FAS Public Interest Report
Journal of the Federation of American Scientists

Volume 55, Number 2 March/April 2002

Dirty Bombs: Response to a Threat

Henry Kelly testified before the Senate Foreign Relations Committee on March 6, 2002 on the threat of radiological attack by terrorist groups. This excerpt is taken from the text of his written testimony, based on analysis by Michael Levi, Robert Nelson, and Jaime Yassif, which can be found at www.fas.org.

Surely there is no more unsettling task than considering how to defend our nation against individuals and groups seeking to advance their aims by killing and injuring innocent people. But recent events make it necessary to take almost inconceivably evil acts seriously. Our analysis of this threat has reached three principle conclusions:

1. Radiological attacks constitute a credible threat. Radioactive materials that could be used for such attacks are stored in thousands of facilities around the US, many of which may not be adequately protected against theft by determined terrorists. Some of this material could be easily dispersed in urban areas by using conventional explosives or by other methods.

Continued on page 6

Making Sense of Information Restrictions After September 11

By Steven Aftergood and Henry Kelly

The Bush Administration introduced a series of new restrictions on public access to government information following the terrorist attacks of last year. Under the new policy, agencies have removed thousands of pages from government web sites and withdrawn thousands of government documents and technical reports from public libraries. In one case, government depository libraries around the country were ordered to destroy their copies of a recently issued USGS CD-ROM on US water resources.

The new restrictions have alarmed scientists, public interest groups, and concerned citizens because they interfere with the conduct of research and limit legitimate access to information needed for public discussion of key policy issues. Continued growth of restrictions without any clear end in sight creates understandable concern that we are watching a veil of indiscriminate security descending on significant portions of the American policy process.

Without debating the merits of any particular case, it is clear that the new information restrictions have been undertaken in a largely ad hoc fashion. While the unprecedented emergency required quick action in the short term, the inconsistent and often arbitrary policies that have emerged are clearly not satisfactory over the long term. While terrorist threats require reshaping some standards, they do not call for wholesale abandonment of existing processes and safeguards. Few of the issues raised are new. The challenge of drawing a line between what should be protected and what should not has been the subject of years of debate that has

Continued on page 2

In This Issue

The FAS Public Interest Report
The FAS Public Interest Report (USPS 188-100) is published bi-monthly at 1717 K St. NW Suite 209, Washington, DC 20036. Annual subscription is $50/year.

Archived FAS Public Interest Reports are available online at www.fas.org or phone (202) 546-3300, fax (202) 675-1010, or email fas@fas.org.

Printed on 100% Recycled, 100% Postconsumer Waste, Process Chlorine Free (PCF)

About FAS

The Federation of American Scientists (FAS), founded October 31, 1945 as the Federation of Atomic Scientists by Manhattan Project scientists, works to ensure that advances in science are used to build a secure, rewarding, environmentally sustainable future for all people by conducting research and advocacy on science public policy issues. Current weapons nonproliferation issues range from nuclear disarmament to biological and chemical weapons control to monitoring conventional arms sales; related issues include drug policy, space policy, and disease surveillance. FAS also promotes learning technologies and limits on government secrecy. FAS is a tax-exempt, tax-deductible 501(c)3 organization.

Editorial Staff

EDITOR: Henry Kelly, President

ASSISTANT EDITOR: Karen Kelley, Organization Manager

"Information" *Continued from page 1*

resulted in a large and useful body of law and policy that governs information disclosure and provide safeguards against abuse.

Recent steps taken by the administration have exceeded the authority provided by existing law and executive orders. This situation must be quickly remedied. The process of building a new system provides an opportunity to address several flaws in the existing system. The following issues deserve careful scrutiny:

(i) How does the new threat of terrorism affect the criteria for releasing information?

(ii) Should separate release decisions be made concerning whether to keep material classified and whether to make it easily available by putting it on the web?

(iii) What procedures can be adopted to prevent abuse, and provide assurance that the people making decisions about releasing information are not withholding information to protect themselves from public scrutiny of their actions?

"Sensitive but Unclassified"

Several of the new restrictions on information are not congruent with the existing legal framework defined by the Freedom of Information Act (FOIA), or with the executive order that governs national security classification and declassification. FOIA is the primary instrument giving the public the legal right of access to government information. It also provides legal authorization for the government to withhold information that fits within one or more of its nine exemptions (e.g., classified national security information, proprietary information, privacy information, etc.)

Perhaps the most serious example of deviation from existing standards can be found in a March 19 White House memorandum to executive branch agencies, urging them to withhold "sensitive but unclassified information related to America's homeland security."

This is bad policy because no one knows what it means. The meaning of "unclassified" is clear, of course, but the crucial term "sensitive" is not defined. This is a problem, because agencies may have many reasons for considering information "sensitive" that have nothing to do with national security. They may wish to evade congressional oversight, to shield a controversial program from public awareness, or otherwise manipulate the political system through strategic withholding and disclosure of information.

The Administration has also moved to make a distinction between hard copy documents (deemed less sensitive) and web-based documents (deemed more sensitive) that is not recognized in law. No guidelines have been issued defining how to make this distinction or the basis for maintaining the distinction, thereby giving thousands of individual government organizations arbitrary authority to remove material from the web. Since there are no procedures for reviewing these decisions, there are no protections from abuse.

Some agencies are attempting to impose controls on documents that have been declassified under proper authority and publicly released, which is not permitted under current guidelines (and which is probably futile).

Failure to provide a clear definition of "sensitive but unclassified information" points to the need for greater clarity in government information policy—a policy that encompasses legitimate security concerns while upholding the virtues of public disclosure.

Start Making Sense

Crafting a new policy that responds to the sometimes competing interests in security and public access should not be an extraordinarily difficult task.

In the first place, most government information will be self-evidently subject to disclosure under the Freedom of Information Act, or else clearly exempt from disclosure under the provisions of that law. These are easy cases where the proper legal course of action is obvious.

But there will be certain types of information that form an ambiguous middle ground, to which the law has

Continued on page 12

The "War on Terror" and the "War on Drugs": A Comparison

By Mark A. R. Kleiman, Peter Reuter, and Jonathan P. Caulkins

The problem of large-scale terrorism aimed at targets within the United States is new. It is much too early to judge how permanent the problem is: whether the September 11 attacks will be seen in retrospect as making a phase change in the level of domestic risk from such acts, or instead stand out like the Chicago fire or the Galveston flood, not as a precedent but as a one-time event. (To some extent, that may be determined by the adequacy of the policy response.)

The effort to prevent repetitions of the September 11th incidents has begun to be called "the war on terror." This suggests analogies to the "war on drugs," and there have been attempts to use these comparisons to draw conclusions about the appropriate shape and likely success of the anti-terrorism campaigns.

The counter-drug experience holds at least three useful lessons for policy makers:

1. Enforcement strategies are very different: Drug dealers have customers; terrorists have supporters and victims. Drug organizations are mostly anonymous and interchangeable, thus making the removal of any one, or even any small number, of limited usefulness. Terrorist organizations appear to be highly individual and may take a long time to replace, so that the removal of even one, such as Al-Quaeda, might make a large difference to the threat faced in the United States. The largely successful campaign against the American Mafia — a campaign against a specific group of organizations, rather than against a class of activities — may provide much more insight into successful anti-terrorist policy than does the more diffuse and less successful drug enforcement effort;
2. Border control is both necessary and limited, but is unlikely to be the key to preventing terrorism. Sealing the borders against tons of cocaine and heroin has proven impossible. Border interdiction is likely to be even less successful against explosive devices, nuclear materials, or biological weapons where the threats are measured in kilograms, or even grams. Detecting tens or hundreds of terrorists among millions of border-crossers is likely to prove no easier.
3. Coordination problems are immense, not to be solved by merely naming a "czar." The drug czar has been able to affect federal drug policy only marginally, partly because of budgetary obstacles and Congressional fragmentation. Inducing agencies with very different missions and cultures, reporting to different levels of government, to work together will never be easy, and Cabinet rank is a poor substitute for money and authority.

Crime Control and Enforcement

Terror has victims, and sponsors, rather than consumers. Thus there is no clear analogy in the counter-terror efforts to "demand reduction" efforts as in drug control policy. Instead of reducing demand, counter-terror policy has the possibility of hardening targets, such as reinforcing cockpit doors. However, terrorist organizations, like drug dealers, are capable of adapting to control efforts mounted against them.

Drug enforcement attacks ongoing activity. Investigative targets have sold drugs many times before, they hope to continue doing so on a regular (in some cases daily) basis, and the next drug transaction typically looks a lot like the last one. Counter-terror operations seek to arrest activity before it occurs, and are constrained by the need to stop any known future action that might risk personal injury. By contrast, undercover drug investigations routinely continue while the organizations under surveillance deliver drugs to customers.

An essential contribution of undercover drug investigations is making drug market participants suspicious of strangers who claim interest in transacting drugs. The existence of undercover operations hampers all drug operations, not just those directly targeted. Even if enforcement agencies have trouble penetrating terrorist cells, aggressive efforts to do so may hamper cooperation among cells by making them suspicious of strangers.

Drug distribution networks are robust to enforcement because they are networks rather than monoliths or hierarchies. The "new" terrorist organizations are reported to have more of a network structure, so they may be more resilient than the "classical" terrorist organizations of the 70's and 80's, but they are still more vertically and horizontally integrated, and to that extent more vulnerable, than are drug distribution networks.

Dismantling one drug trafficking organization benefits others by eliminating competition for markets. Enforcement can take advantage of this, either by getting one group to inform against the other or by making intergroup (or intragroup) violence the target of investigative efforts. There is in general no comparable incentive for different terrorist organizations or cells to interfere with each other.

Among enforcement activities, counter-terror may resemble traditional organized crime enforcement more closely than it does drug enforcement. Organized crime enforcement prosecutes people for labor racketeering, gambling, prostitution, etc. It is not aimed at those illicit industries, but at a small list of organizations, each with a finite, though changing, list of members. By contrast with the standoff in the "war on drugs," organized crime enforcement campaigns in the past have been substantially successful.

Incapacitation and Replacement

There is little prospect of affecting the supply of drugs through incapacitation. There may be much more promise

Continued on page 4

"Drugs and Terror" *Continued from page 3*

in the removal of a relatively small number of terrorists.

In the instance of drugs, low- and mid-level operatives have proven to be almost infinitely replaceable. By contrast with "predatory" crimes such as burglary, the incapacitation effect of imprisoning a drug dealer is close to zero. Even high-level drug dealers and entire dealing organizations have proven to be replaceable, with at most a brief supply interruption.

Whether these statements are true of terror operatives attacking targets in the United States is an open question, but it is easy to believe that they are not, especially when it comes to suicide operations. Despite its ample funding, al-Qaeda mounted no more than one successful operation every year or so. Nor is there a "demand" for terrorist acts in the sense that there is a demand for heroin, so there is no mechanism that automatically replaces terrorists as the market more or less automatically replaces drug retailers.

The requisites for a successful terrorist operation would seem to be (1) knowledge of how to create damage or ingenuity in developing new methods of doing so; (2) access to the requisite material means; (3) a supply of operatives willing to kill (and perhaps die); (4) money, or the ability to raise money and move it around internationally; (5) organization capable of putting these requisites together to actually carry out operations across borders; and (6) motivation, either intrinsic or extrinsic. The combination of these might prove hard to reproduce; if so, a terrorist group dismantled by enforcement might not be replaced.

In deterring drug dealing, the scarce resource is the ability to incarcerate, not the ability to arrest. The opposite is true of terrorism. More than a million Americans sold cocaine in the last 12 months. Locking up all of them would be extraordinarily expensive. Locking up all of the individuals in the US who are working to commit lethal terrorist attacks would, by contrast, put no strain on the prison system. The problem is catching them, not holding them.

Source Country Control and Interdiction

Offshore production locations are an important resource for cocaine and heroin production, but they are hard to shut down and easy to replace. There may be greater promise in "source-country" operations against terrorist groups.

Drug crops can potentially be grown almost anywhere, and even sincere efforts by source-country governments may be unable to prevent successful cultivation for export. The number of viable source countries for terrorism may be smaller than for drugs. Though recruiting and training terrorists does not depend on large areas or specific climates, it may need the acquiescence, perhaps even complicity, of the host government, rather than merely weakness. Fewer countries may wish to offer such protection — especially in light of recent events in Afghanistan — than are prepared to passively tolerate drug production. U.S. actions in Afghanistan also demonstrate that the respect for foreign sovereignties that constrains counter-drug actions does not limit counter-terrorist actions to anything like the same extent.

The counter-drug experience shows that border control can play a supporting role in the effort to protect the United States from terrorist threats. On the order of 300 metric tons of cocaine, and some multiple of that amount of marijuana, enter the US each year. Those quantities are a minuscule fraction of the corresponding numbers for legitimate commerce; the difficulty of interdiction rises with the size of the legitimate flows of persons and goods, because the needle of contraband shipments are hard to find in the haystack of licit commerce. The problem for terrorism control at the border is even greater, because the difficulty of detection rises as the materials get more compact. That makes toxins and infectious agents especially threatening, and intelligence-based (as opposed to random) search especially valuable.

Acceptable leakage rates are much lower for terrorism than for drugs. Stopping 90% of the drugs entering the US would be a spectacular success, but letting 10% of attempted major terrorist acts succeed would be a disaster. The ratio of potential social damage to weight or bulk is much higher for explosives and toxins, and incalculably higher for infectious agents, than it is for drugs. Tracing a shipment of drugs to the recipient often involves letting the delivery be consummated, increasing the chances that an attempted shipment will result in an arrest, rather than merely the loss of materials. The fault-intolerant climate of anti-terror efforts makes "controlled deliveries" much more troublesome for terrorist materials than they are for drug shipments. That reduces the value of border controls in identifying and arresting terrorists.

The existence of "dual-use" materials, whether fertilizer in the Oklahoma City blast or box-cutters and airliners on September 11, raises the same problem; the threat does not stand out from the background.

Money Matters

International terrorism, like drug dealing, involves moving money around, but the sums are of different orders of magnitude. The September 11 actions are estimated to have cost about half a million dollars, which is roughly nine minutes' revenues in the US cocaine market. The direction of flow is also different. Money in the drug business all moves up from the customers first to low-level dealers, then up the domestic supply chain, and eventually (in much smaller amounts) to overseas suppliers. Money flows in the terror business are more complicated, and the foot soldiers are likely to receive payment from above rather than sending dollars up the chain.

Moving drug money is like moving drugs. It is costly and, more importantly, creates enforcement vulnerability. But money laundering investigations cannot cut drug traffickers off from their source of money, which is their customer base. Since terrorism *per se* expends money, rather than making it, it is conceivable that controls on money movements could constrain terrorist operations.

The Coordination Problem

Both the drug problem and the terror problem involve foreign residents and foreign nationals damaging US interests by actions taken both here and abroad. This means that the US government can benefit from actions taken by foreign governments. How to balance unilateral, bilateral, and multilateral efforts is a problem in both areas; the optimal mix is not the same in the two cases.

The cross-jurisdictional challenges, substantial for drug control, are even greater for terrorism control. Terrorist organizations transcend jurisdictional boundaries more than do individual drug organizations. No one international drug organization operates in more than a handful of countries, and no domestic drug organization operates in more than a handful of cities. If al-Qaeda is viewed as one organization, not as a movement composed of separate organizations, then its geographic reach is extensive.

With some difficulty, joint federal-local task forces have been created to pool information about investigations of drug operations that span local jurisdictional boundaries. Efforts that have been made with foreign enforcement agencies have been more tentative and always involve some operational risk. Something parallel, but grander, may be needed to effectively pool counter-terror investigation information.

The coordination problem extends beyond coordinating investigative agencies. Consider the failures revealed by the September 11 operations. More than a dozen intelligence agencies failed to detect a plot to circumvent FAA security procedures that were implemented by private contractors at municipally operated airports in order to seize commercial airliners to crash into national icons, creating disasters responded to by multiple city, county, state, federal, and non-profit emergency response teams.

The Office of National Drug Control Policy is charged with coordinating the nation's counter-drug efforts, but it largely lacks the power and authority to alter the budgets or actions of the various federal agencies, let alone the state and local agencies. The drug czar is in fact not a czar. Nor is that the result of poor statutory drafting; the agencies whose activity the "drug czar" is supposed to coordinate, and the appropriations subcommittees who handle their budgets, prize their autonomy. Giving a homeland defense czar powers adequate to his mission will necessarily bring him into conflict with his cabinet peers, their key subordinates, and their Congressional supporters, and the public interest will not lie entirely on either side of those conflicts.

Proposals to combine various elements and responsibilities of the Customs Service, Immigration and Naturalization Service, and other agencies into a single Border Control Agency have apparently already fallen victim to the interagency political process. It is hard to judge from outside whether that result is better or worse than its alternatives.

Conclusions

One way to make new problems seem familiar is to seek out analogies. That is both a natural psychological response and a rational analytical strategy. The similarities between the problems of illicit drug distribution and foreign-based terrorist activity go deeper than the "war" metaphor. In each case, the problem is both important and somewhat inchoate. In each case, the problem has both domestic and transnational aspects. In each case, law enforcement is indispensable but not itself a complete solution. In each case, there is great difficulty in either accepting an ongoing high level of damage or in formulating a strategy to bring that damage down to a level that seems acceptable. In each case, the tendency to think that tougher is better may not be justified by results. In each case, there is both great need and great difficulty in coordinating efforts across governments, across levels of government, across agencies, among disciplines, and across the public, private, and civic sectors.

However, terrorism is also unlike drug distribution in vital ways: the scale of the activity to be suppressed; the structure of the organizations whose schemes we must try to foil; the motivations of their participants; the scale, structure, and direction of the related financial transactions; and the tolerance for failure. Even if it were true that we have failed in the "war on drugs" (a proposition that cannot be properly evaluated without more careful specification of standards and alternatives than is usually employed), that would not imply the inevitable failure of the attempt to suppress terrorist actions. By the same token, we cannot simply "port" successful strategies and tactics, or evaluative techniques, from drug policy to terrorism control. "As our case is new, we must think anew, and act anew." ***PIR***

Even if it were true that we have failed in the "war on drugs," that would not imply the inevitable failure of the attempt to suppress terrorist actions.

The Authors:

Peter Reuter is Professor of Public Affairs and Criminology at the University of Maryland and editor of the "Journal of Policy Analysis and Management." He was the founding co-director of the RAND Drug Policy Research Center and is the co-author with Rob MacCoun of Drug War Heresies.

Mark Kleiman is Professor of Policy Studies at UCLA and editor of the "Drug Policy Analysis Bulletin." He and Peter Reuter are co-chairs of the FAS drug policy program.

Jonathan Caulkins is Professor of Operations Research and Public Policy at Carnegie Mellon University. He won the 1999 Kershaw Award, given every two years by the Association for Public Policy Analysis and Management to recognize distinguished contributions to the field of public policy analysis by researchers under the age of 40.

"Dirty Bombs" *Continued from page 1*

2. While radiological attacks would result in some deaths, they would not result in the hundreds of thousands of fatalities that could be caused by a crude nuclear weapon. Attacks could contaminate large urban areas with radiation levels that exceed EPA health and toxic material guidelines.
3. Materials that could easily be lost or stolen from US research institutions and commercial sites could contaminate tens of city blocks at a level that would require prompt evacuation and create terror in large communities even if radiation casualties were low. Areas as large as tens of square miles could be contaminated at levels that exceed recommended civilian exposure limits. Since there are often no effective ways to decontaminate buildings that have been exposed at these levels, demolition may be the only practical solution. If such an event were to take place in a city like New York, it would result in losses of potentially trillions of dollars.

Background

Significant amounts of radioactive materials are stored in laboratories, food irradiation plants, oil drilling facilities, medical centers, and many other sites. Cobalt-60 and cesium-137 are used in food disinfection, medical equipment sterilization, and cancer treatments. During the 1960s and 1970s the federal government encouraged the use of plutonium in university facilities studying nuclear engineering and nuclear physics. Americium is used in smoke detectors and in devices that find oil sources.

With the exception of nuclear power reactors, commercial facilities do not have the types or volumes of materials usable for making nuclear weapons. Facility owners provide adequate security when they have a vested interest in protecting commercially valuable material. However, once radioactive materials are no longer needed and costs of appropriate disposal are high, security measures become lax, and the likelihood of abandonment or theft increases.

We must wrestle with the possibility that sophisticated terrorist groups may be interested in obtaining these materials and with the enormous danger to society that such thefts might present. Significant quantities of radioactive material have been lost or stolen from US facilities during the past few years and thefts of foreign sources have led to fatalities. In the US, sources have been found abandoned in scrap yards, vehicles, and residential buildings.

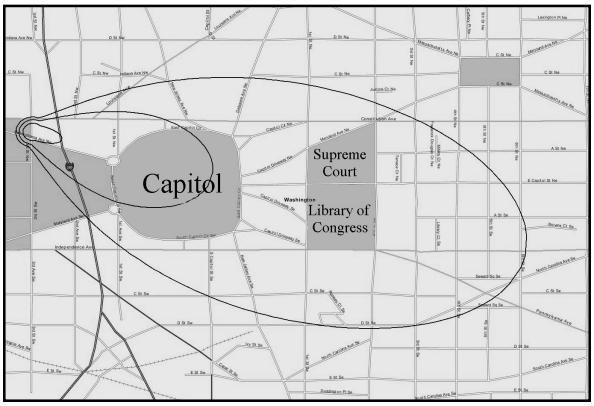

Figure 1. Long-term Contamination Due to Cesium Bomb in Washington, DC

Inner Ring: One cancer death per 100 people due to remaining radiation

Middle Ring: One cancer death per 1,000 people due to remaining radiation

Outer Ring: One cancer death per 10,000 people due to remaining radiation; EPA recommends decontamination or destruction

If these materials were dispersed in an urban area, they would pose a serious health hazard. Intense sources of gamma rays can cause acute radiation poisoning, or even fatalities at high doses. Long-term exposure to low levels of gamma rays can cause cancer. If alpha emitters, such as plutonium, americium or other elements, are present in the environment in particles small enough to be inhaled, these particles can become lodged in the lungs and damage tissue, leading to long-term cancers.

Case Studies

We have chosen three specific cases to illustrate the range of impacts that could be created by malicious use of comparatively small radioactive sources: the amount of cesium that was discovered recently abandoned in North Carolina, the amount of cobalt commonly found in a single rod in a food irradiation facility, and the amount of americium typically found in oil well logging systems. The impact would be much greater if the radiological device in question released the enormous amounts of radioactive material found in a single nuclear reactor fuel rod, but it would be quite difficult and dangerous for anyone to attempt to obtain and ship such a rod without death or detection. The Committee will undoubtedly agree that the danger presented by modest radiological sources that are comparatively easy to obtain is significant as well.

The impact of radioactive material release in a populated area would vary depending on a number of factors, such as the amount of material released, the nature of the material, the details of the device that distributes the material, the direction and speed of the wind, other weather conditions, the size of the particles released (which affects their ability to be carried by the wind and to be inhaled), and the location and size of buildings near the release site. Uncertainties inherent in the complex models used in predicting the effects of a radiological weapon mean that it is only possible to make crude estimates of impacts; the estimated damage we show might be off by an order of magnitude.

In all three cases we have assumed that the material is released on a calm day (wind speed of one mile per hour) and that the material is distributed by an explosion that causes a mist of fine particles to spread downwind in a cloud. People will be exposed to radiation in several ways.

- They will be exposed to material in the dust inhaled during the initial passage of the radiation cloud, if they have not been able to escape the area before the dust

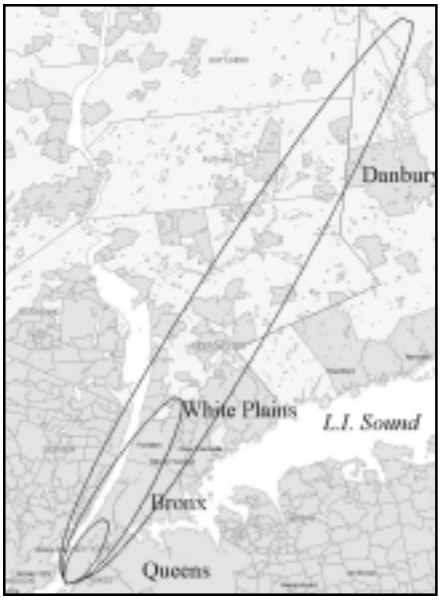

Figure 2. Long-term Contamination Due to Cobalt Bomb in NYC - EPA Standards

Inner Ring: One cancer death per 100 people due to remaining radiation

Middle Ring: One cancer death per 1,000 people due to remaining radiation

Outer Ring: One cancer death per 10,000 people due to remaining radiation; EPA recommends decontamination or destruction

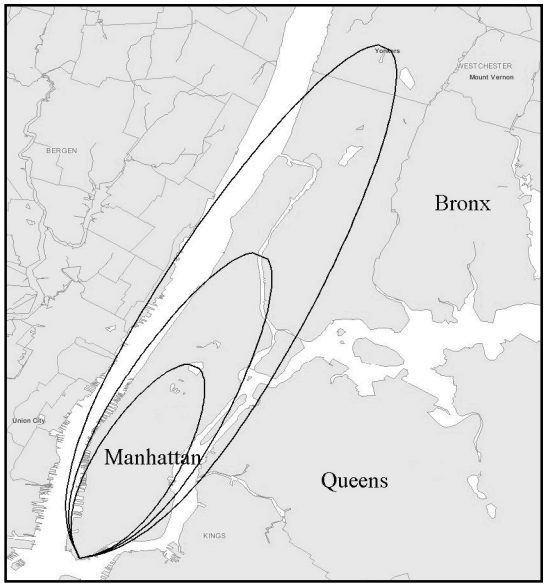

Figure 3. Contamination Due to Cobalt Bomb in NYC - Chernobyl Comparison

Inner Ring: Same radiation level as *permanently closed zone* around Chernobyl

Middle Ring: Same radiation level as *permanently controlled zone* around Chernobyl

Outer Ring: Same radiation level as *periodically controlled zone* around Chernobyl

cloud arrives. We assume that about twenty percent of the material is in particles small enough to be inhaled. If this material is an alpha emitter, it will stay in the body and lead to long term exposure.

- Anyone living in the affected area will be exposed to material deposited from the dust that settles from the cloud. If the material contains gamma emitters, residents will be continuously exposed to radiation from this dust. If the material contains alpha emitters, dust that is pulled off the ground and into the air by wind, automobile movement, or other actions will continue to be inhaled, adding to exposure.
- In a rural area, people would also be exposed to radiation from contaminated food and water sources.

The EPA has a series of recommendations for addressing radioactive contamination that would likely guide official response to a radiological attack. Immediately after the attack, authorities would evacuate people from areas contaminated to levels exceeding those guidelines. People who received more than twenty-five times the threshold dose for evacuation would have to be taken in for medical supervision.

In the long term, the cancer hazard from the remaining radioactive contamination would have to be addressed. Typically, if decontamination could not reduce the danger of cancer death to about one-in-ten-thousand, the EPA would recommend the contaminated area be eventually abandoned. Several materials that might be used in a radiological attack can chemically bind to concrete and asphalt, while other materials would become physically lodged in crevices on the surface of buildings, sidewalks and streets. Options for decontamination would range from sandblasting to demolition, with the latter likely being the only feasible option. Some radiological materials would also chemically bind to soil in city parks, with the only disposal method being large scale removal of contaminated dirt. In short, there is a high risk that the area contaminated by a radiological attack would have to be deserted.

Example 1: Cesium (Gamma Emitter)

Two weeks ago, a lost medical gauge containing cesium was discovered in North Carolina. Imagine that the cesium in this device was exploded in Washington, DC in a bomb using ten pounds of TNT. The initial passing of the radioactive cloud would be relatively harmless, and no one would have to evacuate immediately. However, residents of an area of about five city blocks, if they remained, would have a one-in-a-thousand chance of getting cancer. A swath about one mile long covering an area of forty city blocks would exceed EPA contamination limits, with remaining residents having a one-in-ten thousand chance of getting cancer. If decontamination were not possible, these areas would have to be abandoned for decades. If the device was detonated at the National Gallery of Art, the contaminated area might include the Capitol, Supreme Court, and Library of Congress, as seen if Figure 1.

Example 2: Cobalt (Gamma Emitter)

Now imagine if a single piece of radioactive cobalt from a food irradiation plant were dispersed by an explosion at the lower tip of Manhattan. Typically, each of these cobalt "pencils" is about one inch in diameter and one foot long, with hundreds of such pieces often being found in the same facility. Admittedly, acquisition of such material is less likely than in the previous scenario, but we still consider the results, depicted in Figure 2. Again, no immediate evacuation would be necessary, but in this case, an area of approximately one-thousand square kilometers, extending over three states, would be contaminated. Over an area of about three hundred typical city blocks, there would be a one-in-ten risk of death from cancer for residents living in the contaminated area for forty years.

Continued on page 8

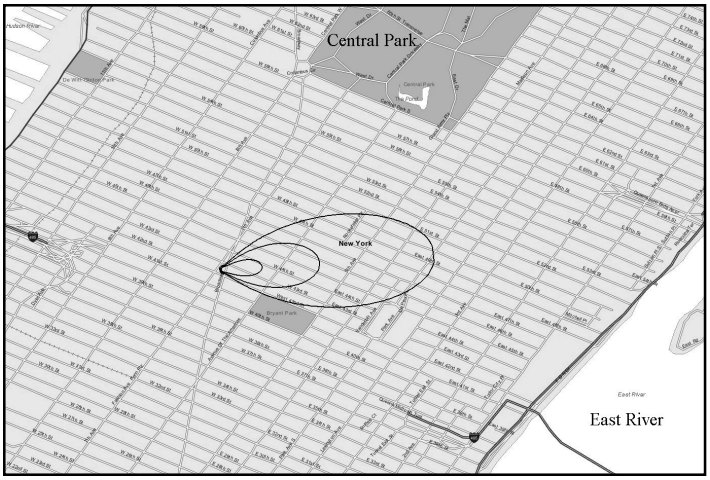

Figure 4. Immediate Effects Due to Americium Bomb in New York City

Inner Ring: Everyone must receive medical supervision

Middle Ring: Maximum annual dose for radiation workers exceeded

Outer Ring: Area should be evacuated before radiation cloud passes

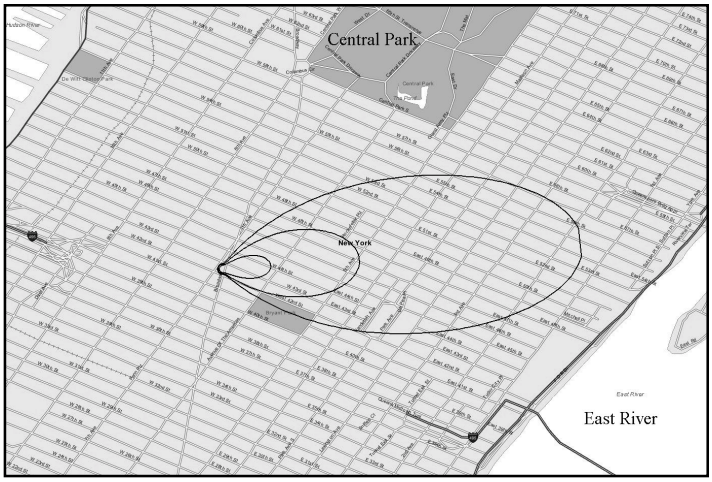

Figure 5. Contamination Due to Americium Bomb in New York City.

Inner Ring: One cancer death per 100 people due to remaining radiation

Middle Ring: One cancer death per 1,000 people due to remaining radiation

Outer Ring: One cancer death per 10,000 people due to remaining radiation; EPA recommends decontamination or destruction

"Dirty Bombs" *Continued from page 7*

The entire borough of Manhattan would be so contaminated that anyone living there would have a one-in-a-hundred chance of dying from cancer caused by the residual radiation. It would be decades before the city was inhabitable again, and demolition might be necessary.

For comparison, consider the 1986 Chernobyl disaster, in which a Soviet nuclear power plant went through a meltdown. Radiation was spread over a vast area, and the region surrounding the plant was permanently closed. In our current example, the area contaminated to the same level of radiation as that region would cover much of Manhattan, as shown in Figure 3. Furthermore, near Chernobyl, a larger area has been subject to periodic controls on human use such as restrictions on food, clothing, and time spent outdoors. In the current example, the equivalent area extends fifteen miles.

Example 3: Americium (Alpha Emitter)

If a typical americium source used in oil well surveying were blown up with one pound of TNT, people in a region roughly ten times the area of the initial bomb blast would require medical supervision and monitoring, as depicted in Figure 4. An area thirty times the size of the first area (a swath one kilometer long and covering twenty city blocks) would have to be evacuated within half an hour. After the initial passage of the cloud, most of the radioactive materials would settle to the ground. Of these materials, some would be forced back up into the air and inhaled, thus posing a long-term health hazard, as illustrated by Figure 5. A ten-block area contaminated in this way would have a cancer death probability of one-in-a-thousand. A region two kilometers long and covering sixty city blocks would be contaminated in excess of EPA safety guidelines. If the buildings in this area had to be demolished and rebuilt, the cost would exceed fifty billion dollars.

Recommendations

A number of practical steps can be taken that would greatly reduce the risks presented by radiological weapons. Since the US is not alone in its concern about radiological attack, and since we clearly benefit by limiting access to dangerous materials anywhere in the world, many of the measures recommended should be undertaken as international collaborations.

1. Reduce access to radioactive materials

Measures needed to improve the security of facilities holding dangerous amounts of these materials will increase costs. In some cases, it may be worthwhile to pay a higher price for increased security. In other instances, however, the development of alternative technologies may be the more economically viable option. Specific security steps include the following:

Fully fund material recovery and storage programs. Hundreds of plutonium, americium, and other radioactive sources are stored in dangerously large quantities in university laboratories and other facilities. In all too many cases they are not used frequently, resulting in the risk that attention to their security will diminish over time. At the same time, it is difficult for the custodians of these materials to dispose of them since in many cases only the Department of Energy (DoE) is authorized to recover and transport them to permanent disposal sites. The DoE Off-Site Source Recovery Project, which is responsible for undertaking this task, has successfully secured over three-thousand sources and has moved them to a safe location. Unfortunately, the inadequate funding of this program serves as a serious impediment to further source recovery efforts. This program should be given the needed attention and firm goals should be set for identifying, transporting, and safeguarding all unneeded radioactive materials.

Review licensing and security requirements and inspection procedures for all dangerous amounts of radioactive material. Human Health Services, the DoE, the Nuclear Regulatory Commis-

sion and other affected agencies should be provided with sufficient funding to ensure that physical protection measures are adequate and that inspections are conducted on a regular basis. A thorough reevaluation of security regulations should be conducted to ensure that protective measures apply to amounts of radioactive material that pose a homeland security threat, not just those that present a threat of accidental exposure.

Fund research aimed at finding alternatives to radioactive materials. A research program aimed at developing inexpensive substitutes for radioactive materials in functions such as food sterilization, smoke detection, and oil well logging should be created and provided with adequate funding.

2. Early Detection

Expanded use of radiation detection systems. Systems capable of detecting dangerous amounts of radiation are comparatively inexpensive and unobtrusive. The Office of Homeland Security should act promptly to identify all areas where such sensors should be installed, ensure that information from these sensors is continuously assessed, and ensure adequate maintenance and testing. High priority should be given to key points in the transportation system, such as airports, harbors, rail stations, tunnels, highways. Routine checks of scrap metal yards and land fill sites would also protect against illegal or accidental disposal of dangerous materials.

Fund research to improve detectors. A program should be put in place to find ways of improving upon existing detection technologies as well as improving plans for deployment of these systems and for responding to alarms.

3. Effective Disaster response

An effective response to a radiological attack requires a system capable of quickly gauging the extent of the damage, identifying appropriate responders, developing a coherent response plan, and getting the necessary personnel and equipment to the site rapidly.

First responders and hospital personnel need to understand how to protect themselves and affected citizens in the

Continued on page 10

FAS Conclusions

Radiological attacks constitute a credible threat. Radioactive materials that could be used for such attacks are stored in thousands of facilities around the US, many of which may not be adequately protected against theft by determined terrorists. Some of this material could be easily dispersed in urban areas by using conventional explosives or by other methods.

Radiological attacks would not result in the hundreds of thousands of fatalities that could be caused by a crude nuclear weapon, though they could contaminate large urban areas.

Materials that could easily be lost or stolen could contaminate tens of city blocks at a level that would require prompt evacuation and create terror in large communities even if radiation casualties were low. But, since there are often no effective ways to decontaminate buildings that have been exposed at these levels, demolition may be the only practical solution.

FAS Recommendations

Reduce access to radioactive materials
1. Fully fund material recovery and storage programs.
2. Review licensing and security requirements and inspection procedures for all dangerous amounts of radioactive material.
3. Fund research aimed at finding alternatives to radioactive materials.

Early Detection
1. Expanded use of radiation detection systems.
2. Fund research to improve detectors.

Effective Disaster response
1. First responders and hospital personnel need to understand how to protect themselves and affected citizens.
2. Research into cleanup of radiologically contaminated cities.

Just In! Results of the FAS Member Survey

In early 2002, FAS conducted a survey of our members. Our purpose was to better understand member interests, document expertise, and engage members in helping affirm old priorities and set new ones.

The survey's results profile a highly educated membership with in-depth expertise in such sciences as physics, biology, and chemistry, and who work either full-time in these fields or are retired from positions in academic institutions. FAS members share the concerns of civil rights, environmental, and human rights organizations, and are active supporters of Environmental Defense, the Natural Resources Defense Council, the ACLU, People for the American Way, and Human Rights Watch. The largest percentage of our members joined FAS in the 1970s. When asked how members came to join FAS, 60% said that they had "known about FAS forever." While half of FAS' responding members are over 70 years of age, a growing number of individuals under the age of 50 are joining up. We were pleased to learn that 68% of our members find the Public Interest Report "informative, timely and relevant;" 20% agreed that the PIR "is perfect as is;" and 19% would like us to cover more energy and environmental issues.

FAS' members are a group with mutual concerns, common backgrounds, and scientific interests. Their survery responses do differ, though. Let's take a closer look.

"My fields of expertise are . . ."

FAS was founded by physicists working on the Manhattan Project in 1945 and was known back then as the "scientists lobby" and the social conscience of the nation's scientists. When we asked members to identify the fields in which they worked, sciences such as physics, biology and engineering outnumbered the fields of foreign policy, economics, law and finance. Nearly 30% of survey respondents identified themselves as physicists. The

Continued on page 10

"Dirty Bombs" *Continued from page 9*

event of a radiological attack and be able to rapidly determine if individuals have been exposed to radiation. There is great danger that panic in the event of a radiological attack on a large city could lead to significant casualties and severely stress the medical system. While generous funding has been made available for this training, the program appears in need of a clear management strategy. Dozens of federal and state organizations are involved, and it is not clear how materials will be certified or accredited.

Research into cleanup of radiologically contaminated cities has been conducted in the past, primarily in addressing the possibility of nuclear war. Such programs should be revisited with an eye to the specific requirements of cleaning up after a radiological attack.

Conclusion

The events of September 11 have created a need to very carefully assess our defense needs and ensure that the resources we spend for security are aligned with the most pressing security threats. The US has indicated its willingness to spend hundreds of billions of dollars to combat threats that are, in our view, far less likely to occur than a radiological attack. This includes funding defensive measures that are far less likely to succeed than the measures that we propose in this testimony. The comparatively modest investments to reduce the danger of radiological attack surely deserve priority support.

In the end, however, we must face the brutal reality that no technological remedies can provide complete confidence that we are safe from radiological attack. Determined, malicious groups might still find a way to use radiological weapons or other means when their only goal is killing innocent people, and if they have no regard for their own lives. In the long run our greatest hope must lie in building a prosperous, free world where the conditions that breed such monsters have vanished from the earth. ***PIR***

"Survey" *Continued from page 9*

next largest fields represented were medicine (18%), biology (15%), engineering (15%) and chemistry (13%).

It is especially interesting to compare fields represented by FAS earliest members with more recent members. Nearly half of FAS members who joined before 1955 are physicists. FAS newest members, who joined since 2000, are also physicists (21%), but 29% said their field of expertise is national security, 25% said aerospace, and 22% said computer science. This reflects significant growth in security-related fields over the past decades—and an increasingly diverse membership. Other fields were environmental science, psychology, public policy, finance, law and transportation. Nearly half of responding members work in nonprofit or academic institutions as opposed to private industry (13%) or in government (8%).

> Based on survey results, [FAS] members' priorities are right on target with FAS' agenda.

"The highest level of education I have attained is . . ."

FAS continues to attract highly educated scholars and analysts, and the composition of members' level of education does not change as the fields of expertise do from one age group to another. Among all respondents, 63% have Ph.Ds. Individuals with professional doctoral degrees such as doctors or lawyers account for 14%. A master's degree is the highest level of education attained by 12%, and 7% have a bachelor's degree. Two percent of members are high school students or graduates. These two latter goups are our most recent members, having come to us through our website.

"Go to <www.fas.org> . . ."

In addition to giving access to technical information and policy analysis, the FAS website is our most effective member recruitment tool. Since 2000, 85% of FAS newest members joined over the web. More than half of these members also use the website once a month; more than a third use it every week. The survey also shows that among FAS' earliest members (members who joined between 1945 and 1970), 43% use the website once a month or less. For members who joined in the 1980s and 90s, we see a modest increase in members' use (46%). Only 7% of our members have no access to the Internet.

The feature of the website that FAS members use most often are the technical details about weapons technologies and arms control treaties, and the country-by-country weapons sales and possessions tables. Eighteen percent refer to the site for this information, while 15% use the site to keep up to date on FAS findings and projects. This does not capture the hundreds of thousands of hits that the website receives daily from non-member users. Surprisingly, one third of our members were not aware of the site at all.

"I subscribe to . . ."

The survey offered members a wide range of choices of journals and trade magazines, including Bulletin of Atomic Scientists, Foreign Affairs, Fortune, Time, Science, Scientific American, and US News and World Report. By far, the most subscribed to magazines were Science (48%) and Scientific American (36%). Subscribers to the Bulletin of Atomic Scientists and New Scientists each account for 21% of member respondents. While subscription to Science and Scientific American is steady among FAS members throughout the generations, only 6% of our most recent members subscribe to the Bulletin.

"I am also a member of . . ."

Our survey shows that FAS members live up to their reputation as scientists with a conscience. They support numerous causes, working to protect the world's environmental resources, eliminate weapons of mass

FAS Staff News

Levi Directs Strategic Security Project

In February, Michael Levi was promoted to director of the Strategic Security Project. Since then, Michael has endeavored to raise the awareness of both policy makers and the public regarding nuclear security issues. He has published comments in the *New York Times*, written an Op-Ed for the *Christian Science Monitor* and has been a guest on several radio and television programs. Since February, he has initiated collaborative efforts with the Center for Defense Information and the Monterey Institute of International Studies regarding low-yield nuclear weapons and the US Nuclear Posture Review. His recent work has also focused on missile defense, cooperative security programs with Russia, radiological weapons, and nuclear terrorism. A proposal for an article on dirty bombs has been accepted by *Scientific American* and will be forthcoming this summer. Michael continues to amaze with his astonishing energy, tireless devotion, and sharp intelligence.

Strategic Security Project Hires Yassif, Kellar

Jaime Yassif began work as the Program Assistant for the Strategic Security Project in February. She comes to FAS from Swarthmore where she majored in biology and political science. One of Jaime's first projects at FAS was conducting research for FAS' testimony before the Senate Foreign Relations Committee. She has also assisted in creating a report on the status of highly enriched uranium in Russia and other nations. Her hard work on this project and numerous other proposals, Op-Eds, and grants has been greatly appreciated. When Jaime isn't working to increase global security, her favorite recreational activity is dance, and she has recently performed as part of an African dance troupe.

Josh Kellar began work as an intern for the Strategic Security Project in March. He has undergraduate degrees in physics and English from Georgetown University, and a MA in creative writing from Boston University, where he studied poetry. Thus far, Josh has assisted with physics calculations, editing, and writing, both for the Strategic Security Project and for many other grateful FAS staff members.

ASMP Intern Returns for More

Matthew Schroeder rejoined FAS in February as a Research Associate with the Arms Sales Monitoring Project. After working during the summer of 2001 for the FAS ASMP Project, he returned to Columbia University's School of International and Public Affairs to complete his Masters in International Affairs. He is also a director on the National Council of the Fellowship of Reconciliation, an 85-year-old peace and justice organization. Before coming to FAS, Matt worked as an intern at the Landmine Survivors Network. At FAS, Matt has worked on the ASMP web site and has also been working to monitor US military assistance to the Philippines, Columbia, Georgia, and Yemen. He hails originally from Holland, MI. ***PIR***

---

destruction, and bring about a fair and more humane global society. They also support their professions. We found that 70% of FAS members support organizations such as the American Physical Society and the American Chemical Society. We did not ask members to differentiate among the various professional organizations.

"FAS' top priorities should be . . ."

Based on survey results, members' priorities are right on target with FAS' agenda. Members also reported that they would be willing to help advance these priorities by writing letters to members of Congress and the White House (41%). A smaller percentage of members said that they would write op-eds to local and national news outlets (18%) and mentor young people who are interested in careers in science (12%).

In three years, FAS will turn 60, an age seasoned with experience and wisdom. Findings from our member survey show that our commitment to our mission is constant. FAS is considered one of the most effective organizations in the arms control movement, and we are strong advocates for sensible public policies that reflect the latest developments in science and technology. This is due, in part, to the steadfast support of many long-time members and recent upsurge in interest among younger Americans. Your support allows FAS to continue the course that was set in 1945. We are very grateful to you. ***PIR***

"Information" *Continued from page 2*

not yet caught up. This may be information that was formerly available on web sites, but that has now been removed, or records that were officially declassified and released, but that have now been withdrawn. It is everything that might conceivably be considered "sensitive but unclassified."

In deciding how to treat such information, the Administration should enunciate a clear set of guiding principles, as well as an equitable procedure for implementing them and appealing adverse decisions.

The guiding principles could be formulated as a set of questions, such as:

- Is the information otherwise available in public domain? (Or can it be readily deduced from first principles?) If the answer is yes, then there is no valid reason to withhold it, and doing so would undercut the credibility of official information policy.
- Is there specific reason to believe the information could be used by terrorists? Are there countervailing considerations that would militate in favor of disclosure, i.e., could it be used for beneficial purposes? Documents that describe in detail how anthrax spores could be milled and coated so as to maximize their dissemination presumptively pose a threat to national security and should be withdrawn from the public domain. But not every document that has the word "anthrax" in the title is sensitive. And even documents that are in some ways sensitive might nevertheless serve to inform medical research and emergency planning and might therefore be properly disclosed.
- Is there specific reason to believe the information should be public knowledge? It is in the nature of our political system that it functions in response to public concern and controversy. Environmental hazards, defective products, and risky corporate practices only tend to find their solution, if at all, following a thorough public airing. Withholding controversial information from the public means short-circuiting the political process, and risking a net loss in security.

Of course, no set of principles will produce an unequivocal result in all cases. There will often be a subjective element to any decision to release or withhold contested information. Someone will always be dissatisfied.

In order to forestall or correct abuses or mistaken judgments, an appeals process should be established to review disputed decisions to withhold information from the public. Placing such a decision before an appeals panel that is outside of the originating agency—and that therefore does not have same bureaucratic interests at stake—would significantly enhance the credibility of the deliberative process.

> We are watching a veil of indiscriminate security descending on significant portions of the American policy process.

The efficacy of such an appeals process has been repeatedly demonstrated by an executive branch body called the Interagency Security Classification Appeals Panel. This panel, which hears appeals of declassification requests from the public that have been denied by government agencies, has ruled against its own member agencies in an astonishing 80 percent of the cases it has considered.

A good faith effort to increase the clarity, precision, and transparency of the Bush Administration's information policies, along with provisions for the public to challenge a negative result, would go a long way towards rectifying the current policy morass. ***PIR***

FAS Public Interest Report
1717 K Street NW, Suite 209, Washington, D.C. 20036
(202) 546-3300; fas@fas.org
March/April 2002, Volume 55, Number 2

ADDRESS SERVICE REQUESTED

PERIODICALS PAID AT WASHINGTON, D.C.