Radiological and Nuclear Countermeasures Program

Issue

A nuclear attack within U.S. borders—whether with a conventional weapon or a radiological dispersal device (RDD, also known as a dirty bomb)—would have devastating effects. Knowledge, technologies, and systems are needed to anticipate and prevent such an attack—and mitigate the effects of an event that can't be prevented.

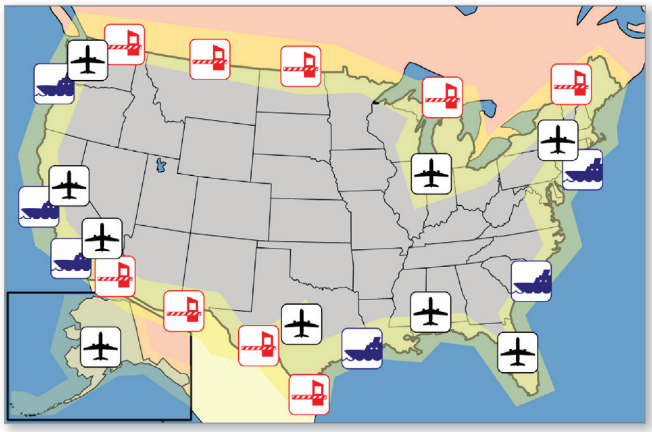
Solution

Sandia's Radiological and Nuclear Countermeasures Program applies more than 50 years of experience in safekeeping the nuclear stockpile to help secure the nation from nuclear terrorism. Our work covers the full range of solutions needed, from understanding and anticipating threats to recovering from events.

Benefits

Our deep knowledge of the issues enables us to respond quickly to today's challenges—and to anticipate the research needed to counter future threats. And because Sandia's central focus is engineering, we know how to build solutions that work under real-world constraints.

We also know that the most robust solutions often require input from a variety of disciplines. To that end, we seek out expertise from teams across Sandia and develop partnerships with industry, universities, and other national laboratories. In addition we have a strong track record of working with industry to make our products available to the people who need them.



Sandia helped design a cost-effective national system of protection against radiological and nuclear threats, based on a clear understanding of actual threats and vulnerabilities.

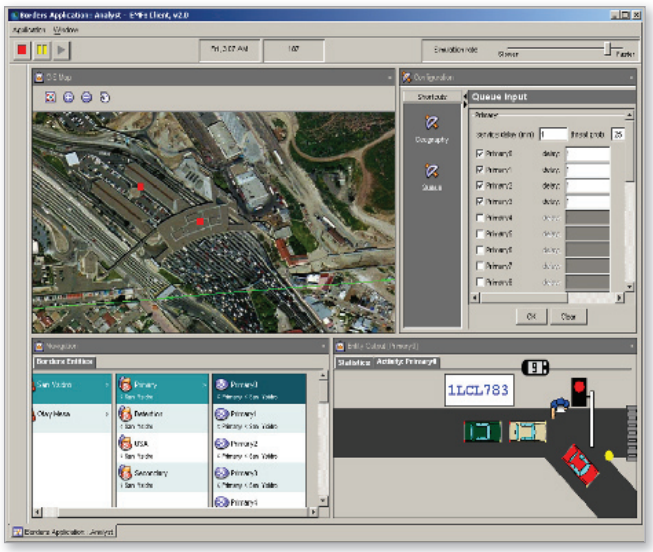
A Sampling of Sandia's Capabilities

Anticipate threats

While there is no feasible way to protect the entire nation from every possible nuclear threat, a multi-lab examination of threats and risks from a systems perspective has led to preliminary designs for a cost-effective national defensive architecture. Sandia is now leading follow-on work to better define the contributions of state and local agencies to the architecture, focusing on vehicle inspection procedures, as well as equipment, operational, training, and maintenance issues.

Scaling defensive architecture concepts down to smaller venues, Sandia has developed concepts of operation to enhance detection capabilities at special events that could be targets of terrorism, such as political conventions or Olympic Games. Our capabilities include recommending detection architectures; developing unattended, easily relocated systems; integrating the detection system with operations already in place; and responding rapidly to urgent high-alert situations.

Another intriguing tool developed by Sandia is a simulation that allows comprehensive analysis of the security of U.S. border operations. By illustrating the impacts of changes to these operations, the simulation



A computer program allows border authorities to understand the performance and drawbacks of different border protection technologies, helping them invest in technologies with the greatest benefits.

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

enables quantification of the costs and benefits of deploying radiation detection technologies. These findings can help U.S. border authorities implement technologies to effectively uncover threats while minimizing the impacts on people and businesses.

Detection

Sandia is working to overcome the complex problem of detecting the special nuclear material (SNM) used to make nuclear devices and distinguishing SNM from the more abundant naturally occurring nuclear material (NORM).

Our Sensor for Measurement and Analysis of Radiation Transients (SMART) radiation detection system—proven through field tests at selected ports—is a promising near-term option for helping to secure ports. Thermo Electron Corporation is now producing commercial units that incorporate the proprietary auto-isotope identification software used in SMART.

In addition, we're pursuing advanced research for enhanced detection to meet future needs. For example, Sandia is shrinking photomultiplier tubes (PMTs), a component that amplifies signals to allow detection. Miniaturizing detector components could in turn lead to smaller, less costly, and more easily portable detection systems. We're also exploring the feasibility of coupling capture gated neutron spectrometry with a new lithium/trans-stilbene crystal to develop a portable detector with very high sensitivity.

In addition, we are investigating advanced active interrogation methods that involve coupling standard detectors with a source of high energy neutrons or photons. These high energy particles allow greater penetration of containers potentially shielding SNM. Systems currently in development have a broad array of applications, ranging from fixed-site inspection facilities for examining large intermodal cargo containers to compact, battery-operated devices for inspecting suspicious containers at remote locations.

Other work is focused on creating new materials—such as large, optical-quality polycrystalline lanthanum halide scintillators and single crystalline diamond—that could greatly enhance detection capabilities at a lower cost than possible with today's materials. Sandia is also conducting a major experiment that involves sampling cargo in containers at sea to determine whether detectors placed on ships will accurately sense SNM while producing minimal false alarms.

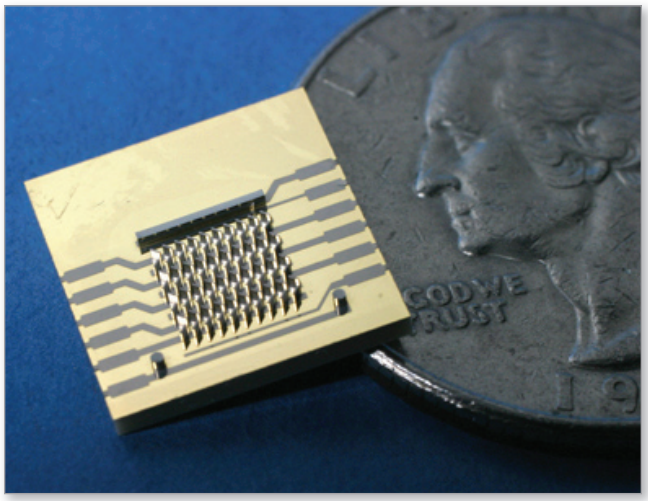
Response and recovery

After examining data from more than 500 explosive experiments conducted at a unique Sandia facility, Sandia and Brookhaven National Laboratory have created guidance to help first responders, infrastructure owners, and decision-makers plan a response to a dirty bomb that will speed assistance to injured victims and minimize the overall radiation dose to the public.

This guidance—published in the April 2006 issue of the journal *Health Physics*—puts strong science behind the tough decisions needed in the first hours following an RDD detonation. More than 200 firefighters, hazmat and law enforcement personnel, public health officials, and senior decision-makers offered suggestions to enhance the value of this guidance in the real world.

Sandia and other national laboratories also stand ready 24/7 to offer assistance to Customs personnel who are responding to a nuclear threat or smuggling incident at a border or port of entry.

To restore buildings after an event, Sandia is developing a coating to provide immediate containment of a site contaminated with radioactive material. This coating is a thick "paint" that encapsulates contaminated surfaces, binding to the radioactive material and preventing its spread. The coating can then be peeled off of the surface in large pieces, removing most of the radioactivity, and disposed of. Our coating has successfully undergone bench-scale testing. It now requires additional validation testing on a larger scale.



Sandia's materials research could lead to better, faster detection at lower cost.

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Learn more at
http://homelandsecurity.sandia.gov