enforcement efforts in Afghanistan and other countries have demonstrated, bringing justice to terrorists and their supporters is complicated by the fact that they hide among innocent civilians and in remote places. Finding terrorists and preventing terrorist attacks here in the United States is difficult for the same reason—for example, a terrorist on the FBI's Watch List may sneak past security personnel at an airport thanks to false documents and a simple disguise. These challenges require new

technologies and systems to identify and find individual terrorists. The Department of Homeland Security would support research and development efforts in biometric technology, which shows great promise. The Department would focus on improving accuracy, consistency, and efficiency in biometric systems. Furthermore, the Department would explore biomolecular and other new techniques, as well as enhancements to current techniques such as noise suppression methods for voice authentication.

Improve the technical capabilities of first responders. If we do not protect our first responders from the dangerous effects of chemical, biological, radiological, and nuclear attacks, we may lose the very people we depend on to minimize the damage of any such attacks. The Department of Homeland Security would launch a steady and long-term effort to provide first responders with technical capabilities for dealing with the effects of catastrophic threats—capabilities that would aid both first responders and victims of the attack. These capabilities would include protective gear and masks, prophylactic treatments, and decontamination equipment. The Department would undertake sustained efforts to develop treatments and decontamination methodologies for radiological and nuclear events. The Department would also focus on developing new methods to merge disparate databases and provide first responders with accurate and usable pictures of building layouts and other key information about the site of a terrorist incident. In all these efforts, the Department would pay great attention to ensuring that these technologies are easy to use under the extreme conditions in which first responders operate.

Coordinate research and development of the homeland security apparatus. The Department of Homeland Security, working with the White House and other federal departments, would set the overall direction for our Nation's homeland security research and development. The Department would establish a management structure to oversee its research and development activities and to guide its interagency coordination activities. It would base these efforts on a constant examination of the Nation's vulnerabilities, continual testing of our security systems, and updated evaluations of the threat and its weaknesses. It would make sure that new technologies can scale appropriately—in terms of complexity, operation, and sustainability—to meet any terrorist attack, no matter how large.

The technologies developed through this research and development should not only make us safer, but also make our daily lives better; while protecting against the rare event, they should also enhance the commonplace. Thus, the technologies developed for homeland

security should fit well within our physical and economic infrastructure and our national habits. System performance must balance the risks associated with the terrorist threat against the impact of false alarms and impediments to our way of life.

Establish a national laboratory for homeland security. Under the President's proposal, the Department of Homeland Security will establish a laboratory—actually a network of laboratories—modeled on the National Nuclear Security Administration laboratories that provided expertise in nuclear weapon design throughout the Cold War. These laboratories would provide a multidisciplinary environment for developing and demonstrating new technologies for homeland security and would maintain a critical mass of scientific and engineering talent with a deep understanding of the various operational and technical issues associated with homeland security systems. The Department would establish a central management and research facility with satellite centers of excellence located at various national laboratories.

The national laboratory for homeland security would develop, demonstrate, and then transition to the field new technologies and system concepts to counter the specific threats of chemical, biological, radiological, and nuclear terrorism. It would transfer successful technologies to commercial industry for manufacture and long-term support. It would reach out to various regional, state, and local homeland security efforts, gaining familiarity with their issues, and providing them core research, development, test, and evaluation expertise. The laboratory would help the Department of Homeland Security's efforts to conduct and support threat and vulnerability analyses.

Solicit independent and private analysis for science and technology research. Under the President's proposal, the Department of Homeland Security will fund independent analytic support for our homeland security science and technology endeavors. These efforts will support planning activities, including net assessment, preparing agency guidance, and reviewing agency programs and budgets; systems analyses; requirements analyses; assessments of competing technical and operational approaches; and the Department's use of "red team" techniques. (See *Intelligence and Warning* chapter for additional details on "red team" techniques.) The organizations that provide this support to the Department will undertake long-range projects and should have access to sensitive government and proprietary data, including intelligence assessments. They should also possess unquestionable objectivity, staying free from conflicts of interest with other government institutions and the private sector.

Establish a mechanism for rapidly producing prototypes. Technologies developed for a variety of purposes are often directly applicable, or quickly adaptable, for homeland security needs. Under the President's proposal, the Department of Homeland Security will work with other federal agencies to provide a means for rapid prototyping of innovative homeland security concepts based on existing technologies. It would collect unsolicited ideas, evaluate them, and maintain a capability for funding the most promising ideas either directly or in partnership with a relevant agency. The Department would ensure that successful prototypes are sustainable by partnering with the commercial sector for manufacture and long-term support.

Conduct demonstrations and pilot deployments. The Department of Homeland Security would systematically engage in pilot deployments and demonstrations to provide a conduit between the state and local users of technology and the federal developers of that technology. These pilot deployments and demonstrations would serve as a focal point for the development of regional solutions, testing how well new homeland security technologies work under local conditions across America. We must also test how well those technologies work in the case of a large-scale attack.

Set standards for homeland security technology. In order to encourage investment in homeland security science and

technology efforts, the Department of Homeland Security, along with other federal agencies, would work with state and local governments and the private sector to build a mechanism for analyzing, validating, and setting standards for homeland security equipment. The Department would develop comprehensive protocols for certification of compliance with these standards. This activity will allow state and local officials to make informed procurement decisions.

Establish a system for high-risk, high-payoff homeland security research. Bringing the full force of science to bear on our efforts to secure the homeland will require systematic investment in innovative and revolutionary research and development projects. We expect many of these projects to fail due to the technical risks involved, but the payoff for success will be great. The Department of Homeland Security would establish a program with a high level of programmatic and budgetary flexibility to solicit private industry for innovative concepts.

Through these and other focused science and technology programs, we will develop new tools and techniques to secure our homeland. Our enemies are adaptive, constantly searching for new ways to strike us. We must do the same. Just as we did in World War II and in the Cold War, we must use our great strength in science and technology to triumph in the war on terrorism.
