SPECIAL FEATURE: REMEDIATION

INTERAGENCY BIOLOGICAL RESTORATION DEMONSTRATION (IBRD): A COLLABORATIVE APPROACH TO BIOLOGICAL INCIDENT RECOVERY

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Following the terrorist attacks in 2001, much time and effort has been put toward improving catastrophic incident response. But recovery—the period following initial response that focuses on the long-term viability of the affected area—has received less attention. Recognizing the importance of being able to recover an area following a catastrophic incident, the Department of Defense, through its Defense Threat Reduction Agency (DTRA), and the Department of Homeland Security, through its Science and Technology Directorate (DHS S&T), created the Interagency Biological Restoration Demonstration (IBRD) program. IBRD was a 4-year program jointly managed and funded by DTRA and DHS S&T, the goal of which was to reduce the time and resources necessary to recover a wide urban area from an intentional release of *Bacillus anthracis*. Specific program objectives included understanding the social, economic, and operational interdependencies that affect recovery; establishing long-term coordination between the Departments of Defense and Homeland Security; developing strategic recovery/restoration plans; identifying and demonstrating technologies that support recovery; and exercising recovery activities and technology solutions. IBRD has made important first steps toward improving national preparedness in the area biological incident recovery. Specifically, IBRD has helped enhance the efficacy and efficiency of recovering large urban areas by developing consequence management guidance; identifying key S&T capabilities and integrating them with planning and guidance documents; and establishing key relationships across the federal interagency, federal-to-regional, civilian-to-military, and public-to-private stakeholders. Upon completion of IBRD in fall 2010, both DTRA and DHS S&T planned follow-on programs.

THE 2001 ANTHRAX ATTACK tested the nation's ability to respond to and recover from an intentional, multisite, persistent biological agent release. Remediating contaminated facilities following the 2001 release proved to be both time-consuming and expensive. Cleanup efforts at

the affected postal service facilities alone cost in the hundreds of millions of dollars, and the last affected building reopened 7 years after the event.¹

During the 2001 cleanup, numerous challenges that affected the overall efficiency of the effort were identified. For

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example, developing sampling strategies to determine both the level of contamination within a facility and the effectiveness of subsequent remediation efforts proved difficult. Additionally, remediation strategies were developed largely in real time. While it is true that the unique characteristics of each event will drive the development of remediation strategies, there are basic actions that can be done in advance (ie, the identification of appropriate remediation procedures, decontamination equipment, and decontaminants for common surface types) to make the cleanup more efficient. Establishing and agreeing on clearance standards necessary to reoccupy a facility also was a challenge.¹ Ultimately, all affected buildings were remediated and reopened, but the challenges that surfaced during recovery efforts, as well as the amount of money and time it took to complete them, highlighted the need for strategizing and planning for recovery prior to an incident.

As challenging as the cleanup of affected facilities in 2001 was, remediating a wide urban area following an outdoor release of anthrax (such as the scenario described in National Planning Scenario #2 Biological Attack—Aerosol Anthrax²) would be exponentially more difficult. In addition to the challenges described above, remediating an outdoor area would include new considerations, such as the effect of meteorological conditions on the spread and duration of contamination, and the potential for the agent to reaerosolize. Additionally, outdoor surfaces and structures, such as parks, and transit and road systems may need to be remediated, which would require new decontamination strategies and clearance goals. Fumigation, which was widely used in the affected buildings in 2001,³ would not be feasible outdoors, nor would it be possible to reach the clearance goal used in 2001 of zero growth (ie, no growth of spores on samples taken following decontamination⁴) on environmental samples.

In addition to technical challenges, cleaning up an area that measured in square miles would be vastly more time-consuming than cleaning up individual facilities. Finally, social and economic challenges that were not present in 2001 would cause further complications. If an urban area in the U.S. is uninhabitable for a significant amount of time, there may be long-term, far-reaching effects that are not immediately apparent.

In response to the 2001 anthrax attack, national biodefense policy began to direct that the issue of recovery be addressed. Between 2003 and 2004, several Homeland Security Presidential Directives (HSPDs) were issued that acknowledged this need. HSPD-5, "Management of Domestic Incidents," for example, called for the U.S. government to establish a single comprehensive approach to domestic incident management, "providing policy to prevent, prepare for, respond to, and *recover from* [italics added] terrorist attacks, major disasters, and other emergencies..."⁵ HSPD-8, "National Preparedness," went on to define preparedness as "the existence of plans, procedures, policies, training, and equipment necessary at the

Federal, State, and local level to maximize the ability to prevent, respond to, and *recover from* [italics added] major events."⁶ Finally, and most pointedly, HSPD-10, "Biodefense for the 21st Century," identified the need to improve "Federal capabilities to support states and localities in their efforts to rapidly assess, decontaminate, and return to pre-attack activities," and to develop standards and protocols for the most effective approaches for these activities.⁷

The result of these directives was the development of the National Response Plan (now called the National Response Framework, or NRF) and the National Incident Management System (NIMS), which provide guidance and instruction on developing a unified, all-hazards approach to domestic incident management. Recovery is addressed in Emergency Support Function (ESF) #14, "Long-Term Community Recovery," of the NRF. The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security (DHS) is identified as the ESF coordinating agency, with several other agencies, including the Department of Defense (DoD), serving as support agencies. ESF #14 provides a mechanism for coordinating government and private-sector organizations to enable recovery from a disaster. Specific tasks include identifying and facilitating recovery resources, providing technical support, and assisting in pre- and post-incident planning and training.⁸

While response and recovery from a terrorist event or natural disaster are largely identified as civilian responsibilities, the military is playing an increasing role. In the aftermath of Hurricane Katrina in 2005, for example, more than 72,000 U.S. military and National Guard personnel were deployed to the affected areas, making it the largest military deployment in the U.S. since the Civil War.⁹ Though the warfighter remains a primary concern of DoD, it is undeniable that the agency has capabilities that can be of great help in responding to and recovering from an intentional biological weapons release. In addition, a biological event in a U.S. city located near a military installation would have a military impact, as many DoD assets are located in the U.S. and servicemen and -women and their families often comprise a large portion of the population surrounding an installation.

In response to the 2001 terrorist attacks, the DoD stood up the U.S. Northern Command (USNORTHCOM), which is responsible for "planning, organizing, and executing homeland defense and civil support within the continental U.S., Alaska, and territorial waters."^{10(p8)} By doing so, DoD acknowledged the military's significant experience in planning, organizing, training, and equipping personnel and in operating in contaminated environments. It recognized that it must be prepared to use these capabilities in the aftermath of domestic catastrophic events. Further, in 2005 DoD issued its *Strategy for Homeland Defense and Civil Support*, which outlines the department's strategy for transforming the military's role in homeland defense and civil support. One of the objectives of this strategy is "[supporting] a

comprehensive national response to prevent and protect against terrorist incidents or *recover* [italics added] from an attack or disaster” facilitated by sharing resources across civilian and military boundaries.^{10(p2)}

THE INTERAGENCY BIOLOGICAL RESTORATION DEMONSTRATION (IBRD)

In 2006, to begin to address the issue of wide-area recovery following a biological incident, DHS and DoD partnered on the management and execution of the Interagency Biological Restoration Demonstration (IBRD), a 4-year program that ran from FY2007 through FY2010. The program resided in the DHS Science and Technology Directorate’s (S&T) Chemical and Biological Division, one of the objectives of which is to “optimize technology and process for recovery from biological and chemical attacks,”¹¹ and DoD’s Defense Threat Reduction Agency (DTRA), which is the “department’s official combat support agency for countering weapons of mass destruction.”¹² The goal of the IBRD program was to reduce the time and resources associated with recovering from and restoring a wide urban area following the release of a biological agent.

The specific objectives of the IBRD program were to:

- Understand the social, economic, and operational interdependencies that affect recovery and restoration actions;
- Establish long-term formal coordination between DoD and DHS, along with optimizing this coordination for stakeholders’ use at the state, regional, and local levels;
- Develop strategic recovery plans for DoD and DHS that can be used in other parts of the nation;
- Identify and demonstrate technologies supporting recovery and restoration operations; and
- Exercise restoration activities and available technology solutions using national planning scenarios (with an emphasis on National Planning Scenario #2, Aerosol Anthrax Attack).

PROGRAM STRUCTURE

One of the unique characteristics of the IBRD program was that it was collaboratively developed, managed, and executed by DTRA and DHS S&T. Each organization dedicated a program manager to the program and provided half of the funding.

To ensure that program efforts were meeting operational needs, IBRD partnered with the Seattle, Washington, Urban Area Security Initiative (UASI) region. The Seattle UASI was selected as a partner region because it is home to several critical assets, the headquarters of multiple major industries, and military installations, and because of its participation in several other federal level programs addressing national preparedness. In addition, the demon-

strated maturity of the region’s response plans made it an attractive partner.

Although DoD and DHS sponsored IBRD, the program focused on building or expanding relationships both horizontally and vertically. Intra- and interagency participation was key to the success of the program, as was participation from regional, state, and local governments and private sector organizations. Program products were vetted through 2 primary working groups: the Guidance Working Group, which focused primarily on the *Interim Consequence Management Guidance for a Wide-Area Biological Attack*, and the Technical Working Group, which provided input on gap identification and technical project selection.

The working groups were composed of representatives from DHS, DoD, the Environmental Protection Agency (EPA headquarters; Office of Pesticides Program, Office of Emergency Management, and Office of Research and Development), the Department of Health and Human Services (HHS; Office of the Assistant Secretary for Preparedness and Response, and the Centers for Disease Control and Prevention), the Technical Support Working Group (TSWG), Federally Funded Research and Development Centers/University Affiliated Research Centers (FFRDC/UARC), and Seattle UASI region representatives.

To identify projects for funding, IBRD documented the then current state of U.S. recovery capabilities in a front-end systems analysis. A scenario based on National Planning Scenario #2 was used as context for the analysis. This scenario was tailored to the Seattle urban area to address the unique characteristics of the region and to include both urban areas and military assets. The scenario, which represents just one possible way the event could unfold, was as follows: Terrorists employ 2 surreptitious releases of *Bacillus anthracis* spores, one in downtown Seattle and the other adjacent to Fort Lewis, a large Army base south of Seattle (in 2010, Fort Lewis joined with McChord Air Force base to become Joint Base Lewis-McChord). Each release employs a spraying device that disseminates liter quantities of wet formulation with an aerosolization efficiency of 1%. As both releases were covert, there was no warning to the public or authorities.

Following the development of the scenario, systems analysis began. With the understanding that recovery from a biological incident involving anthrax will be event specific (depending on agent amount, type and formulation, dispersal method, and contamination location), the team recognized the need for multiple analysis methodologies. Therefore, multiple quantitative and qualitative approaches were used in the analysis.

The first step in the analysis was data collection, which included face-to-face and/or phone interviews with more than 70 individuals representing approximately 20 federal, state, and local government agencies and industry. The interviews focused on perceived roles and responsibilities, civilian-military coordination, and gaps and chokepoints in recovery capabilities. Additionally, a literature review was

conducted of more than 300 references, including plans and protocols, policy and legislation, previous studies, and reports and lessons learned. Further, recognized experts in the areas of biological hazards, biological detection, biological decontamination, aerial contamination transport, emergency response operations, *B. anthracis*, and anthrax medical treatment provided white papers and assessments on a variety of technical topics.

From the data gathering activities, the tasks associated with recovery from a biological incident in a wide urban area were used to develop a decision framework. The tasks were color coded to reflect the then-current ability to accomplish them. More than 80 gaps were identified in this step of the analysis, and they were ranked using a numeric score based on the difficulty of filling them. The identified gaps and chokepoints were then prioritized using multiple quantitative and qualitative analysis methods. The results of each analysis were cross-checked and merged into a single ranked list. The gaps/chokepoints fell into 3 main categories: gaps scoping the area requiring recovery, which would have significant downstream effects; gaps reflecting high uncertainty or multiplier effects, which would cause wide variability in overall recovery timelines; and areas in which some capability currently exists but whose application to wide urban areas needs to be developed.

The gap/chokepoint list was used to inform subsequent IBRD efforts. It is important to note, however, the IBRD program did not, nor did it intend to, address all of the gaps/chokepoints identified because some did not fall within the purview of the program or were being addressed by other programs or agencies. In order to assist IBRD program management in deciding which gaps and chokepoints to address, the identified items were reviewed and prioritized by the IBRD TWG. Finally, the identified gaps and chokepoints were aligned with federal interagency needs and priorities.

Based on this information, IBRD-funded projects and events were organized into 3 categories: consequence management guidance and frameworks; S&T efforts; and workshops, exercises, and demonstrations, some of which are described in detail in this issue. Consequence management guidance and frameworks centered on providing a comprehensive approach to remediation/recovery activities, ultimately leading to the restoration of large urban areas and co-located military facilities following the release of a biological agent. The guidance can also be used to help decision makers plan for an event and guide them through recovery processes, including the efficient restoration of critical functions. S&T efforts included studies on agent fate and transport, decontaminant and application device assessments, sampling strategy development, and the development of decision support toolsets. Finally, the program sponsored numerous workshops, exercises, and demonstrations (held primarily in the Seattle area) on a variety of topics, including civilian and military coordination, federal roles and responsibilities, community resilience, waste management, social networking, and interaction with the media.

The IBRD program culminated in September 2010 with a Capstone Exhibition in Seattle to showcase IBRD products. It featured keynote speakers from the Office of the Secretary of Homeland Security; DoD Nuclear, Chemical, and Biological Defense Programs; the office of the DHS Undersecretary for Science and Technology; and FEMA. The audience was composed of a broad range of emergency management professionals and decision makers, including local Seattle urban area and federal partners; recipients of developed capabilities/technologies; IBRD contributors and experts; and military, private sector, and international representatives. The event format included presentations and expert panel discussions with federal, state, and local stakeholders; hands-on tool demonstrations; and performer poster presentations and displays.

NEXT STEPS

Prior to the end of the program, wanting to continue the interagency collaboration that was so key to the success of IBRD, both DHS and DoD began planning follow-on efforts that expanded on the scope of IBRD in both breadth and depth. Each department's follow-on program addresses its primary mission: the DHS program is focused on homeland security, while the DoD program is more centered on national defense.

In February 2011, DHS S&T kicked off the planned 2-year Wide Area Recovery and Resiliency Program (WARRP) in Denver, CO. Much as IBRD partnered with the Seattle UASI, WARRP is partnering with the Denver UASI to work with interagency partners, the military, private industry, and nonprofit organizations to develop solutions to reduce the time and resources required to recover wide urban areas, military installations, and other critical infrastructure following a catastrophic chemical, biological, or radiological (CBR) incident (thus expanding on the IBRD goal of recovering from a biological incident). Guidance documents produced in IBRD will be used to draft Denver-specific recovery and resilience plans, thus testing the transportability of the work done in IBRD. Specific objectives of WARRP are to:

- Develop/refine guidance, plans, and decision frameworks that can be leveraged and transitioned to other parts of the country and internationally, as applicable;
- Identify, develop/refine, demonstrate, and transition technologies/standards that support recovery planning and operations;
- Better understand the public health situation and challenges related to long-term recovery and recommend changes as needed to public health guidance and/or plans;
- Exercise programmatic solutions for CBR recovery;
- Enhance long-term formal coordination among DoD, DHS, the Department of Energy (DOE), the EPA, and

HHS that can be optimized for stakeholder use at the state, regional, and local levels; and

- Develop an objective regional process/capability for identifying and planning for CBR threats.

DoD, through DTRA, is planning a 3-year effort called the Transatlantic Collaborative Biological Resiliency Demonstration (TaCBRD). TaCBRD will develop and demonstrate capabilities that focus on building U.S. and partner nation resilience to a biological incident. By focusing on resilience, TaCBRD will span the spectrum of biological incident management activities to include preparedness and response as well as recovery. TaCBRD will continue the relationship with DHS S&T established in IBRD and include collaboration with the U.S. Department of State (DoS). The program will also partner with a yet to be identified country in Europe. The objectives of TaCBRD are to:

- Enhance national defense by understanding operational interdependencies that affect resilience to biological events overseas;
- Strengthen DoD, DoS, DHS, and other federal organization collaboration on countering biological threats or attacks outside the continental U.S.;
- Develop enhanced/coordinated capacities with partner nation(s) for biological threat preparedness, response, and recovery activities, and strengthen key relationships abroad;
- Improve the responsiveness and flexibility of consequence management response forces; and
- Ensure resilience to catastrophic events by providing the capability to prepare for, respond to, and recover from a biological attack.

CONCLUSION

IBRD took a systems approach to reducing the time and resources necessary to recover a wide urban area following an aerosolized anthrax attack, thus improving the nation's recovery capability. IBRD was never intended to solve or even address all of the challenges associated with biological incident recovery, but important first steps were made toward improving national preparedness in this area. Specifically, IBRD helped enhance the efficacy and efficiency of recovering large urban areas by developing risk-based processes for consequence management; identifying key S&T capabilities and integrating them with planning and guidance documents; and establishing key relationships across the federal interagency, federal-to-regional, civilian-to-military, and public-to-private stakeholders.

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