

RADIOLOGICAL DISPERSAL DEVICES (RDDS): “DIRTY BOMBS”

I. The Issue

A radiological dispersal device (RDD), or “dirty bomb,” uses conventional—non-nuclear—explosives to spread radioactive material. Such a device is attractive to terrorists because the materials necessary to build a weapon are relatively easy to acquire, the technology is simple, and contamination of a large area could cause panic, extensive health problems, and economic havoc. A dirty bomb is considered to be usable for terrorist or political purposes, or to deny the use of the effected area, rather than mass killings.¹

According to analysis by the Federation of American Scientists, an explosion in lower Manhattan dispersing powdered cesium-137 (a large quantity of which has been “orphaned” in Russia) could contaminate—to a level above the relocation threshold recommended by the International Commission on Radiological Protection—an area of about 15 square kilometers.²

The damage caused by the detonation of an RDD ranges from relatively minor to more catastrophic and depends on the type of material used and the size of the explosion. Even if the explosion did not cause extensive loss of life, the potential consequences could be extremely serious in terms of mass panic, economic disruption, and vacating and decontaminating the area. According to a Nuclear Regulatory Commission (NRC) fact sheet on dirty bombs, there are “millions of radioactive devices in the United States” and 21,000 organizations licensed to use radioactive material, as defined in the Atomic Energy Act of 1954.³ However a January 2003 report of the Monterey Institute of International Studies’ Center for Nonproliferation Studies states that “only a small fraction of the millions of commercial radioactive sources used globally, perhaps several tens of thousands, pose inherently high risks.”⁴ Materials with the potential for serious attacks are used in hundreds of medical, industrial, and academic applications, including: “destroying bacteria in food, sterilizing pharmaceutical products, killing cancer cells, inspecting welds, exploring for oil, and doing research in nuclear physics and engineering.”⁵ The materials include cobalt-60, cesium-137, americium, strontium-90, iridium-192, and plutonium.

According to Dr. Henry Kelly, President of the Federation of American Scientists, security systems for potential RDD materials work “reasonably well when the owners have a vested interest in protecting commercially valuable material. However, once the materials are no longer needed and costs of appropriate disposal are high, security measures become lax, and the likelihood of abandonment or theft increase.”⁶ Since September 11, 2001, the NRC and the states (some of which have agreements with the

NRC to license organizations to use radioactive material) have advised their licensees to increase the security of material.⁷

There is an urgent need to determine the extent to which security can be heightened, which materials require immediate attention, and how to carry out a program to implement safety improvements.

The problem of security is even more serious abroad. The Monterey Institute study noted above concluded that more than 100 countries have inadequate regulatory systems.⁸ Senator Joe Biden (D-DE), in his statement introducing legislation to increase the security of radiological sources worldwide, noted the problem of orphaned material. He cited a report of a January 2001 incident in the former Soviet republic of Georgia where three hunters found two abandoned cans of strontium-90 and used the material as a source of warmth. All three were critically injured.⁹ In another incident, in 1987 in Brazil, thieves broke into an abandoned cancer clinic and took a medical device containing a large amount of cesium. An estimated 250 people were exposed; eight developed radiation sickness, and four died.¹⁰ Radioisotope thermal generators placed in numerous remote sites in states of the former Soviet Union to provide power to lighthouses, weather stations, and other installations are another vulnerable source of large quantities of radioactive materials.¹¹

Moreover, there is evidence that al Qaeda controls enough cesium, strontium, or cobalt to mount an RDD attack on the United States.¹²

Obviously, keeping these materials out of terrorists' hands is an immense, important challenge.

Representatives of 120 countries participated in the International Conference on Security of Radioactive Sources in Vienna on March 11-13, 2003. The conference recommended the launching of two international efforts under the aegis of the IAEA: the first, to facilitate the location, recovery and securing of orphaned radioactive sources, and the second, to encourage and assist governments in their efforts to promote adequate radiation safety and security control infrastructures.¹³ The conference also urged that the IAEA promote broad adherence to the Code of Conduct on the Safety and Security of Radioactive Sources, once the revised version is approved and security-related principles are incorporated in the international Basic Safety Standards.¹⁴

On June 2, 2003, the G-8 countries, at their summit in Evian, France, issued a statement welcoming "the findings" of the Vienna conference, "recognizing the essential role of the [IAEA] in combating radiological terrorism," and endorsing the IAEA's "efforts to establish international standards that ensure the long-term security and control of high-risk radioactive sources."¹⁵ The G-8 stated they would:

- "1. Identify elements of the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources that are of the greatest relevance to preventing terrorists or those that harbour them from gaining access to high-risk radioactive sources, and
- "2. Consider developing recommendations on how those elements could be applied at the national level."

II. Recent Legislation

- The “Radiological Terrorism Threat Reduction Act of 2003,” title III of S.1161 as reported by the Committee on Foreign Relations on May 29, 2003, authorizes the Secretary of State to—
 - Propose that the International Atomic Energy Agency (IAEA) conclude agreements with up to eight countries for the temporary secure storage of orphaned, unused, surplus or other radioactive sources;
 - Contribute up to \$4 million in fiscal year 2004 Nonproliferation, Anti-terrorism, Demining, and Related Programs (NADR) funding to the IAEA in support of such agreements;
 - Provide the IAEA with assistance (including contributions of up to \$4 million in fiscal year 2004 NADR funds) in the conduct of a program to promote the discovery, inventory, and recovery of radioactive sources in member nations; and
 - Provide Russia and other states of the former Soviet Union with assistance in substituting solar (or other non-nuclear) power for radioisotope thermal power units in applications such as lighthouses in the Arctic, remote weather stations, and electrical power in other remote locations.
- Section 103 of H.R. 1719, the “Nuclear Security Initiative Act of 2003,” introduced on April 10, 2003, by Rep. Curt Weldon (R-PA) and cosponsored by a bipartisan coalition of 11 Republicans and 13 Democrats, authorizes the appropriation of \$60 million for fiscal years 2004 and 2005 for the purpose of assisting the states of the former Soviet Union to improve security at facilities containing radioactive materials that could be used in radiological dispersal devices (RDDs).
- H.R. 891, the “Dirty Bomb Prevention Act,” introduced on February 25, 2003, by Representative Edward J. Markey (D-MA) and cosponsored by eight, would establish a high-level task force to (1) make recommendations to the President and the Congress for ensuring the security of sealed sources from potential terrorist threats; and (2) report to the President and Congress within 180 days, and every 3 years thereafter, its recommendations for regulatory and legislative changes that will improve the security of sealed radioactive sources. The bill also requires the Nuclear Regulatory Commission to contract with the National Academy of Sciences for a study of potential means for replacing sealed sources with nonradioactive materials in industrial, research, and commercial settings.
- S. 350, the “Dirty Bomb Prevention Act of 2003,” introduced on February 11, 2003 by Senators Hillary Clinton (D-NY), Judd Gregg (R-NH), and Harry Reid (D-NV), would establish a high-level task force to evaluate threats against the security of sensitive radioactive materials and identify administrative and legislative actions to provide the maximum practicable degree of security against those threats.
- S. 193, the “Radiation Detection for Dirty Bomb Material in Containers and Bulk Cargo Act of 2003,” introduced on January 17, 2003, by Senator Mary Landrieu (D-LA), directs the Secretary of Energy to take certain actions to try to facilitate the detection of radioactive sources hidden in sea freight containers or cargo crossing land borders.

- The National Defense Authorization Act for Fiscal Year 2003 (H.R. 4546, which became Public Law 107-314) authorizes the Secretary of Energy (1) to establish within the Department of Energy’s International Materials Protection, Control, and Accounting program a new program for RDD materials in the states of the former Soviet Union (FSU) (section 3156); and (2) to assist countries in the “region” of the FSU and other “regions of concern” to improve their domestic export control programs with respect to both nuclear devices and RDDs (section 3160).
- S. 2545, the “Nuclear Nonproliferation Act of 2002,” introduced on May 22, 2002 by Senator Pete Domenici (R-NM), with co-sponsorship of Senators Joe Biden (D-DE), Bob Graham (D-FL), Mary Landrieu (D-LA), Blanche Lincoln (D-AR), Barbara Mikulski (D-MD), Jeff Bingaman (D-NM), Chuck Hagel (R-NE), Joseph Lieberman (D-CT), Richard Lugar (R-IN), and Frank Murkowski (R-AK), would have directed the Secretary of Energy to establish an international program on the protection, control, and accounting of materials usable in RDDs.
- S. 3121, the “Nuclear and Radiological Terrorism Threat Reduction Act of 2002,” introduced on October 16, 2002, by Senator Joe Biden (D-DE), with co-sponsorship of Senators Richard Lugar (R-IN), Pete Domenici (R-NM), Hillary Clinton (D-NY), Judd Gregg (R-NH), and Charles Schumer (D-NY), would have (1) authorized the Secretary of State to undertake measures in support of international programs to detect and prevent acts of nuclear and radiological terrorism, and (2) authorized the appropriations for those efforts.

III. Obstacles

- Materials for an RDD are very widely available and often poorly secured.
- Although actions could be taken to secure the more dangerous radioactive materials, we may never be able to provide complete protection against RDD use.

IV. Q & A

Q: What is a “dirty bomb” or radiological dispersal device (RDD)?

A: This is a device using a conventional (not nuclear) explosive to scatter radioactive material to contaminate people in the vicinity or the environment in a larger area.

Q: Why are RDDs believed to be attractive to terrorists?

A: First, the materials to build RDDs—conventional explosives and radioactive sources—are widely available. The explosives, or their ingredients, can be easily purchased; and the radioactive sources are located in tens of thousands of facilities in the U.S. and around the world, where the level of security may not be adequate or where materials have been abandoned (“orphaned”).

Q: What is being done to deny terrorists access to the radioactive material they could use to build RDDs?

A: Organizations licensed to use radioactive sources in the U.S. have been asked to increase their security; and in June 2002, the U.S., Russia, and the International Atomic Energy Agency (IAEA) established a working group that is developing a strategy to locate, secure, and recycle orphaned radiological sources throughout the states of the former Soviet Union. However, the U.S. and the international community

are in the beginning stages of the effort to protect against terrorist use of RDDs. For example, legislation introduced (but not enacted) in 2002 would have required evaluation of steps that the U.S. should take to this end. Similar legislation was introduced in 2003.

V. Talking Points

- Because the materials and technology needed for production of a dirty bomb/RDD are relatively easy to acquire, a dirty bomb/RDD is one of the most likely weapons of choice for terrorist organizations.
- Although detonation of an RDD may not cause a massive number of casualties, the resulting radiological contamination would cause severe economic repercussions as well as strike a psychological blow to the population.
- In June 2002, the U.S., Russia, and the International Atomic Energy Agency (IAEA) established a working group that is developing a strategy to locate, secure, and recycle orphaned radiological sources throughout the states of the former Soviet Union. However, such materials are available virtually worldwide, requiring broad-based international cooperation.
- The U.S. and the international community are in the beginning stages of the effort to protect against terrorist use of RDDs.

VI. Factoids

- There are millions of radioactive devices in the U.S. alone; and 21,000 organizations have been licensed to use radioactive materials.
- Radioactive materials can be found in nearly every country around the world.
- Detailed instructions for building RDDs were found in al Qaeda caves in Afghanistan.
- Intense sources of gamma rays can cause acute radiation poisoning; and long-term exposure to low levels of gamma rays and alpha emitters can cause cancer.
- RDDs could scatter radioactive materials that can chemically bind to concrete and asphalt or become lodged in crevices on the surfaces of buildings and streets.
- RDDs could contaminate scores or even hundreds of blocks in an urban area, resulting in severe economic dislocations and many billions in decontamination and demolition/reconstruction costs.
- In January 2001, three hunters in the former Soviet Republic of Georgia found two cans of strontium-90 in the woods and were critically injured when they used them as a source of heat carried in their backpacks.
- In 1987 in Brazil, thieves took a medical device containing a large amount of radioactive cesium from an abandoned cancer clinic. The material killed four people and gave eight radiation sickness.

VII. Applicable Treaties, Legislation, and Other International Agreements

- The Atomic Energy Act of 1954 (42 U.S.C. §§2011-2259), the Energy Reorganization Act of 1974 (42 U.S.C. §§5801-79), and the Department of Energy Organization Act of 1977 (42 U.S.C. §§7101-7352) give primary responsibility for managing the control of nuclear energy and radioactive materials to the Nuclear Regulatory Commission (NRC) and the Department of Energy (DOE).
- The NRC has the authority to license nuclear reactors and the users of radioactive materials.
- The DOE develops nuclear warheads and is responsible for energy development and related functions.

¹ Anthony H. Cordesman, "Radiological Weapons as Means of Attack," accessed at: www.csis.org/burke/hd/reports/radiological.pdf.

² Michael Levi and Henry Kelly, "Weapons of Mass Disruption," *Scientific American*, 77 (November 2002).

³ Nuclear Regulatory Commission, "Fact Sheet on Dirty Bombs," accessed at: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/dirty-bombs.html>.

⁴ Charles D. Ferguson, Tahseen Kazi, and Judith Perera, "Commercial Radioactive Sources: Surveying the Security Risks," Center for Nonproliferation Studies, Monterey Institute of International Studies (2003), accessed at: <http://cns.miis.edu/pubs/opapers/op11/op11.pdf>.

⁵ Levi and Kelly, *op cit.*, note 2.

⁶ Henry Kelly, "Testimony before the Senate Committee on Foreign Relations," March 6, 2002, accessed at: <http://www.fas.org/ssp/docs/030603-kellytestimony.htm>.

⁷ Nuclear Regulatory Commission, *op. cit.*, note 3.

⁸ Ferguson, Kazi, and Perera, *op cit.*, note 4.

⁹ *Congressional Record*, October 16, 2002, S10579.

¹⁰ Henry Kelly, *op. cit.*, note 6.

¹¹ *Congressional Record*, *op cit.*, note 11.

¹² David Albright, "Al Qaeda's Nuclear Program: Through the Window of Seized Documents," November 6, 2002, accessed at: http://www.nautilus.org/fora/Special-Policy-Forum/47_Albright.html.

¹³ International Atomic Energy Agency, "Stronger Controls Needed to Prevent Terrorist 'Dirty Bombs,'" Press Release, March 13, 2003, accessed at: http://www.iaea.org/worldatom/Press/P_release/2003/prn0303.shtml.

¹⁴ *Ibid.*

¹⁵ "Non Proliferation of Weapons of Mass Destruction Securing Radioactive Sources - A G-8 Statement," accessed at the G-8 Evian Summit website: http://www.g8.fr/evian/english/navigation/news/news_update/non_proliferation_of_weapons_of_mass_destruction_securing_radioactive_sources_-_a_g8_statement.html.