Backgrounder

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Dealing with Dirty Bombs: Plain Facts, Practical Solutions

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Most assessments of America's vulnerabilities include some mention of the nation's susceptibility to attacks by radiological dispersal devices, or "dirty bombs." The threat is often portrayed as a homogenous danger, but it in fact covers a spectrum of risks, not all of which are equally serious.

Because the nature of the threat is often misconstrued, there is no shared appreciation of the problem or how best to address it. The reality is that the threat of a dirty bomb attack by terrorists is a credible one, although the psychological and economic consequences would likely far outweigh any casualties or physical destruction. To be better prepared, the United States should:

- Develop national standards for emergency response,
- Create a national system-of-systems emergency response structure,[1]
- Focus federal resources on developing national surge medical capacity,
- Centralize oversight of federal emergency medical response in the Department of Health and Human Services,
- Enhance federal expertise in emergency medical care, and

1. A "system of systems" is an overarching system that allows disparate systems to communicate and function with each other. The term is often used in the defense industry.

Talking Points

- The demand for dirty bombs. Both terrorists and terrorist states have actively pursued dirty bomb programs.
- What is a dirty bomb? A dirty bomb is *not* a nuclear weapon. It is simply a device used to disperse radioactive material.
- Are dirty bombs practical for 21st century terrorism? While less sophisticated dirty bombs may be an attractive means by which to spread psychological terror, the more dangerous versions would be exceeding difficult—although not impossible—for terrorists to develop and deliver.
- What would be the impact of a dirty bomb? The impact of a dirty bomb depends on the amount and type of radioactive materials used and numerous environmental conditions.
- Detecting radiation. While technologies to detect radiological threats are fairly mature, work still needs to be done to make these technologies efficient and affordable.

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- Establish better coordination with the private sector.

The Demand for Dirty Bombs

Radiological dispersal devices are attractive to terrorists and terrorist states. Abu Zubaydah, a key al-Qaeda operative captured in Pakistan on March 28, 2002, was widely believed to have told U.S. investigators that al-Qaeda was "interested" in obtaining a dirty bomb. Although Zubaydah's statements are unconfirmed, they appear to dovetail with evidence reportedly seized by U.S. forces in Afghanistan. In addition, on May 8, 2002, the FBI arrested Abdullah al Muhajir on charges of planning a radiological attack in the United States at the direction of al-Qaeda operatives.[2]

Although it was never fielded, Saddam Hussein also sought this capability.[3] In 1987, Iraq tested a bomb weighing 1,400 kilograms that carried radioactive particles derived from irradiated impurities in zirconium oxide.[4] Further prototypes were designed from the casings of 100 Muthanna-3 aerial chemical bombs. They were then modified to a 400-kilogram weight so that aircraft could carry more. Of the original 100, it is likely that only 25 were destroyed and that the remaining 75 were sent to the Al Qa'Qa State Establishment for an unknown fate.[5]

What Dirty Bombs Are, and What They Are Not

The first step in appreciating the threat of dirty bombs is to understand that they are not nuclear weapons. Indeed, the only difference between a dirty bomb and a conventional explosive is that the dirty bomb is laced with some sort of radiological material. Therefore, it is better to think of the threat not in terms of the dirty bomb, but instead in terms of any devise that disperses radioactive materials.

A radiological dispersal device may not even require an explosion. It is quite possible to separate the "dirty" from the "bomb." A terrorist could choose any number of methods to disperse dangerous radioactive material. The dispersion method may well be a conventional explosion, but putting radioactive material in a trashcan or sprinkling it on a sidewalk could also be an effective—and covert—means of contamination.

The initial destruction caused by a dirty bomb would likely result from the explosion itself and not from the nuclear material. Its destructive capacity would be a function of the amount and type of explosive materials used, not of the radioactive additives. A car bomb laced with radioactive cobalt-60 would look no different from a car bomb without the extra material.

Likewise, the radiological affect would be defined by the type and amount of radioactive material. A bomb with a small amount of radioactive material might wreak economic havoc and spread terror, but it would have little biological effect on local populations. On the other hand, a bomb laced with large amounts of strontium-90 (a highly radioactive isotope found in old Soviet power generators), highly enriched uranium, or spent nuclear fuel from a nuclear power plant could be devastating.

2. For example, see Mark Hosenball, "How Good Is Abu Zubaydah's Information," MSNBC News, April 27, 2002, at *www.msnbc.msn.com/id/3067224*. In May 2002, authorities arrested Jose Padilla, an American citizen who converted to Islam and took the name Abdullah al Muhajir. Authorities claimed that al Mujahir had "trained with the enemy, including studying how to wire explosive devices and researching radiological dispersion devices." See "From Brooklyn to al Qaeda?" ABC News, June 10, 2002, at *www.abcnews.go.com/sections/us/DailyNews/chicagosuspect_profile020610.html*.
3. For an overview of the open-source data describing Iraq's weapons of mass destruction programs before the war, see "Appendix: A Survey of Iraq's Arsenal and Use of Weapons Of Mass Destruction," in Baker Spring and Jack Spencer, "In Post-War Iraq, Use Military Forces to Secure Vital U.S. Interests, Not for Nation-Building," Heritage Foundation *Backgrounder* No. 1589, September 25, 2002, at *www.heritage.org/Research/MiddleEast/bg1589.cfm*.
4. United Nations, *Tenth Report of the Executive Chairman of the Special Commission Established by the Secretary General pursuant to Paragraph 9(b)(i) of Security Council Resolution 687 (1991), and Paragraph 3 of Resolution 699 (1991) on the Activities of the Special Commission*, S/1995/1038, December 17, 1995, part VII.
5. William J. Broad, "Iraq Tested Bomb Meant to Carry Radioactive Cloud," *The New York Times*, April 29, 2001; United Nations, *Tenth Report of the Executive Chairman of the Special Commission*; and Federation of American Scientists, "Radiological Weapons," updated November 03, 1998, at *www.fas.org/nuke/guide/iraq/other/radiological.htm* (January 23, 2004).

However, like most threats, the highest risks are also the least likely. Not only are the more dangerous materials much more difficult to obtain, but the successful dispersal of a highly radioactive material would require an extremely sophisticated terrorist.

The Practicality of Dirty Bombs

To kill or sicken a large number of people would require a relatively large weapon with highly radioactive material. A truck bomb, for example, with 220 kilograms of explosive and 50 kilograms of one-year-old spent fuel rods could produce a lethal dosage zone with a radius of about one kilometer.[6] Detonating such a device in an urban area with a large, unsheltered population might contaminate thousands of people or more.[7]

Although producing such a weapon is far easier than building a nuclear bomb, fabricating a highly effective radiological dispersal device that could easily be transported to its target would be difficult. Among the problems in building such a large device is the heavy shielding required to work with a significant amount of highly radioactive material. Otherwise, it would melt the carrying containers and sicken or kill anyone attempting to assemble or transport the weapon. For example, one assessment concluded that sufficient radioactive material to contaminate 230 square kilometers would require about 140 kilograms of lead shielding.[8] While such weapons may not be practical tools for most terrorists, the idea of martyrdom could lead some to disregard the dangers.

Distributing radiological material as a fine aerosol (the ideal molecule size being about one to five microns, a fraction of the width of a human hair) would require some degree of specialized knowledge and specialized handling and processing equipment to mill the radioactive agent and blend it with an inert material to facilitate dispersion and increase the risk of inhalation.

Many variables can significantly affect the effectiveness of an attack: the distance from the radioactive source; the manner of dispersal; weather conditions (extent of dispersal); the degree of protection (e.g., buildings and overhead cover); and the type of radiation. For example, Alpha particles—one type of radiation—travel only a short distance, and most will not penetrate the dead, outside layer of skin. They are harmful, however, if inhaled or swallowed. Beta particles can penetrate the skin and inflict cellular damage, but they can be blocked by common materials such as plastic, concrete, and aluminum.

In contrast, gamma rays and neutrons are far more powerful and do not lose energy as quickly as alpha and beta particles when they pass through an absorber like clothing or walls. Heavy lead shielding, great amounts of other shielding with absorbent or scattering material (e.g., several feet of earth or concrete), or significant distance (perhaps kilometers) may be required to avoid high-dose exposure.[9] In an urban attack, buildings might absorb or shield significant amounts of radiation, significantly reducing the initial prospects for casualties.

Unlike nuclear weapons, a radiological dispersal device does not require plutonium or enriched uranium. It requires only some form of radioactive material, which any nuclear reactor is capable of producing. In addition, numerous medical and industrial practices employ radioactive substances. However, obtaining these less dangerous materials associated with industry and the medical field

6. James L. Ford, "Radiological Dispersal Devices," *Strategic Forum*, Vol. 136 (March 1998), pp. 3–4.

7. In one proposed scenario, radioactive cobalt released at the tip of Manhattan in New York City contaminated a 1,000-square-kilometer area over three states. Henry Kelly, President, Federation of American Scientists, testimony before the Committee on Foreign Relations, U.S. Senate, March 6, 2002, at *www.fas.org/ssp/docs/030602-kellytestimony.htm*. In another scenario developed by the Center for Counterproliferation Research and the Defense Threat Reduction Agency, detonation of a device consisting of 100 kilograms of C4, 50 grams of Cesium-137, and 2 kilograms of plutonium in a San Diego convention center was estimated to have killed 31 and caused up to 1,969 additional fatalities and sickened 6,569. Center for Counterproliferation and the Defense Threat Reduction Agency, *NBC Scenarios: 2002–2010*, April 2000, pp. 14 and 19.

8. Ford, "Radiological Dispersal Devices," p. 4.

9. David G. Jarret, *Medical Management of Radiological Casualties* (Bethesda, Md.: Armed Forces Radiological Research Institute, 1999), pp. 4–9, and Hanford ALARA Reference Center, "Shielding Use and Analysis," undated, pp. 1–4, at *www.hanford.gov/alara/PDF/analysis.pdf* (January 21, 2004).

would be easier than obtaining the more dangerous materials that result from nuclear power production.

Illicitly obtaining materials is not impossible. The United States has significant gaps in its export rules.[10] Abroad, however, the problems are even worse. Large quantities of relatively dangerous radioactive material remain unaccounted for.

When assessing the risk of foreign radioactive material entering the United States, it is important not to be misled by media outlets that purport to demonstrate the ease with which terrorists could smuggle these substances into the U.S.[11] While it may or may not be easy to smuggle radioactive material into the United States, smuggling harmless depleted uranium demonstrates no more than smuggling an illegal Persian rug. Depleted uranium is a byproduct of the manufacturing of fuel for nuclear reactors and nuclear weapons. Simply put, it is leftovers after the highly radioactive uranium-235 has been removed from uranium ore. The remaining (depleted) uranium is very dense and produces minimal radiation.[12]

The Likely Impact of a Dirty Bomb

The impact of a successful dirty bomb attack on those who do not receive an immediately lethal, incapacitating dose of radiation is difficult to predict. Even the largest radiological dispersal device is likely to inflict catastrophic casualties only if long-term cancer risks are considered.[13]

Prompt modern medical treatment can dramatically improve survivability after radiation injury for individuals who do not receive an initial, lethal dose of radiation.[14] In particular, dramatic medical advances have been made in caring for individuals with suppressed immune systems, a common byproduct of radiation attack.

In addition, the danger of low-dose exposure from a radiological weapon may be far less than is commonly assumed. The long-term effect of low-dose radiation is determined by the capacity of irradiated tissue to repair DNA damage within individual cells, which is governed by a number of exposure, health, and genetic factors. There is some scientific evidence that current models may significantly overestimate the risks.[15]

On the other hand, due to public fears of radiation, an attack might have a considerable disruptive effect—forcing mass evacuations, creating economic chaos, and inflicting environmental and property damage and significant cleanup costs. In 1987, for example, scrap dealers in Goiânia, Brazil, unintentionally dispersed 137 pieces of a highly radioactive

10. Charles D. Ferguson *et al*., "Commercial Radioactive Sources: Surveying the Security Risks," Monterey Institute of International Studies *Occasional Paper* No. 11, January 2003, pp. 45 and 64, at *cns.miis.edu/pubs/opapers/op11/op11.pdf*.

11. Brian Ross, Rhonda Schwartz, and David Scott, "How Safe Are Our Borders?" ABC News, September 11, 2003, at *abcnews.go.com/sections/wnt/DailyNews/sept11_uranium020911.html* (January 20, 2004).

12. Jack Spencer and Michael Scardaville, "Dispelling the Myths About the Military Use of Depleted Uranium," Heritage Foundation *Executive Memorandum* No. 721, February 20, 2001, at *www.heritage.org/Research/NationalSecurity/EM721.cfm*.

13. For example, one scenario of a radiological dispersal device attack on New York City suggests that residents in a 1,000-square-kilometer area could suffer death rates from cancer ranging from 1 in 10 within a kilometer of the attack, to a 1 in 100 risk for those living in all of Manhattan, to 1 in 10,000 for those living up to 15 kilometers downwind of the attack. See Kelly, testimony before the Committee on Foreign Relations. These figures, however, are not for immediate casualties, but for long-term cancer risks. They do not include accounting for factors such as the protective effects of buildings, medical treatment, or cleanup. In addition, this analysis was based on radiation-exposure standards derived from Environmental Protection Agency and Nuclear Regulatory Commission guidelines and does not address the fact that these standards are somewhat controversial and may overstate long-term threats. The modeling used for this scenario draws on linear no-threshold theory (LNT). See Michael Levi and Henry Kelly, "Dirty Bombs Continued," *FAS Public Interest Report*, Vol. 55 (May 2002). LNT holds that any amount of radiation dose, even those close to zero, is harmful. Therefore, low-dose exposure is assumed to have effects similar to those of high-dose exposure, but with lower incidence (i.e., fewer casualties per the number exposed). There is no scientific consensus over whether LNT is appropriate for accurately predicting casualties. For contrasting views on the debate, see Myron Pollycove, "The Rise and Fall of the Linear No-Threshold (LNT) Theory of Radiation Carciogenesis," presentation to the Institute of Physics, 1997, at *cnts.wpi.edu/RSH/Docs/PollycovePhysics.html*, and Richard Wakeford, "Low Dose Irradiation: A Threshold Assumption Is Inappropriate," paper presented to the Southport Conference, 1999, at *www.srp-uk.org/srpcdrom/p7-3.doc*.

14. Jarret, *Medical Management of Radiological Casualties*, pp. 8–9.

material, which required a massive environmental cleanup.[16] This is proportional to industrial accidents or environmental incidents in the United States. However, a radiological release that was intentional and associated with a terrorist attack would undoubtedly have a psychological effect disproportionately greater than the actual physical threat.

Thus, the fear factor is a major component of the radiological threat. A radiological strike, in which the fear of the unknown might be particularly acute, could trigger severe and widespread reactions, including mass hysteria and serious psychological casualties.[17]

The economic impact of a radiological strike should also be considered. If contamination is extensive, just removing irradiated material could have significant consequences. For comparison, removing low-level radioactive waste from a biomedical research facility to an appropriate storage facility is extremely expensive, costing $300 or more per cubic foot.[18] The economic consequences of an attack would also include the cost of evacuating contaminated areas and housing, feeding, and caring for displaced persons, as well as lost worker productivity.

Given the widespread availability of radioactive material, deception, hoaxes, and blackmail may also occur. These dangers are hardly new. In January 1979, for example, the general manager of a nuclear facility in Wilmington, North Carolina, received an extortion letter with a sample of uranium dioxide powder.[19]

Detecting the Presence of Radiation

Technologies to detect radiological threats are fairly mature. Radiological monitors can identify contaminated food supplies and detect dispersal devices. Passive detection systems are relatively simple and safe to employ, but they can be evaded by shielding. Active systems (i.e., detectors that x-ray or irradiate an object with neutrons or high-energy electrons) can overcome some attempts to evade detection. Active detection, however, is more costly, inconvenient, and complex.[20]

One issue in attempting to detect radiological weapons in transit is the problem of false positives. Many commercial items and industrial and health care equipment employ radioactive material. It is likely that screening will inadvertently cause the unnecessary investigation of many items and persons. With the U.S. transportation system handling more than 11 million tons of freight each year, screening could significantly impede the flow of goods and services, especially in high-traffic areas such as airports, shipyards, and border crossings. Interspersed in this vast amount of material are

15. Health Physics Society, "Radiation Risk in Perspective: Position Statement of the Health Physics Society," March 2001, at *www.Hps.Org/Documents/Radiationrisk.pdf*; National Radiological Protection Board, "Risk of Radiation-Induced Cancer at Low Doses and Low Dose Rates for Radiation Protection Purposes," *Documents of the NRPB*, Vol. 6, No. 1 (1995), pp. 1–7; *Animal Studies of Residual Hematopoietic and Immune System Injury from Low Dose/Low Dose Rate Radiation and Heavy Metals*, Armed Forces Radiobiology Research Institute *Contract Report* 98–3, 1998, p. 1. See also Military Medical Operations Office, *Medical Management of Radiological Casualties Handbook*, Armed Forces Radiobiology Research Institute, December 1999, pp. 34–39, and Electronic Power Research Institute, *Health Risks Associated with Low Doses of Radiation*, EPRI TR–104070, 2002.

16. For a detailed analysis of the incident, see International Atomic Energy Agency, *Dosimetric and Medical Aspects of the Radiological Accident in Goiânia, Brazil in 1987*, June 1998.

17. Defense Threat Reduction Agency *et al*., *Human Behavior and WMD Crisis: Risk Communication Workshop: Final Report*, March 2001, at *www.bt.usf.edu/Reports/AHA-report-hospital-mass-casualties-2000.PDF.*

18. Committee on the Impact of Low-Level Radioactive Waste Management Policy on Biomedical Research in the United States, *The Impact of Low-Level Radioactive Waste Management Policy on Biomedical Research in the United States* (Washington, D.C.: National Academy Press, 2001), p. 11, and Audeen W. Fentiman *et al*., "Factors That Affect the Cost of Low-Level Radioactive Waste Disposal," Ohio State University Information Extension Research *Low-Level Radioactive Waste Fact Sheets* RER–66, at *www.ag.ohio-state.edu/~rer/rerhtml/rer_66.html* (January 21, 2004).

19. S. A. Mullen, J. J. Davidson, and H. B. Jones Jr., *Potential Threat to Licensed Nuclear Activities from Insiders (Insider Study)*, NUREG–0703 (Washington, D.C.: Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, July 1980).

20. Steve Fetter *et al*., "Detecting Nuclear Warheads," *Science & Global Security*, Vol. 1 (1990), p. 226.

many products that include varying amounts of radioactive material.

In some ways, searching for a radiological bomb will be like searching for a needle in a needle stack. For example, in September 2002, U.S. officials boarded and searched the cargo ship *Palermo Senator* after detecting radiation. After several days, the source was determined to be a harmless load of ceramic tiles, which was emitting naturally occurring radiation.[21]

The Department of Homeland Security (DHS) already employs a variety of passive and active sensors to screen people and cargo entering the United States and is developing more effective and efficient screening systems. In addition, research on detecting radiological sources and mitigating the effects of radiation is a priority for the department's Science and Technology Directorate.

Preparing for the Unthinkable

Efforts to secure the global supply of radioactive material and prevent it from falling into the hands of terrorists should continue.[22] Improved export controls, international monitoring, "buyback" programs, and other threat reduction measures could reduce, if only somewhat, the global glut of high-risk radioactive substances;[23] but even with aggressive enforcement programs, sufficient material will likely be available worldwide over the next decades for any group wanting to mount a radiological attack.

U.S. strategy rightly focuses on stopping terrorists before they can successfully conduct an attack on American soil. However, given the wide availability of radioactive material and the many means of employing it in an attack, a determined terrorist could conduct a successful strike. Fortunately, a great deal can be done to mitigate the casualties, psychological affects, and economic consequences of a radiological event. In addition, many of the countermeasures that can be implemented are "dual-use." In other words, they would also greatly facilitate a national response to any kind of natural or man-made disaster.

Domestic efforts to prepare for a radiological attack should focus on creating a truly national emergency response system that would allow state and local governments to efficiently pool their resources, effectively direct federal assets where they are most needed, and appropriately engage the private sector. Particularly with regard to a radiological response, a national system should effectively perform four functions: provide accurate and timely information, surge medical response to the scene, ensure efficient and effective cleanup of the contaminated area, and monitor health and environmental affects.

Building an effective national emergency response system could facilitate all these actions. Specifically, the U.S. should:

- **Develop national standards for emergency response.** There are no national standards for an emergency response to a dirty bomb attack, or for that matter to any major terrorist incident. This is a subject of some debate. Long before September 11, experts in the field recognized that the lack of measurable objectives would make it difficult to establish policy goals, allocate resources properly, and establish the right balance of local, state, and federal roles in responding to a disaster.[24] On the other hand, many have opposed such an initiative. The National Governors' Association, for example, has argued against mandatory standards. The U.S. Conference of Mayors has called for broad discretion in funding, allowing communities to adapt resources to local needs.[25]

21. Admiral Thomas H. Collins, remarks before the World Shipping Council, September 17, 2002, p. 2, at *www.uscg.mil/commandant/speeches%5Fcollins/2002%2D09%2D17worldshippingcouncil7.doc*, and David A. Howard, "Valuable Lessons from Palermo Senator Incident," *American Shipper*, October 2002, at *www.americanshipper.com*.

22. Mathew Bunn, "Preventing Nuclear Terrorism: A Progress Report," Belfer Center for Science and International Affairs, October 22, 2003.

23. Ferguson *et al*., "Commercial Radioactive Sources: Surveying the Security Risks," pp. 65–66.

24. Richard A. Falkenrath, "The Problems of Preparedness: Challenges Facing the U.S. Domestic Preparedness Program," executive session on domestic preparedness discussion paper, John F. Kennedy School of Government, 2000, p. 15.

In fact, current assessments of preparedness are based on voluntary surveys and needs assessments. Both have significant shortfalls. They lack objective measures of preparedness and consistent criteria for determining what personnel and equipment are needed for emergency response. Nor do these assessments account for the biases frequently associated with self-reported information. Establishing broad national standards is essential for creating a rationale national response system.

The House Select Committee on Homeland Security has unanimously approved the Faster and Smarter Funding for First Responders Act (H.R. 3266), which includes procedures for establishing standards for responding to radiological attacks and other types of attacks using weapons of mass destruction. This legislation could serve as the foundation for establishing appropriate national preparedness standards.[26]

- **Create a national system-of-systems emergency response structure.** Given the complex and demanding requirements of responding to a radiological attack or other major terrorist threat, the fundamental requirement of an effective national response system may be to adopt a system-of-systems or network-centric approach to emergency preparedness. Network-centric operations could increase effectiveness by networking sensors, decision makers, and emergency responders. In essence, this means linking knowledgeable entities in the response to emergencies from the local level to the national level.

  Such a system might produce significant efficiencies by sharing skills, knowledge, and scarce high-value assets and by building capacity and redundancy in the national emergency response system, as well as gaining the synergy of providing all responders with a common operating picture and the ability to readily share information. Network-centric systems might be especially valuable in responding to a radiological attack, where responders will have to disseminate information quickly and accurately, surge medical capacity, adapt to difficult and chaotic conditions, and respond to unforeseen requirements.

  The DHS should adopt a system-of-systems architecture to support the National Incident Management System and focus research, development, and acquisition programs in the emergency response areas on those capabilities that would most contribute to building a national emergency responder network.

- **Focus federal resources on developing national surge capacity.** Over one-third of the current federal assistance provided to state and local government is for developing local hospital surge capacity. This funding supports a questionable strategy. A fixed hospital-based national emergency response system is not the answer. It is likely that local hospitals would be quickly overwhelmed by mass casualty attacks, particularly radiological strikes that might see thousands of contaminated victims as well as additional thousands of the "worried well," or unaffected individuals who seek medical treatment out of fear.

  Federal aid should strike the right balance in ensuring that the national, state, and local governments focus on their appropriate responsibilities. Assistance to the state and local levels should focus on medical surveillance, detection, and communication so that problems can be identified quickly and regional and national resources can be rushed to the scene.

- **Centralize medical response capabilities in the Department of Health and Human Services (HHS).** An effective national medical response could be key to successfully mitigating casualties from a radiological attack. Oversight

25. U.S. General Accounting Office, *National Preparedness: Integration of Federal, State, and Local and Private Sector Efforts Is Critical to an Effective National Strategy for Homeland Security,* GAO–02–621T, April 11, 2002, p. 13.

26. James Jay Carafano, "Homeland Security Grant Bill Needs Revision But Is a Step in the Right Direction," Heritage Foundation *Executive Memorandum* No. 909, January 8, 2004, at *www.heritage.org/Research/HomelandDefense/EM909.cfm.*

of national medical emergency programs, however, is split between HHS and the DHS.

Bifurcating responsibility for medical response programs such as the Metropolitan Medical Response System, National Disaster Medical System, and National Strategic Stockpile between HHS and the DHS is a mistake. Managing complex programs through interagency memoranda of understanding is bureaucratic, inefficient, and unnecessary. Clearly, transferring responsibility and budgetary oversight of these efforts into one department or the other would increase efficiency. HHS has the expertise and experience—which the DHS lacks—to oversee large medical emergency response programs.

Congress should amend the Homeland Security Act of 2002 to move responsibility for overseeing the National Strategic Stockpile, the Metropolitan Medical Response System, and the National Disaster Medical System to HHS.

- **Enhance federal expertise in emergency medical care.** The federal government lacks an integrated approach to emergency medicine, a key component of responding to a radiological attack. HHS, for example, does not have a National Institute of Emergency Medicine. Meanwhile, the Emergency Medical Services Division, tasked with developing the federal contribution to enhancing and guiding the emergency medical system, is a small office within the Department of Transportation's National Highway and Traffic Safety Administration, far removed from other key elements of the federal emergency medical response system in HHS and the DHS.

  Congress should address the shortfall in federal expertise in emergency medical services by moving Emergency Medical Services Division functions to HHS and establishing an Institute for Emergency Medicine within the National Institutes of Health that is dedicated to spearheading emergency medical research efforts. This institute should work closely with the Centers for Disease Control and Prevention to devise more comprehensive emergency medical response strategies, particularly with regard to radiological contamination.

- **Establish better coordination with the private sector.** A significant portion of the cleanup after a radiological disaster will be conducted by the private sector. Potentially, in addition to professional responders and volunteers, there are about 6.5 million skilled construction workers in the United States who could respond in the wake of a disaster.

  Thousands of workers, for example, were required at the World Trade Center to help in response and recovery operations.[27] The response also illustrated the challenges of being unprepared to quickly integrate civilian assets into a dangerous emergency response environment. A safety survey of the site found that many of these workers lacked even basic safety equipment, including safety eyewear, dust masks, ear protection, gloves, steel-toed boots, and hard hats. As a result, numerous injuries occurred and long-term health concerns arose during the course of operations.[28]

  The DHS, in concert with state and local governments and the private sector, should explore means to pre-train and certify construction workers; establish a registry of qualified contractors, firms, and unions; and link them to emergency management agencies. The DHS also needs to determine how technologies to speed cleanup efforts and protect workers can be rapidly distributed or contracted from the private sector when required.

27. Donald Elisburg and John Moran, "Response to the World Trade Center (WTC) Disaster: Initial WEPT Grantee Response and Preliminary Assessment of Training Needs," National Institute of Environmental Health Sciences, October 6, 2001, p. 7. See also Bruce Lippy and Kerry Murray, "The Nation's Forgotten Responders," National Clearinghouse for Worker Safety and Health Training," December 14, 2002, pp. 17–23.

28. Elisburg and Moran, "Response to the World Trade Center (WTC) Disaster," p. 7.

Conclusion

A clearer understanding of the dirty bomb threat will ensure that policymakers are prepared to coordinate public, private-sector, and governmental responses to a dirty bomb attack. Policymakers and the public need to understand the costs and risks associated with dirty bombs to invest appropriate resources for preparation and prevention efforts as well as for consequence mitigation.

Perhaps most important is ensuring that people do not overreact to the mere presence of radiation without full knowledge of the extent and type of contamination. Implementing a few commonsense policies will not only better prepare the nation for a dirty bomb attack, but also substantially increase America's general preparedness.

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