

A National Strategy against Terrorism Using Weapons of Mass Destruction

THE World Trade Center and Oklahoma City bombings signaled a change in the character of terrorism in the U.S. Most of the previous acts of domestic terrorism have not involved mass casualties. However, recent incidents indicate an apparent desire of terrorists to injure or kill large numbers of innocent people--six people were killed and more than 1,000 injured in the World Trade Center bombing, and 168 people died in the bombing of the Alfred P. Murrah Federal Building.

As horrifying as these acts of terrorism were, damage and casualties could have been much greater if the terrorists had used weapons of mass destruction (WMD)--nuclear, chemical, or biological weapons. In March 1995, the Aum Shinrikyo cult demonstrated that terrorists can acquire WMD with its sarin nerve gas attacks in the Tokyo subway that killed 12 people and sickened more than 5,000.

An open society like ours in the U.S. is particularly vulnerable to WMD terrorism. Information on nuclear, chemical, and biological weapons is readily available on the Internet and in many how-to books. There is increasing evidence of illegal trafficking in nuclear materials. In addition, a number of countries hostile to the U.S. are known to be developing WMD capabilities, and some of them are known to support terrorist groups.

Livermore Study Group Formed

In June 1996, the Director of Central Intelligence and the Deputy Secretary of Energy chartered a study of the threat posed by terrorist groups using nuclear, chemical, or biological

weapons in the U.S. Organized by Lawrence Livermore with Associate Director Wayne Shotts as the sponsor, the group was chaired by R. James Woolsey, former Director of Central Intelligence, and Joseph S. Nye, Jr., former Assistant Secretary for Defense for International Security Affairs. Known as the Livermore Study Group, it included eminent experts from the Central Intelligence Agency, the Departments of Defense and Energy, the Federal Bureau of Investigation, the Arms Control and Disarmament Agency, Congress, U.S. industry, and academia.

The study group examined the potential of terrorist use of WMD against the U.S., reviewed current U.S. capabilities, and made recommendations for enhancing the nation's ability to prevent and respond to this threat.

U.S. Poorly Prepared for WMD Terrorism

The study group concluded that the U.S. is ill-prepared to respond to a terrorist attack that uses WMD. According to co-chair Jim Woolsey, "Of all the threats that could inflict major damage to the U.S., terrorists using weapons of mass destruction is the threat for which the nation is least prepared." The study group notes that although existing capabilities work well for planned high-risk events like the 1996 Atlanta Olympics, no integrated system is in place to deal with a threat of the magnitude, complexity, and severity of WMD terrorism.

The study group recognized that a nascent national policy addressing the threat of WMD terrorism is in place, that it is being implemented at the level of the National Security Council (NSC) by a small staff, and that this high-level group's efforts are making progress in coordinating national resources to meet the challenges posed by WMD terrorism. However, much remains to be done.

National Strategy Recommended

The study group's overriding recommendation is, therefore, to give the threat of terrorism using WMD the highest priority in U.S. national security policy. Specifically, it recommends an accelerated and intensified national program, integrated across the entire federal system and managed as a program out of the NSC, to address comprehensively the threat of WMD terrorism.

The study group emphasized that an end-to-end systematic strategy is the best defense against WMD terrorism. Through an enhanced national program, an end-to-end systematic strategy

could be implemented that integrates technology, operations, and policy and provides a framework for coordinated local, state, and federal emergency response. "We are not alone in our thinking," says Wayne Shotts, Laboratory Associate Director for Nonproliferation, Arms Control, and International Security and study sponsor. "A number of other studies related to the WMD threat have echoed the recommendation for a more robust national program." The Livermore Study Group takes these recommendations several steps further, urging an end-to-end strategy to provide a multilayered defense--from detection and prevention to reversal and response--in which all phases of a potential WMD terrorist attack can be addressed (Table 1).

Table 1. End-to-end strategy for responding to threats and acts of WMD terrorism.

Intelligence and warning	Prevention	Crisis management	Consequence management	Retaliation
<ul style="list-style-type: none"> • Strategic warning • Tactical warning 	<ul style="list-style-type: none"> • Denial • Demotivation • Deterrence • Elimination 	<ul style="list-style-type: none"> • Detection • Threat validation • Location • Weapon assessment • Impact assessment • Attribution • Demotivation and deterrence • Render safe 	<ul style="list-style-type: none"> • Damage assessment • Evacuation and protection • Reconstitution • Cleanup 	<ul style="list-style-type: none"> • Attribution • Prosecution • Military response

Regarding the need for enhanced capabilities, the study group recognizes that many of the agencies responsible for counterterrorism have initiated significant new efforts to enhance U.S. capabilities in this arena. Nevertheless, in looking at an end-to-end strategy, the group identified a number of promising activities to improve the nation's ability to counter the threat of WMD terrorism.

For example, in the area of intelligence and warning, the study group's key recommendations are for more and better technologies and systems for tracking materials and activities indicative of WMD development, production, or transport and for policies and approaches that allow U.S. law enforcement agencies to function effectively in the modern communications-technology environment.

For the prevention phase, the study group calls for additional exploitation of diplomatic efforts, foreign policy, and treaties to

promote WMD nonproliferation, strengthen international law enforcement, counter the conditions that foster terrorism, and facilitate the use of technology to counter WMD terrorism. They also note the need for better material control programs worldwide to prevent weapons materials from reaching the hands of terrorists and for expanded border protection programs to detect and intercept WMD materials.

To improve U.S. capabilities in crisis management, the study group urges accelerated development of new sensor systems (or improvement of existing systems) for detecting, identifying, and locating WMD materials and devices as well as technical capabilities for disabling and rendering WMD devices safe. Also required for more effective response and deterrence are better technologies, databases, and other means of forensic identification and attribution of the source, origin, and pathways of weapon materials and devices.

For consequence management, the study group stresses the need for intensified planning and preparation to enable emergency response personnel and medical communities to deal with mass casualties caused by WMD agents. The group also calls for faster and more accurate atmospheric transport and deposition models for determining the populations at risk if biological or chemical agents are released.

"The study group recognizes that implementing an integrated national program to deal with the constantly changing threat of WMD terrorism will not be simple or straightforward," says Joe Nye, study co-chair. "However, we must not wait until a disaster of Pearl Harbor proportions forces us to recognize the severity of this threat and the need to mount an adequate defense."

Strategic Support from New Technologies

While the study group's charter does not extend beyond analysis and recommendations regarding WMD terrorism, Dennis Imbro, a Livermore scientist who served as liaison to the group, notes that "there must be a marriage of technology and policy to effectively counter this threat." The national laboratories are a valuable source of innovative and advanced technologies and thus can make important contributions to this critical aspect of national security. A number of technologies are being developed or refined at Lawrence Livermore that can address gaps in current U.S. counterterrorism capabilities.

One particularly promising technology with anti-WMD-

terrorism application is the Wide-Area Tracking System (WATS) for detecting and tracking a ground-delivered nuclear device. Another is the Joint Biological Remote Early Warning System (JBREWS) for alerting U.S. field troops of an attack with biological agents (Figure 1). Both systems consist of a network of sensors and communications links, with information continuously evaluated by unique data-fusion algorithms. The sensors can be permanently deployed at chosen locations or mounted in vans for deployment on demand to protect specific areas for specific situations or events.

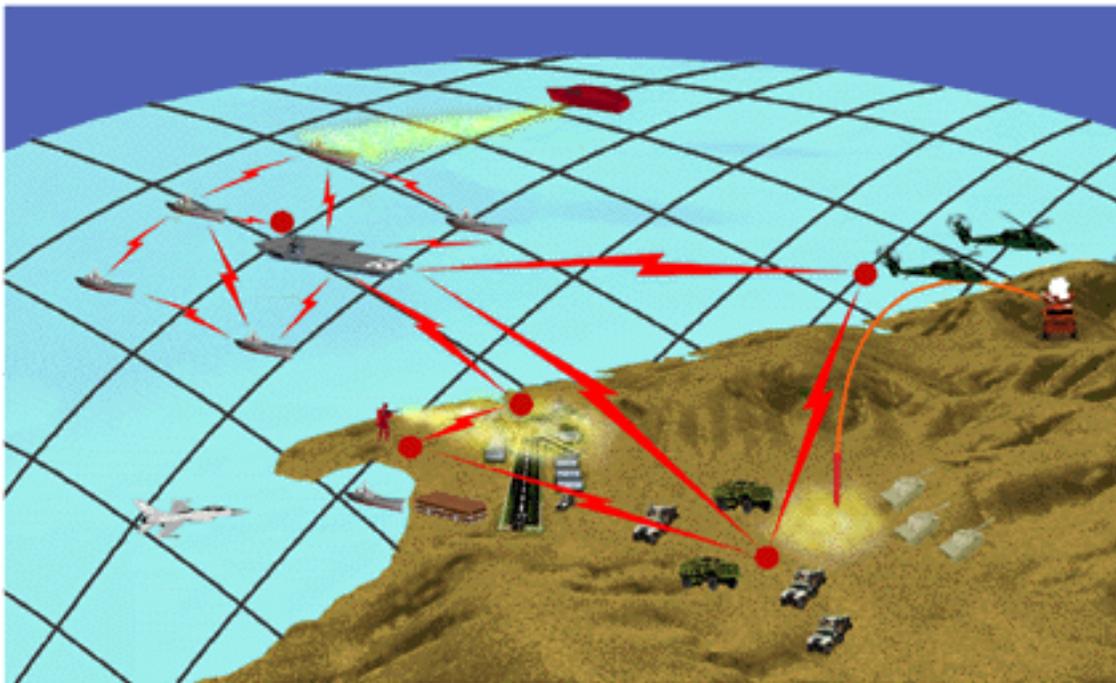


Figure 1. The Joint Biological Remote Early Warning System (JBREWS) is a system of networked sensors and communication links being developed to rapidly alert field troops of an attack with biological weapons.

A portable radiation detector developed at Livermore to monitor and detect nuclear materials in the field at ambient temperatures also has potential uses to defend against WMD terrorism (Figure 2). The new system is based on a relatively new cadmium-zinc-telluride detector material and can separate gamma- or x-radiation energies to identify the isotopic signature of nuclear materials such as plutonium and uranium. The system has immediate applications, for example, in detecting and deterring nuclear smuggling through airports and shipping ports and in national and international nuclear materials safeguard operations.



Figure 2. The portable radiation detector being demonstrated by its inventor Anthony Lavietes can identify the precise isotopic signature of nuclear materials such as plutonium and uranium by detecting gamma radiation. It improves upon the large germanium-based detectors shown in the background and has a variety of applications, among them assistance with defense against terrorism using weapons of mass destruction.

To detect biological weapons, Livermore has developed immunoassay and DNA recognition-based sensors. Unlike most biodetection instruments, which are bulky and can only be used in laboratory settings, the mini-flow cytometer and the mini-PCR (polymerase chain reaction) instrument can be used in the field to identify specific biological warfare agents. (See *S&TR*, [July/August 1997](#), pp. 14-16.) Both have been tested successfully at the U.S. Army's Dugway Proving Ground in Utah.

Livermore is also home to the Forensic Science Center, which uses a wide range of advanced chemical, biological, and nuclear analysis techniques to examine samples for the U.S. government and law enforcement agencies. Forensic science techniques are essential for identifying the source of WMD.

These Laboratory technologies and capabilities and others

like them contribute greatly to meeting the monumental challenge of countering the threat posed by WMD terrorism.

--*Lauren de Vore*

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