



ANTITERRORISM PROGRAMS

The Unthinkable Becomes Real for a Horrified World

BOSTON—As the wreckage of the World Trade Center and the Pentagon smoldered and the world began to take in the horror of last week's terrorist attacks, the unthinkable no longer seemed fantastic. If groups armed with little more than knives and pilot's training could bring about such mind-numbing devastation, what might they be capable of doing with weapons of mass destruction?

"Now, anything is possible," warned Allison MacFarlane, a Massachusetts Institute of Technology (MIT) nuclear security researcher, speaking at a hastily organized symposium here held less than 36 hours after the suicide attacks. Had the terrorists had a nuclear weapon, she noted gravely, "we might be facing the fact that New York City doesn't exist." Adds William Hoehn III, director of the Washington, D.C., office of the Russian-American Nuclear Security Advisory Council: "The rules of the game have changed, and the taboo against the mass killing of civilians has been broken."

The United States now spends more than half a billion dollars annually on research to defend against such attacks using weapons of mass destruction (see table on p. 2185). But researchers and antiterrorism experts agree that those efforts are badly organized, waste-



Point of impact. The Pentagon was functioning the day after being hit by a hijacked airliner.

ful, and poorly coordinated. Despite a recent stream of blue-ribbon panel reports from Congress, the National Academies of Sciences (NAS), and the Pentagon's Defense Science Board that call for reform, the national effort remains a grab bag of programs spread across a half-dozen feuding federal agencies. Most lack adequate ties with local and state officials. "What we need are priorities and a long-range research agenda," pleads Michael Wermuth, chief of staff of a

congressionally chartered panel led by Virginia Governor James Gilmore that will report in December on the country's capacity to respond to domestic terrorist attacks using weapons of mass destruction.

Last week's attacks have already set off a quiet scramble at federal labs across the country to beef up efforts ranging from new biological and chemical detection techniques to profiling the behavioral patterns of terrorist cliques. But some scientists are worried that a rattled public will expect too much from them. "Technical solutions can't solve the problem" of terrorism, says Harvard biologist Matthew Meselson, a member of a 1998 NAS panel that examined U.S. responses to potential chemical and biological terrorism. Instead, many researchers and politicians—both in the United States and other nations—want the Bush Administration to change direction and lobby for stronger international controls on biological weapons and greater bilateral cooperation with Russia. Adds Paul Josephson, a science historian and nonproliferation expert at Colby College in Waterville, Maine, "Joint and multilateral programs are the only hope for nonproliferation."

Unholy trinity. Weapons of mass terror come in three flavors. The first is nuclear. Since 1992, there have been six known cases of highly enriched uranium or plutonium being intercepted by authorities as it passed in or out of the former Soviet Union. As to how much bomb-grade material has been successfully smuggled, "we have no idea,"

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Intense Fire Doomed Trade Center Towers

One hundred minutes after being struck near the 90th floor by a hijacked airliner, the 110-story, 415-meter-high North Tower of the World Trade Center collapsed into a six-story-high pile of rubble. Engineers and materials scientists are still analyzing the collapse, but they believe its primary cause to be the intense heat—up to 1000°C—from the nearly 30,000 kilograms of burning jet fuel.

The structure's core, floor supports, and tubelike outer frame—more than 200 columns that bore most of the building's weight—were formed by steel beams. But those beams would have become severely

detectors to setting up decontamination systems—has proved difficult.

“There is no central coordination, and there is enormous redundancy and waste,” says Tucker. “There is no integrated system,” agrees Ernest Moniz, an MIT physicist and former chief scientist at the Department of Energy. “To get one, you have to break a lot of china”: interagency jealousies and congressional oversight by a bewildering number of committees.

Better coordination and more resources, however, are not a magic bullet, warn some scientists. “I don’t see a shortage of money; I see a shortage of ideas,” says Harvard’s Meselson. “And we’re already spending gigantic amounts to cure cancer and AIDS, so let’s not exaggerate what more money would do.”

He and others say R&D to halt or cope with attacks is no substitute for diplomacy to prevent them. That means stopping the

RIISING R&D FUNDING TO COMBAT TERRORISM

Category	(in millions of dollars)			
	FY 1998	FY 1999	FY 2000	FY 2001*
Total U.S. spending on antiterrorism	\$6500	\$8760	\$8400	\$9300
Total R&D	403	527	728	813
R&D for weapons of mass destruction†	240	369	537	590
Basic research	71	31	48	92
Detection and diagnostics	18	59	78	97
Modeling and simulation	4	11	17	17
Personal and collection protection	12	10	30	28
Personal and environmental decontamination	2	9	21	24
Therapeutics and treatment	0	16	21	27
Vaccines	3	36	88	99
Other	131	197	240	205

* Requested amount.

† Weapons of mass destruction include biological, chemical, and nuclear weapons.

Spread thin. The government’s spending on research to combat terrorism covers many activities across a half-dozen agencies.

It will be up to the White House to alter that. Vice President Richard Cheney currently is heading an effort begun in May to restructure the way the United States copes with domestic terrorism. And the Gilmore Commission will propose strong White House actions, says Wermuth: “We need to get control of this and force the agencies to sing from the same song sheet.”

There is plenty of advice on how that should be done. A panel led by former senators Warren Rudman and Gary Hart in February called for the creation of a Cabinet-level agency to combat terrorism and urged a doubling of federal R&D spending to help prevent and prepare for attacks using weapons of mass destruction. It also predicted a terrorist attack with nuclear, chemical, or biological weapons within the next 25 years. A 1998 NAS report on R&D needs for improving civilian medical response to chemical and biological terrorism calls for drugs and vaccines to combat anthrax and smallpox, portable and efficient detectors and diagnostic kits, and better communications. And the Defense Science Board 2001 report calls for stockpiling vaccines, passive protection such as surgical masks, and early-warning systems for reporting disease. “We have to accept that we can’t stop these attacks,” says Whitesides. “But we can make them as unattractive as possible.”

spread of the materials and expertise needed to develop such weapons. “It is time that this trade was exposed, disrupted, and stamped out,” said British Prime Minister Tony Blair on 14 September. His foreign secretary, Robin Cook, added that “we must redouble our efforts to stop the proliferation and availability of such weapons.”

But until now, the Bush Administration has not made proliferation a high priority. It has opposed new rules for monitoring compliance with the 1972 Biological Weapons Convention, arguing that they are unworkable, and proposed cutting funds for nuclear nonproliferation programs in 2002—including an effort to conduct an inventory of Russia’s plutonium stockpile. “This doesn’t make any sense,” says Hoehn.

The U.S. government may reevaluate those policies in the light of last week’s attacks. “If anything good has come from this, it is that complacency has been shattered,” says Peter Jahrling, a biologist at the U.S. Army Medical Research Institute at Fort Detrick, Maryland. “What was unimaginable to most is now regarded as a vulnerability.” The debate comes too late for the victims of the 11 September tragedies, but perhaps not for millions who could be targets of future attacks.

—ANDREW LAWLER

With reporting by Richard Stone.

ScienceScope

The terrorist attacks of 11 September jarred the scientific community in many ways. A few dispatches from Science reporters:

Emergency Response After the World Trade Center collapse, emergency medical care specialists in New York City for a 2-day review of “public access to defibrillation” funded by the National Heart, Lung, and Blood Institute sprang into action. “There were about 50 of us” from around the country, says Lynne Richardson, chair of emergency medicine at the city’s Mount Sinai School of Medicine. “We tried to help” by setting up clinics in two hotel ballrooms and recruiting supplies from a nearby pharmacy. They treated a few hundred people for minor injuries but were “frustrated that we couldn’t do more,” Richardson says.

Words of Support At the U.S. National Academy of Sciences in Washington, D.C., messages of condolence and support poured in from sister science, medicine, and engineering academies around the world. “To those of us who, through our work in national academies, stand for values of reason and enlightenment and who see ourselves as part of a global family, such a horrendous crime is particularly repugnant,” wrote Paul Callaghan, president of the Royal Society of New Zealand.

No Go Thousands of scientists cancelled travel plans after organizers called off scores of meetings. Among the cancellations: “Assembling the Tree of Life,” a major evolution and taxonomy summit scheduled for 20 to 22 September at the American Museum of Natural History in New York City (*Science*, 14 September, p. 1979). “We intended for this symposium to be a celebration of Life on Earth,” read a cancellation e-mail from the organizers.

On Alert At the Department of Energy’s national laboratories, security was stepped up. The Livermore National Laboratory in California, for instance, closed public areas, moved security checkpoints to outer fences, and began searching all delivery vehicles. Nonessential staff were asked to stay home on the day of the attacks. Researchers with the lab’s National Atmospheric Advisory Release Center were put on alert, ready if needed to monitor and forecast the movement of the smoke plumes created by the fires at the World Trade Center and the Pentagon.